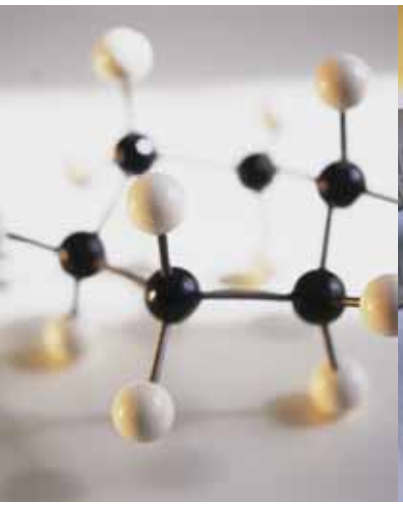
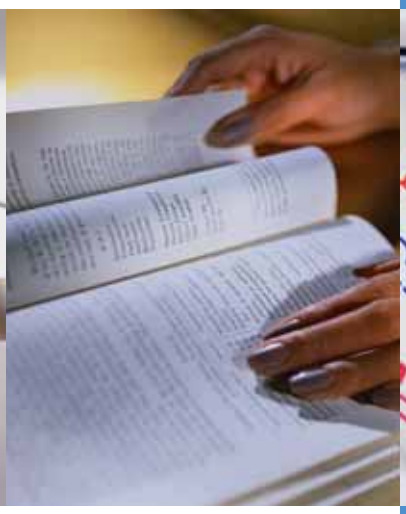
ISSN 1756-9524 (Print)
ISSN 1756-9532 (Online)

June 2008

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

Number 16
Volume 9 Issue 1

Reviews

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

The journal is free of charge to academics in UK higher education institutions. The material is also published electronically on our web site. Subscriptions are available for those outside the UKHE sector who wish to receive the paper version. Contact the Centre for details.

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

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

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

Editor

Roger Gladwin
Physical Sciences Centre
Chemistry Department
Liverpool University
Liverpool L69 7ZD
Tel: 0151 794 3576
Fax: 0151 794 3586
Email: rgladwin@liv.ac.uk

Editorial

This issue is the first with our new look. Following the survey of our community we decided to give each of our publications a 'livery' so they may be more easily recognised from each other and so that individual issues in a series may be more easily distinguished.

We also have a new name, gone is *Physical Sciences Educational Reviews* (which was considered by some to be a misnomer). The journal is now simply *Reviews* (with the sub-title: *a guide to publications in the physical sciences*) and as a consequence of the renaming has a new ISSN (one for the paper version, one for the electronic version).

We continue to fill the journal with reviews of resources for teaching the physical sciences, undertaken by our team of independent academics from the UK and overseas.

Roger Gladwin
Editor

In this issue...

Book reviews...

An Introduction to the Optical Spectroscopy of Inorganic Solids

Subject area
Physical sciences, spectroscopy

Description
Introductory work on optical spectroscopy, with emphasis on experimental techniques

Authors
José García Solé, Luisa Bausá and Daniel Jaque

Publishers/Suppliers
John Wiley and Sons Ltd (eu.wiley.com/WileyCDA)

Date/Edition
2005 (November 2005 reprint)

ISBN
978-0-470-86886-7

Level
Undergraduate, research

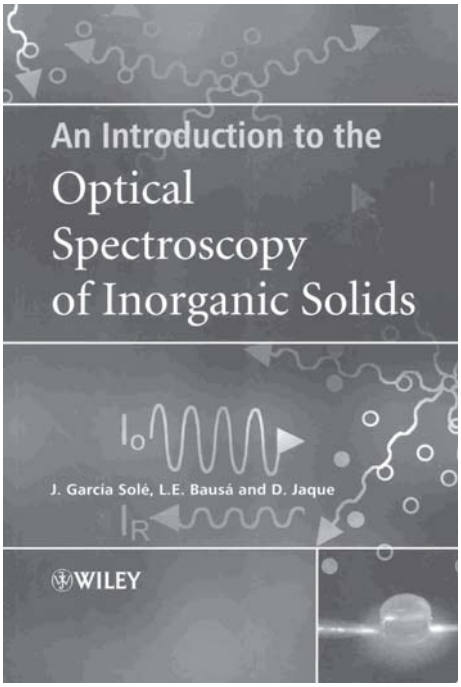
Price
£39.95

Tony Harker
Department of Physics and Astronomy
University College London
Gower Street
London
WC1E 6BT
May 2008

Summary Review

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

This text on optical spectroscopy is refreshingly different from most others in that it is written by experimentalists from an experimental viewpoint. This means that spectroscopic tools including light sources are described first, so that the reader knows how the measurements are made before reading in detail about the light-emitting centres in solids. As described in a previous review of this book (Physical Sciences Educational Reviews **7**(1) 4-5, June 2006), this approach is carried out effectively, and there is a good balance of content between spectroscopy, specific light absorption and emission mechanisms and optically active centres, group theory and tabular material.



This text is stated on the reverse title page to be "Reprinted with corrections November 2005", but it is hard to find any corrections in the text. I would have hoped that the reprinting would have been taken as an opportunity to correct problems in production, such as the footnote on page 176 with directs the reader to "see p. 000". Similarly, there are editorial matters which should have been addressed. For example, the table of physical constants uses *K* [italic upper-case k] as the symbol for Boltzmann's constant. This looks like a sensible decision for a work in which *k* [italic lower-case k] is likely to be used to denote a wavevector, but it might be wiser to revert to the conventional k_B [italic lower-case k subscript normal upper-case b]: the text initially uses κ [Greek kappa] and later *k* [italic lower-case k] for Boltzmann's constant, and both κ [Greek kappa] and *k* [italic lower-case k] for wavevector!

Despite this missed opportunity for minor improvements, this is a useful book for an undergraduate or an early-stage postgraduate course in spectroscopy.

Applied biophysics: a molecular approach for physical scientists

Subject area
Biophysics

Description
This book presents the fundamentals of molecular biophysics, and highlights the connection between molecules and biological phenomena

Authors
Tom A Waigh

Publishers/Suppliers
John Wiley and Sons Ltd
(eu.wiley.com/WileyCDA)

Date/Edition
2007

ISBN
978-0-470-01718-0

Level
Undergraduate

Price
£29.95

Richard Henchman
School of Chemistry
University of Manchester
Oxford Road
Manchester
M13 9PL
April 2008

Summary Review

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

A timely textbook explaining how the many concepts and tools widely used in physics can be applied to understand biological systems. Given the significant breadth and depth of this rapidly growing subject, Tom Waigh does a good job in providing a valuable bridge between physics and biology. There is plenty of material for upper-level undergraduate and postgraduate courses in either physics, chemistry or biology degrees, either familiarising those in physics with biological systems or those in biology with physical concepts or those in chemistry with both. There is a strong focus on recent developments, and it is intended to complement the many books already published on the chemical side of the subject and on established analytical methods.

Therefore, it contains little on how properties relate to molecular composition or reactivity and most models are coarser than the molecular level. Quantitative models to explain biophysical phenomena largely depend on relatively simple molecular properties: for example, little explanation is given of the hydrophobic effect in terms of molecular interactions; rather, it is only incorporated implicitly into the surface tension and surface area model. A more accurate title for the book may have “a molecular approach” replaced with “a mesoscale approach”. Useful sections are provided on recently developed analytical methods such as optical tweezers rather than focusing on now standard methods such as NMR or x-ray crystallography that are covered elsewhere.

A diverse range of topics is explored. After a brief review of the molecular hierarchy from molecules to cells and an explanation of the main molecular interactions, the book launches into a discussion of those phase transitions and phases particular to biological systems involving protein conformation, crystallisation, colloids and liquid crystals. Next comes diffusive and activated dynamics, thermodynamic models for assembly, and surface phenomena such as surface tension, capillarity and friction. This is followed by sections on the dynamics, shape and solubility of biomacromolecules, on ionic solutions and ionic polymers, and on the properties of membranes.

Primers are supplied on mechanics and rheology (viscoelasticity) and their applications to biological systems. The coverage on experimental techniques focuses more on recent developments including scattering, osmotic pressure, force measurements, electrophoresis, sedimentation, rheology, tribology (friction) and mechanical properties. Finally, three particular kinds of systems are highlighted, namely motors, biomaterials and DNA phase behaviour.

The chapters are each largely self-contained and do not have to be covered in any particular order. While there is an emphasis on quantifying the properties, there is a good balance of explanatory text and equations with a plentiful use of helpful figures and few lengthy derivations. Given the complexity of biology, many models are understandably approximate but still give useful insight. Most models are complemented by appropriate biological examples. At the end of each chapter are listed other texts to which the reader could refer for more information. The material is accurate with only a few small typographical and formatting errors. Altogether, it is a very useful synthesis of physical concepts and biological processes based around the molecular and mesoscales.

Astrophysics: decoding the cosmos

Subject area
Astrophysics

Description
This book is an accessible introduction to the key principles and theories underlying astrophysics

Authors
Judith Ann Irwin

Publishers/Suppliers
John Wiley and Sons Ltd
(eu.wiley.com/WileyCDA)

Date/Edition
2007

ISBN
978-0-470-01306-9

Level
Undergraduate

Price
£34.95

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

The book **Astrophysics: Decoding the Cosmos** is intended for undergraduates studying astronomy. This is a very easy to read textbook although full of physical insight. I would certainly recommend undergraduate students to take a good look at it. It may also be useful for advanced undergraduates who would like to refresh themselves with some basic concepts of Astrophysics such as how light from astrophysical objects is observed, what the matter content of the Universe is, how light is produced, how it interacts with matter and space, and how we can retrieve information on physical conditions in the Universe from the analysis of the light we receive. As it does not cover the whole of our undergraduate Astronomy curriculum (eg Relativity and Gravitation), we cannot make it the key reference textbook. However, it is a useful tool for students and university teachers alike. There is a good range of problems to solve, with solutions available to lecturers on the companion web site.

I enjoyed reading this book throughout. It is well written, the style is clear and there is even a feeling of Judith Irwin talking to us. She manages to introduce a variety of topics in an elegant manner emphasising the underlying physics in a more-than-descriptive way. The amount of mathematics is at the right level, allowing the interested students to acquire the tools to further progress. This implies that the students should be somehow familiar with simple algebra such as derivatives, integrations, summations, expansions etc. First-year undergraduates who are not comfortable with such mathematics may still find it worth reading as these mathematical steps are often accompanied by a discussion about their physical significance. The author makes extensive use of references to other parts of the book (tables, equations, figures, appendix) - which is always useful.

I found the overall visual appearance of the book - font style and size, page layout - appealing. Most importantly, the figures and illustrations are well-chosen, always relevant and well-presented. All of them are in black and white, and it is a good alternative to the packed-with-colours textbooks which sometimes near the saturation level and require too much concentration for the reader to analyse and understand the colour codes. Nevertheless, the glossy insert of 16 colour plates found at the centre of the book is a nice addition. Some more colour reproductions would be welcomed in a future edition.

Some errors appeared in the text due to font issues, and the publisher offers an erratum with a list of corrections. This list is not too long though, and it is easy to take a couple of minutes to take note of the errors in the book. A shorter list of additional errors is available on the companion web site, and correcting those in the book is straightforward.

One regret I have is the use of cgs units. As this book will be used to teach some basic elements of Astrophysics to undergraduates, SI units are more appropriate and I would have preferred to see SI units instead of cgs.

The reader interested in knowing more about **Astrophysics: Decoding the Cosmos** by Judith A Irwin can take a look at the preface available at <decoding.phy.queensu.ca/preface.pdf> in order to get a personal feel of what this book offers.

Nicolas Labrosse
Department of Physics and Astronomy
University of Glasgow
G12 8QQ
April 2008

Chemical Thermodynamics at a Glance

Subject area
Physical chemistry

Description
This book provides a concise overview of the main principles of Chemical Thermodynamics for students studying chemistry and related courses at undergraduate level

Authors
H D Brooke Jenkins

Publishers/Suppliers
Blackwell Publishing (bookshop.blackwell.co.uk/jsp/welcome.jsp)

Date/Edition
2008

ISBN
978-1-4051-3997-7

Level
Undergraduate

Price
£19.99

Richard Henchman
School of Chemistry
University of Manchester
Oxford Road
Manchester
M13 9PL
April 2008

Summary Review

range: * poor to ***** good

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

This is a well-organised presentation of the standard material in a thermodynamics undergraduate course for chemists or chemical engineers. The concepts covered mostly relate to gases, liquids and mixtures. It is more suitable as a reference book than a textbook since its layout is concise and systematic and the emphasis is more on the concepts than on examples of the concepts' applications. The development of ideas is logical and clear but faster than would be appropriate at the purely introductory level. Therefore, some familiarity of the student with thermodynamics beforehand would be recommended as could be provided by a general physical chemistry textbook.

Amongst its advantages, the material is conveniently presented in 54 bite-sized chapters each only two to four pages long and usually covering a single concept. This makes information readily accessible owing to the informative contents, the clear sectioned layout of the small chapters as well as the index. Furthermore, all the main equations, concepts and the connections between them are concisely summarised in a flow chart on the back inside cover. There is a good balance of explanations and equations and the derivations are well-interspersed with explanations.

Regarding its content, the relevant IUPAC notation and the main concepts are defined. A mathematics summary reviews the required integration, partial differentiation and logarithms and exponentials. A number of chapters then describe the first, second and third laws of thermodynamics together with the concepts of enthalpy and entropy. This is followed by the Gibbs energy, its dependence on temperature and pressure, its relationship with entropy and enthalpy, how it determines phases and the Clapeyron equation. The concepts of chemical potential to describe multicomponent systems, the phase rule, molality, fugacity and activity are applied to ideal and real mixtures in equilibrium with their vapours as described by Dalton's, Raoult's and Henry's laws. The different kinds of equilibrium constants are defined together with how systems move towards equilibrium and how equilibrium constants depend on temperature and pressure. After a derivation of the Gibbs-Duhem equation, the book finishes on detailed derivations of the equations for the colligative properties of freezing point, boiling point and osmotic pressure.

The perspective on thermodynamics is very much from the empirical, macroscopic point-of-view as the author makes very clear in a flow chart on the inside front cover. While this approach makes the material self-contained, it does not help with the integration of this knowledge with the sibling topic of kinetics. Nor does it discuss much the connection between molecular and thermodynamic properties and how this knowledge allows us to make simplifying approximations in the thermodynamic equations, for example, exactly why the Clausius-Clapeyron equation holds or when can we assume ideal mixtures. Making more of these connections would help alleviate the dryness of thermodynamics and help students to identify more with its relevance to other branches of chemistry, other physical sciences and indeed the everyday world. Overall, this clear and structured presentation of thermodynamics will be of assistance to students in revising and instructors in providing a comprehensive source of the main material. Presenting thermodynamics in an appealing and instructive way is an ongoing problem and this text addresses this issue in its clarity and useful organisation.

Chemistry: structure and dynamics

Subject area
General chemistry

Description
This text presents data, and challenges students to derive the models. This approach helps students get a feel for how chemists approach problems in the real world

Authors
James N Spencer, George M Bodner and Lyman H Richard

Publishers/Suppliers
John Wiley and Sons Ltd (eu.wiley.com/WileyCDA)

Date/Edition
3rd Edition

ISBN
978-0-471-65552-7

Level
Undergraduate

Price
£73.95

Zia Khan
CA/151, 9/A
Muhammad Hussain Rd
Modeltown A
Bahawalpur
Pakistan
May 2008

Summary Review

range: * poor to ***** good

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

This book provides useful basic knowledge for many important topics of chemistry. According to the authors the book provides brevity, flexibility, currency, a way of unifying things, a conceptual nature and a selection of case studies. The book is divided into sixteen chapters. Chapters 1, 2 and 3 provide the general introduction to elements and compounds, atoms, atomic number, mass number, isotopes, ions, formulae, the periodic table, etc. Then the authors have explained various important topics like chemical equations, molecules versus moles, balancing chemical equations, mole ratios and chemical equations with the help of coloured figures and useful examples followed by stoichiometry, density, solute, solvent, solutions and molarity and dilution calculations. Also Bohr's model of the atom and then the spectrum of the hydrogen atom followed by electronic transitions, are described. After that, the first ionisation energy, the Shell model, application of the Shell model to the periodic table and then photoelectron spectroscopy have been explained. Next quantum numbers (principal, angular, magnetic quantum number), the Pauli Exclusion Principle, predicting electron configurations and correlation with the periodic table, electron configuration and Hund's rule, have been described. Then the size of atoms (metallic radii and covalent radii) relative sizes of atoms and their ions, patterns in ionic radii, second third, fourth and higher ionisation energies have been explained using suitable tables. The last important topic in this chapter is the average valence electron energy (AVEE).

Chapter 4 deals with the covalent bond, starting with a description of valence electrons and then the sharing of electrons. Other important topics are Lewis Structures and their application, the octet rule, resonance hybrids, electronegativity and partial charge. Additionally there is some discussion of the shapes of molecules; ie the electron domain (ED) model for predicting the shapes and role of non bonding electrons in the ED models. Here, there are also some special topics like valence bond theory, hybrid atomic orbitals and molecules with double and triple bonds.

Chapter 5 deals with ionic and metallic bonds. This covers metals, nonmetals and semimetals, followed by active metals, main group metals and their ions, main group nonmetals and their ions, transition metals and their ions, ionic bonds and structures of ionic compounds and various unit cells. There is an interesting triangular figure showing the three different types of chemical bond; ionic, covalent and metallic.

Chapter 6 is about gases; providing some basic concepts and laws, such as Boyle's Law, Amontons' Law, Charles' Law, Gay-Lussac's Law and then the ideal gas equation followed by Dalton's Law of Partial Pressures. This chapter also covers the important topic of the Kinetic Molecular Theory and how this explains the Gas Laws. There are also some special topics; eg Graham's Laws of Diffusion and Effusion; deviations from ideal gas behaviour and the Van der Waal's equation and the analysis of Van der Waal's constants.

The Chapter 7 starts with some basic thermodynamics, covering the first law, the state functions, the enthalpy of a system, enthalpy as a state function followed by standard-state enthalpies of reaction and then enthalpies of atom combination.

Chemistry: structure and dynamics

The next chapter is about liquids and solutions; initially, basic concepts like intermolecular forces, hydrogen bonding, relative strengths of intermolecular forces etc are considered, then we have the kinetic theory of liquids followed by a brief description of phase diagrams, solubility equilibria, solubility rules, net ionic equations and hydrophilic and hydrophobic molecules (the authors have then used interesting applied examples about soaps, detergents and dry cleaning agents, explaining the history and then cleaning actions using suitable examples). Also in this chapter are some special topics; eg colligative properties, depression of the partial pressure of a solvent, boiling point elevation and freezing point depression.

The next chapter is about solids, starting with bond type. Topics include the physical properties that result from the structure of metals, coordination numbers, the structure of metals and unit cells. Other important topics are solid solutions and intermetallic compounds, semimetals and ionic solids illustrated by the help of some interesting figures. This is followed by some special topics covering defects; metals, semi conductors and insulators; thermal conductivity; thermal expansion plus glass and ceramics.

Chapter 10 deals with kinetics and equilibrium and includes topics on the rate of chemical reactions, the collision theory of gases, phase reactions (described using a suitable illustration), followed by equilibrium constant expressions (using some experimental data). The next section is 'Le Châtelier's Principle' (described with useful examples and figures), then solubility product has been described along with the relationship between solubility product and solubility of a salt, followed by some solved examples of solubility calculations then by the common-ion effect and finally some special topics: 'A Rule of Thumb for Testing the Validity of Assumptions' (which can be understood easily by following the accompanying exercise) and 'What Do We Do When the Approximation Fails?' – again supported by good solved examples.

Chapter 11 covers acids and bases; starting with basic concepts and then the Brønsted–Lowry definition of acids and bases, conjugate acid-base pairs and the role of water in the Brønsted model . The next important section is pH; explaining pH and pOH, the relative strengths of different acids and bases and the relationship of structure to relative strengths of acids and bases, strong and weak acid pH calculations, base pH calculations, buffers and their capacities, pH titration curves and then some special topics: diprotic acids, diprotic bases and compounds that could be either acids or bases.

Chapter 12 deals with oxidation-reduction reactions, introducing; common oxidation-reduction reactions, oxidation numbers, recognising oxidation-reduction reactions, oxidising and reducing agents, relative strength of reducing and oxidising agents; supported by useful data in a table. The next section is about standard cell potentials followed by a description about batteries (lead-acid, Nicad, fuel cells) supported by cut away drawing of a typical alkaline battery and data for a typical lead-acid battery and hydrogen-oxygen fuel cell. Then there are topics covering the Nernst equation, electrolysis and Faraday's Law, balancing oxidation-reduction equations, redox reactions in acidic and basic solutions, molecular redox reactions and finally three other special topics.

The next chapter is about chemical thermodynamics. Initially this covers spontaneous processes followed by entropy and disorder. After that entropy and the second law of thermodynamics are explained. There follows sections dealing with entropy of surroundings, system and universe and the third law of thermodynamics, the Gibbs free energy, the standard-state free energies of reactions, equilibria expressed in partial pressures, interpreting standard-state free energy of reaction data, the relationship between free energy and equilibrium constant. Finally the temperature dependence of equilibrium constants and Gibbs free energy of formation and absolute entropies are covered.

The next chapter is about Kinetics; describing basic concepts, order and molecularity, a collision theory of chemical reactions, mechanisms of chemical reactions followed by zero-order reactions plus kinetic equations for zero, first and second order reactions etc. Additionally other important topics are activation energy, catalysts and rate of chemical reactions, determining the activation energy of a reaction and a special topic - deriving integrated rate laws.

Chapter 15 is about nuclear chemistry starting with basic concepts, binding energy calculations, the kinetics of radioactive decay, dating with radioactive decay along with biological effects, nuclear fission and nuclear fusion; discussed with the help of useful figures. There is also an introduction to nuclear medicines and some end of chapter problems.

In the last chapter, various methods of chemical analysis are described, such as chromatography and gas chromatography/mass spectrometry (with a good example of the gas chromatogram of an apple juice). Also there are some practical examples of chemical analysis in fighting crimes and other situations, with the help of some good examples and figures.

Finally, although this book contains most of the materials related to basic chemistry, if the core chapters are mixed with problems at the end of each chapter and with modules (optional) and with some professional help from teachers, then this book is very useful for various entry tests, college levels, and to some extent a basic handbook for 1st year undergraduate students and also for those researchers who always need some basic handy knowledge during their daily experimental work.

View an extended, unedited version of this review

Conservation Chemistry – an introduction

Subject area
Chemistry, conservation science, forensic science

Description
This resource shows how chemical techniques are used in conserving objects made from a wide variety of materials and seeks to introduce some of the ethical considerations of conservation to students

Authors
Ted Lister and Janet Renshaw

Publishers/Suppliers
Royal Society of Chemistry Publishing (www.rsc.org/Publishing/Books/index.asp)

Date/Edition
2004

ISBN
978-0-85404-395-8

Level
School level, A-level, access, foundation

Price
£19.95

Summary Review

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

Conservation Chemistry – an Introduction 'does what it says on the tin'. It is a well produced teaching resource from the RSC divided into three sections, each based around a set of related materials requiring conservation. Each section begins with teachers' notes, including answers to questions and exercises set in the students' notes which follow, and each concludes with an excellent case study. The case studies are the real highlight of these materials and they are written by experts: for example, scientists at the Mary Rose trust wrote the one on conserving the Mary Rose which illustrates the section on conserving wood. These case studies graphically illustrate the complexities of conserving objects, particularly those composed of mixed materials and they tackle difficult questions with sensitivity, realism and accessibility. Does one, for example seek to conserve an object as it is or to restore it to how it looked when first made? How does one tackle the problem of an object made of an early polymer such as casein which requires moisture to prevent progressive embrittlement when it also contains polymers which degrade in moist atmospheres? The authors also look at the problems of displaying a conserved object; lighting, humidity and oxygen, for example.

Each of the three resources in this book: conserving plastics, stone and wood conservation, consider the chemistry behind the degradation of the materials concerned, what products are produced and the effects seen on the object, together with methods for preventing further degradation in order to conserve the object and to display it. There is also a short sub-section in the Mary Rose case study, looking at the conservation of metals.

This is a fascinating subject and is brought to life expertly; the students' notes are clear and well written and there are some good experimental ideas and exercises too. It is well worth consideration by teachers as part of a GCSE science source and a good deal of it would be suitable to augment AS and A-level chemistry too.

If a second edition is planned, I think I would make explicit on the front cover that this is a set of teaching resources and also the level(s) at which the resources are pitched. It is there in the text but one has to look for it. A second slight criticism is that each section launches in with teachers' notes and answers to questions which only make sense after one has read the notes for students (although this format can be discerned from the contents list). The font too is quite small but that may be because the resources are also available on-line and can be found with a little persistence on the RSC web site (the exact URLs given in the book no longer apply in every case!). However, these criticisms are minor and do not detract from a fine set of materials which this reviewer very much enjoyed and would recommend highly.

David Harwood
Institute for Science Education
School of Earth Ocean and Environmental Sciences
University of Plymouth
B508 Portland Square
Plymouth PL4 8AA
April 2008

Core Concepts in Supramolecular Chemistry and Nanochemistry

Subject area
General chemistry, supramolecular chemistry

Description
A primer for introductory undergraduate and graduate courses in supramolecular chemistry

Authors
Jonathan W Steed, David R Turner, Karl J Wallace

Publishers/Suppliers
John Wiley and Sons Ltd (eu.wiley.com/WileyCDA)

Date/Edition
2007/1st Edition

ISBN
978-0-470-85867-7

Level
Undergraduate, research

Price
£24.95

Jim A Thomas
Department of Chemistry
University of Sheffield
Sheffield
S3 7HF
April 2008

Summary Review

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

Just over twenty years after its three founding fathers picked up their Nobel Prizes, supramolecuar chemistry has become an almost ubiquitous chemical research 'buzzword', and any chemistry department worth its salt now dedicates at least part of an undergraduate module to 'chemistry beyond the molecule'. Yet, there is still not a single textbook that comprehensively covers the topic at a level appropriate to the average undergraduate.

On one hand, a handful of primers offering brief overviews have been published, but most of these volumes don't really do justice to the full gamut of supramolecular enterprises, with authors tending to concentrate - perhaps naturally - on areas of their own expertise and interest. At the other extreme, several comprehensive, multi-volume, research focused doorstops have seen the light of day; great resources for researchers and teachers thinking about this area, but hardly the first port of call for the average undergraduate. Up until now the best text for a student looking for some further reading on this subject has probably been *Supramolecular Chemistry* by Atwood and Steed.

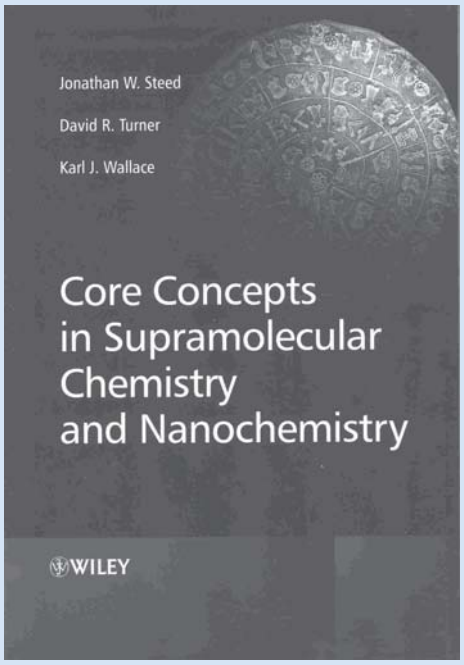
However, while every university chemistry library should definitely have a copy of this book, it is too big and expensive to recommend as an undergraduate purchase. Also, despite being published as recently as 2000, it is beginning to show its age a little – an inherent danger for any textbook summarising a fast moving area. What is more, some of supramolecular chemistry's leading lights and their research were glaringly omitted. In a clear attempt to address these issues, and offer a more student (and lecturer) friendly package, the same publishers have now brought out **Core Concepts in Supramolecular Chemistry and Nanotechnology**.

Given that Jonathan Steed is a co-author of both books it is hardly surprising that the format and much of the content of this new work owes a great deal to *Supramolecular Chemistry*. But even a cursory glance through *Core Concepts*' pages reveals that Steed and his fellow writers (who are also both actively involved in this research area) have delivered a more student friendly resource book for any introductory supramolecular chemistry course.

Overall, the text is written with lucidity: no specialist knowledge is required, when new terms and concepts are introduced they are succinctly defined in stand-alone shaded boxes and the accompanying black and white and greyscale diagrams provide perfectly adequate examples and illustrate points clearly enough. But one of the attractions of supramolecular chemistry is its aesthetic appeal. Host guest interactions and self-assembly processes often yield beautiful architectures that lend themselves well to colourful figures and schematic presentations. Perhaps, this is asking too much (and is economically unrealistic), but a little colour in some of the figures may have helped in visualising this aspect of the subject.

Continued on page 10

Core Concepts in Supramolecular Chemistry and Nanochemistry



From the publisher...

Core Concepts in Supramolecular Chemistry and Nanochemistry

By Jonathan W. Steed, David R. Turner, Karl Wallace

Supramolecular chemistry and nanochemistry are two strongly interrelated cutting edge frontiers in research in the chemical sciences. The results of recent work in the area are now an increasing part of modern degree courses and hugely important to researchers.

Core Concepts in Supramolecular Chemistry and Nanochemistry clearly outlines the fundamentals that underlie supramolecular chemistry and nanochemistry and takes an umbrella view of the whole area. This concise textbook traces the fascinating modern practice of the chemistry of the non-covalent bond from its fundamental origins through to it expression in the emergence of nanochemistry.

978-0-470-85867-7 320pp 2007 £24.95

Continued from page 9

In terms of its scientific content the book is wide-ranging: after an overview that defines supramolecular chemistry and outlines its parameters and concerns, chapters on host-guest interactions, self-assembly, and solid-state supramolecular chemistry (including some discussion of crystal engineering) follow; the book ends with a solitary chapter on nanochemistry. Throughout the work interested readers wanting to learn more about a particular subject area are offered pointers to key reviews.

Taking on the whole of supramolecular chemistry in just over 300 pages would be a demanding task. In fact, although the book is up to date in what it does cover, there are still some significant omissions. This is why I am nonplussed by the final chapter. I am not convinced there is currently a need for an undergraduate text on nanochemistry, but if there is, tacking sixty or so pages on into a textbook on another, albeit related area is unfair on either subject. Surely if this space is going to be used it would have been better employed to add a more examples and explanations to the chapters on supramolecular chemistry? Alternatively the chapters on supramolecular chemistry could have been published as a shorter, more student-affordable stand-alone text.

Summing up then, while this not unreasonably priced book is far and away the best resource text yet for undergraduate course on supramolecular chemistry - and a good primer for anyone starting a research project in the area – it misses its target audience slightly. It could have been so much better if the authors had stuck to their guns and focused on the main event.

Cutting Edge Chemistry

Subject area
General chemistry

Description
This text describes the principles of chemistry as they apply to everyday life, research and in industry

Authors
Compiled by Ted Lister. Edited by Susan Aldridge, John Johnston and Colin Osborne

Publishers/Suppliers
Royal Society of Chemistry Publishing (www.rsc.org/Publishing/Books/index.asp)

Date/Edition
2006 reprint of 2000 edition

ISBN
978-0-85404-914-1

Level
A-level, access, foundation

Price
£24.95

Nancy El-Farargy
c/o Centre for Science Education
11 Eldon Street
University of Glasgow
G3 6NH
April 2008

Summary Review

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

Cutting Edge Chemistry seeks to provide an eloquent description of the extraordinary developments in chemistry throughout history and in anticipation of the future. The remarkable discoveries in the life sciences and the wide variety of technological applications of chemistry that are described in the book can be used as an excellent vehicle to discuss and interpret the fundamental principles of chemistry. “We now take so many modern products for granted that we forget that they would not exist without the chemical knowledge used to make them” (p 4). The breadth of material covered throughout the 196 pages is quite large, although sufficient enough to gain an understanding of the fascinating applications of chemistry. This book would suit science communicators, teachers, trainee teachers and post-16 students.

The authors suggest uses of the book, which include student background reading, interest and enjoyment and for teachers to enliven their own teaching with up-to-date examples from everyday life. Students can also read specific chapters as contextual reading (which can fit in with many syllabi of exam boards throughout the UK) to help provide enthusiasm and context to their work.

Each chapter includes interspersed questions throughout to provoke debate, test understanding and in order to illustrate the fact that “chemists working at the cutting edge use exactly the same principles” (p 10) that a student learns in school or college. Students require prior knowledge to answer these questions; hence it is suitable for post-16 students. In addition, answers are provided at the end of each chapter in order to check progress and understanding.

The high quality of presentation boasts ten bright colour-coded chapters, photographs and illustrations interspersed throughout, which is appealing to readers. In addition, a glossary is provided at the head of each page (as the bold term crops up) for students who might be unfamiliar with some of the chemical vocabulary. ‘Boxes’ are also sprinkled throughout to discuss concepts in more detail. Perhaps an index could be added for those individuals who need to reference information quickly - this being a possibility for a future edition.

The introduction provides an unfolding of some scientific discoveries obtained during the past two centuries and of course illustrates some of the serendipity involved in obtaining these! Throughout the ten chapters, a concise journey of some of the important areas of chemistry is depicted alongside some discoveries of influential Nobel Prize winners.

Chapter 1 (‘Make me a molecule’) gives a flavour of the ingenious strategies that modern chemists use in making molecules. In addition, an unfolding of the historical approaches and experimental techniques utilised is illustrated from the late 19th and 20th centuries. Recent examples illustrate the importance of testing the biological activity and toxicity of the different chiral forms of drugs.

Continued on page 12

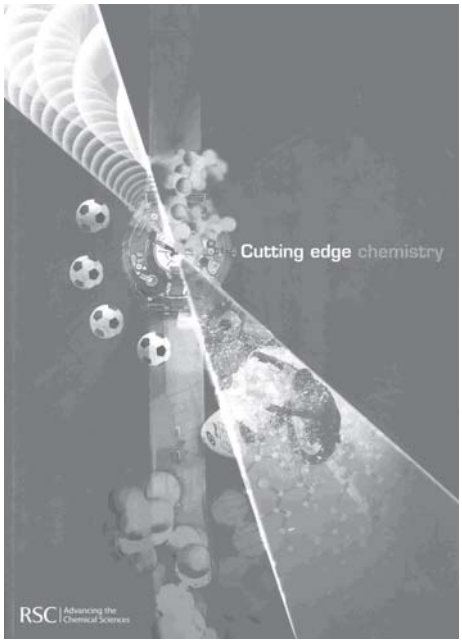
Cutting Edge Chemistry

Continued from page 11

Following on from this, 'the analysis and structure of molecules' (chapter 2) is discussed from a historical and modern emphasis. The chapter considers 'classical' chemical analyses, UV and IR spectroscopy, mass spectroscopy, X-rays and NMR spectroscopy. It concludes with possible future applications of NMR spectroscopy.

Chapter 3 is entitled 'chemical marriage brokers' which stems from the same pictorial character for the word 'catalyst' and 'marriage broker' in the Chinese and Japanese languages. The emphasis is laid upon the importance of catalysts in everyday life and in industry. It is an active area of research for chemists and an especially competitive and secretive area for those working in the oil industry. Readers are left with the inspiring notion of chemists searching for more active and selective catalysts.

The theme is continued in chapter 4 ('Following chemical reactions'), which discusses concepts such as how molecules react with one another and techniques such as flash photolysis to follow these. The use of lasers and how they work are also discussed alongside their modern applications of cataracts operations, supermarket barcodes and the removal of birth marks.



'New science from new materials' (chapter 5) illustrates how research in chemistry can reveal new structures. Concepts include magnetic and electrical properties of metal oxides, the fullerenes and their applications.

Temperature sensors, mobile phone displays and calculators are the production of research in 'The world of liquid crystals' (chapter 6). Readers will appreciate the research that goes into understanding the factors of the desired liquid crystal behaviour in everyday applications. The properties of liquid crystals related to their molecular shape and intermolecular forces make the future prospect of new materials for the biological and pharmaceutical fields exciting.

'The age of plastics' (chapter 7) explores the important themes of synthetic polymer chemistry in a refreshingly different perspective. The chapter begins with the common and important applications of polymers and then provides an unfolding of the fundamental techniques and principles of the chemistry behind these applications. This information is linked with the experimental work of imaginative chemists throughout the chapter.

Chapter 8 is concerned with 'Electrochemistry' and discusses this in the context of various examples such as rusting, metal extraction, the design of batteries, cleaning contaminated soil and biological sensors. The chapter concludes with a future perspective in electrochemical advances.

Chapter 9 discusses 'computational chemistry and the virtual laboratory' and emphasises the ability "to investigate a wide range of chemical behaviour without using a single test-tube", (p 163). The power of predicting shapes and properties of molecules is highlighted in the application of pharmaceutical companies in their search for new medicines.

Finally, chapter 10 considers 'the chemistry of life' in light of the marvel of DNA, genetics, molecular biology and advances in drug design. The contribution of chemistry towards pharmacology is discussed through drug design and the modes of action of some drugs. The chapter ends with the future challenges for chemistry in biology and medicine.

Overall, this is a fairly comprehensive book, which can be used as a source of ideas and inspiration for lectures, tutorials and individual study. This unfolding of the historical and modern context provides a platform for understanding science and the scientific methodologies, which would certainly be beneficial to any post 16 chemistry student.

Discovering the Solar System

Subject area
Astronomy

Description
This book offers a comprehensive introduction to the subject for science students, and examines the discovery, investigation and modelling of these bodies

Authors
Barrie W Jones

Publishers/Suppliers
John Wiley and Sons Ltd
(eu.wiley.com/WileyCDA)

Date/Edition
2nd Edition

ISBN
978-0-470-01831-6

Level
Undergraduate

Price
£37.50

Keith S Taber
Science Education Centre
University of Cambridge Faculty of Education
184 Hills Road
Cambridge
CB2 8PQ
April 2008

The second edition of Jones' **Discovering the Solar System** is highly recommended. The first edition was well received, and this new edition - published almost a decade on - has allowed the author to incorporate new data and thinking to keep the book up to date.

Summary Review

range: * poor to ***** good

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

This is a substantial textbook, of well over 400 pages, split into eleven chapters. The chapters are:
The sun and its family
The origin of the solar system
Small bodies in the solar system
Interiors of planets and satellites: the observational and theoretical basis
Interiors of planets and satellites: models of individual bodies
Surfaces of planets and satellites: methods and processes
Surfaces of planets and satellites: weakly active surfaces
Surfaces of planets and satellites: active surfaces
Atmospheres of planets and satellites: general considerations
Atmospheres of rocky and icy-rocky bodies
Atmospheres of the giant planets

As well as an index and a list of tables, the book also includes an extensive glossary and details of recommended further reading and websites. Being a text book, there are many questions included in the text, and the answers section at the end of the book goes well beyond summary bullet points answers, offering students an intelligent commentary on the key points raised in the questions.

The book includes a range of features that students have come to expect in modern textbooks. There is a good use of headings and subheadings, and summaries are provided at the end of chapters. Key terms denoted by the use of bold text are easily located in text. As well as the formal questions, the text is also interspersed with conceptual questions (denoted as 'stop and think' questions) that the author then goes on to answer. These offer students a very useful chance to pause, and consider their answers, and so check whether they are following the key points.

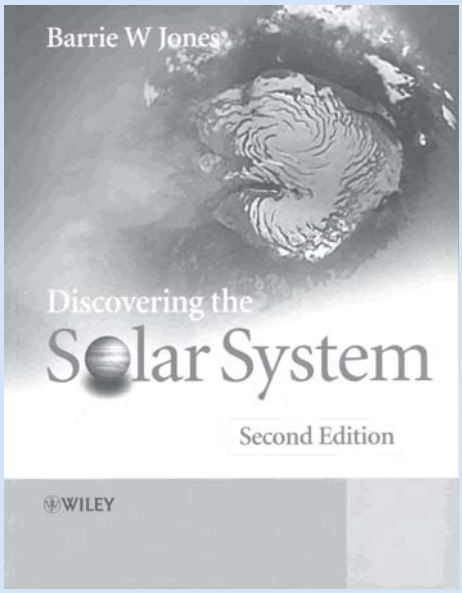
An astronomy book is not complete without some amazing photographs, and as well as many monochrome photographs in the text, the book includes a set of colour plates. There are some wonderful images of high quality, although these are quite small and limited in number. Of course, anyone looking for more images has plenty of other books that are not intended as student textbooks to select from.

I found the writing style was very strong. There are some equations, and a few calculations included in the book, but mathematical material is limited, which certainly aids the readability and overall presentation of the material. Much of the book would read well as an account of the subject for a general reader looking for an authoritative introduction. Jones achieves this whilst offering the student reader a comprehensive text, and I was impressed by how well the text was written.

There are many tables in the book, most placed within chapters at relevant points. However, some of the key data is collected together into a set of tables included as an appendix to the first chapter.

Continued on page 14

Discovering the Solar System



From the publisher...

Discovering the Solar System, 2nd Edition

By Barrie W. Jones

Discovering the Solar System, Second Edition covers the Sun, the planets, their satellites and the host of smaller bodies that orbit the Sun. This book offers a comprehensive introduction to the subject for science students, and examines the discovery, investigation and modelling of these bodies. Following a thematic approach, chapters cover interiors, surfaces and the atmospheres of major bodies, including the Earth. The book starts with an overview of the Solar System and its origin, and then takes a look at small bodies, such as asteroids, comets and meteorites.

978-0-470-01831-6 470pp 2007 £37.50

Continued from page 13

I would make a couple of criticisms of the book. One of these concerns the index, which does not include page references to the entries in the data tables. This means also looking at the list of tables (at the start of the book) to identify where this data is to be found, but as many of the tables have titles such as 'Some properties of…' it would have been useful if the specific quantities being tabulated had been included as index entries. My other slight concern is that there are no references to the sources of information. Jones covers a vast amount of material, and including citations might well have both interrupted the flow of text, and required a large bibliography, so perhaps including references would not be viable. However, this means that students do not have ready links to the primary literature, which might have encouraged some to access the original research. It also perhaps reduces the extent to which the book gives a feel for the processes of science, rather than the outcomes. This might be considered quite important in a subject where the state of current knowledge is rapidly progressing. It might also help give the subject a human dimension that could help encourage some students to consider moving into the field.

To finish on a positive point, relating to what I feel overall is a very strong book, I was impressed by the generous use of line diagrams that accompany the text. The book is well illustrated throughout, and the diagrams are generally very clear, and well labelled. A good deal of thought seems to have gone into the design of some of these figures, and they enhance the text considerably. I particular liked some of the composite diagrams giving very clear comparisons between different bodies (such as the rings systems of the giant planets).

Overall, then, this is a well written and fascinating book that covers a good deal of material, and will effectively support undergraduate learning about the solar system, as well as being of interest to a broader readership.

Electronics: circuits, amplifiers and gates

Subject area
Electronics, general physics

Description
This book offers a complete introduction to the fundamentals of AC and DC circuits along with complex numbers, bandwidth, and operational amplifiers

Authors
David Vernon Bugg

Publishers/Suppliers
Taylor and Francis Group
(www.crcpress.com)

Date/Edition
2006/2nd Edition

ISBN
978-0-7503-1037-6

Level
Undergraduate

Price
£22.49

Intended use and area of application
This is clearly 'the book of the course' for an Introductory Course on Electronics, covering a mix of subjects, ranging from the basics of charge, current and voltage, through operational amplifiers and low level digital logic to Fourier's theorem and an introduction to transformers and three-phase supplies.

Summary Review

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

Style
The book is written in a reasonably informal style, with a good mix of direct presentation, rehearsal questions within the text, and end-of-chapter exercises (for which answers are provided at the end of the question, but with little explanation). The material is necessarily somewhat mathematical, but this is presented with a light touch, and should not put off the less numerate students.

Perhaps inevitably the book has been somewhat overtaken by events – thus "You can demonstrate [the force on a moving electron] by holding a bar magnet up to … a TV set" is no longer going to work in many households. It also seems not to have fully recognised the current requirements for explicit safety warnings – readers are given current levels corresponding to levels of hazard, and are then asked the question, "To what voltages do these correspond?" without attempting an answer, which seems to me to be unacceptable in the modern climate.

Some aspects of the book show a degree of inconsistency that I found irritating, and that could be confusing. Thus one important question when presenting circuit diagrams is the convention to use when joining or crossing connections, in particular how the reader can tell whether crossing connections are joined or not. Two rational conventions are to apply a dot to all joints (ie T-junctions and connected crossings), or only to apply a dot to connected crossings (since T-junctions must join); this book mixes the two conventions in such a way as to leave the inexperienced reader unsure as to whether crossing connectors join or not. Similarly the phrase, "it is acting as a current amplifier" is applied to a unity gain buffer amplifier – while this is true in some senses, the term 'current amplifier' normally has a quite different meaning. I was also irritated by the tendency to site figures a long way from the relevant text, often for no apparent reason.

Requirements
The work is appropriate for a first year science or engineering undergraduate, ideally with A-level Physics and reasonable mathematics.

Usefulness of the book
Despite it flaws, I generally found this a clear and readable work and it is reasonably priced (about £25). I do not teach a formal introductory course in electronics (my interests are more in the use of electronics to support research), but I personally found the selection and sequence of subject matter a little eccentric for such a course, and whether or not it would be appropriate for a particular course would depend very much on the match between the book and the course syllabus.

Robert A Cottis
School of Materials
University of Manchester
PO Box 88
Sackville Street
Manchester
M60 1QD
May 2008

Elementary Climate Physics

Subject area
General physics

Description
An introduction to the basic mechanisms and physics that describe climate and climate change aimed at a general audience of physical sciences undergraduates or for beginning graduate workers in less mathematically rigorous fields

Authors
F W Taylor

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

Date/Edition
2005/1st Edition, reprinted 2006

ISBN
978-0-19-856734-9

Level
Undergraduate

Price
£26.00

Summary Review

range: * poor to ***** good

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

There are scientific ways to learn about climate in the near past – for instance, air inclusions trapped in ice - but there are also important human records. The painter, Pieter Brueghel the Elder, and the incestuous copying industry that sprang up after his death, showed how northern European social groups adapted to the big chills of the sixteenth century. Brueghel's corpse green sky in the *Hunters in the Snow* seems as telling as any thermometer and it's difficult to imagine things could get worse. But turn to page 175 of Fred Taylor's fascinating little book on climate physics and you find that the early nineteenth century saw an even lower nosedive in average temperature.

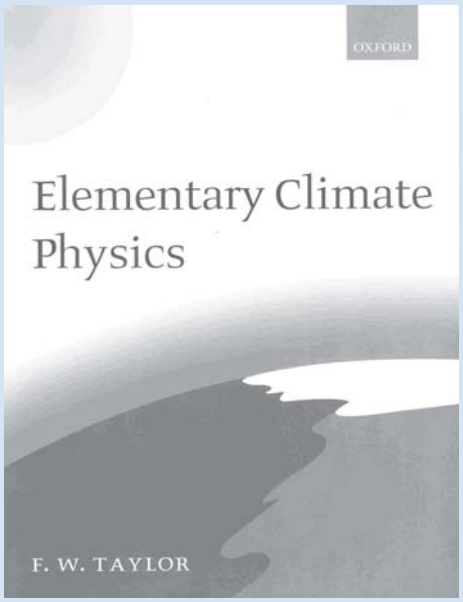
The immediate social impact of climate and the, at times, scabrous debate on the daily management of the world has now seen climate science impressed onto the twenty first century school curriculum. Climate physics is also a mandatory course within at least one major university physics degree, and an obvious topic for broader interdisciplinary programmes. In schools, it is an issue-driven topic; yes, there is some science that can be taught, but the appeal is that the ideas and vocabulary are so well known, it should be easy to generate discussion and debate. Where there are pressures on class contact time, the question for an undergraduate physics course might well be how subjects - such as thermodynamics, radiative transfer, non-inertial motion and fluid dynamics - that were introduced within more formal core courses can be efficiently taught under a thematic banner.

Fred Taylor is a very distinguished contributor to the field with a deep interest in the astonishing weather systems of the planets. He has written this book to introduce the subject to physics undergraduates but it should have a broad appeal to those in related fields. The mathematics is not challenging and the book, as a whole, is pitched at a level to bridge the gap between core physics topics and the content of, say, Houghton's *Physics of Atmospheres*. Indeed the two books are very different in style, not least in the problem sets. Houghton's are quantitative and sometimes challenging (though numerical answers are helpfully provided). Taylor's chapters typically end with almost American-style review questions. These are perhaps less useful to other lecturers but I suspect students will find them a ready and comprehensive revision guide.

As a non-specialist, I found this an easy and very interesting read. The discussion on climate change is calm and honest. Table 7.1 on the staggering range in the global warming potential of various anthropogenically produced gases surprised me and will be going straight into my lectures. I was intrigued that dust (unless extremely fine) is not hugely influential in drop condensation. There is a nice discussion on the way in which convection leads to a temperature gradient close to the Earth's surface whilst radiative transfer creates near-isothermality in the stratosphere. The toy greenhouse models are simple enough to be useful to general or interdisciplinary science programmes, but with sufficient variation - carbon dioxide levels, albedo, feedback - to make them amenable to small workshops. Students would need a basic grounding in thermal physics (they need to be aware, for instance, of the Clausius-Clapeyron equation) and mechanics (at the level of Pippard's Forces and

James Collett
School of Physics
Astronomy and Mathematics
University of Hertfordshire
AL10 9AB
November 2007

Elementary Climate Physics



From the publisher...

Elementary Climate Physics

By F. W. Taylor

Clear and concise first introduction to the subject.
Class-tested, based on extensive teaching experience.
Authoritative introduction to a 'hot' topic in science.
Burgeoning interest in climate among media and politicians.
Plenty of tutorial material, figures, examples, and problem sets.

978-0-19-856734-9 232pp 2005 £26.00

Particles) but the discussion of fluid flow does not go much beyond vorticity and a brief discussion of Ekman transport, both of which could be introduced without a prior course. I found only a few 'typos' but the index seems a little brief and might be usefully extended in a future edition.

The book concludes with a discussion of weather on the planets (even those found very recently beyond our solar system). At the moment, we have only paintings of balloon exploration of the acrid smog that enshrouds Titan. Hopefully some of the young readers of this book can help to realise this next great airship adventure.

Energy and the Environment

Subject area
Physical science

Description
This book provides an overview of energy production and consumption and the implications for society and the environment

Authors
Robert A Ristinen, Jack J Kraushaar

Publishers/Suppliers
John Wiley and Sons Ltd (eu.wiley.com/WileyCDA)

Date/Edition
2006/2nd Edition

ISBN
978-0-471-73989-0

Level
Undergraduate

Price
£58.95

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

The book, **Energy and the Environment**, written by Robert A Ristinen and Jack J Kraushaar, offers a descriptive overview of traditional and emergent sources of energy for largely North American domestic, transportation, and industrial needs and less so, of the impact these energy applications have on the environment. The book is divided into ten chapters split up broadly into non-renewable, renewable, and nuclear energy in addition to a chapter each on fundamental concepts, heat engines, energy conservation, transportation, pollution, and global issues.

The authors describe their book as an introductory text for students without a science or maths background and it largely fulfils this expectation. Limited use is made of exclusively technical terms and applications, principles, and processes are thoughtfully explained. Energy basics including the expected laws, principles and relevant unit conversions are covered in Chapter 1 'Energy fundamentals/Energy use in industrialised society' followed by a commendably critical look at fossil fuels in Chapter 1 and 2 ('The Fossil fuels') in light of limited worldwide reserves and stupendous energy consumption alongside a woefully slow uptake of non-renewables in the US. Here a direct comparison of US energy consumption to European and Third world counterparts rather than a mere mention on p 19 (and again in Chapter 7 Energy conservation) would have highlighted the seemingly persistent disregard in the US for the global energy dilemma. Chapter 3 'Heat engines' follows well with an exploration of fossil fuel combustion and underpinning thermodynamic principles.

Calculations in general are kept to a minimum throughout the text without this impacting negatively on basic understanding. This approach is not entirely reflected, however, in the selection of end of chapter questions over half of which are calculations poorly supported by a minimum of answers and feedback in the appendix. Historical excerpts throughout, such as of Thomas Edison's first electric utility plant (p 71) alongside quotes and the occasional anecdote bring new themes and principles to life. Research studies are helpfully referred to in support of projections or decisions despite these reflecting largely US findings.

Chapters 4 and 5 are both dedicated to renewable energy sources which reflects the authors' conviction of the increasingly central role renewables should play in the future. Solar energy in all its variations (passive solar, solar thermal electric, photovoltaic, solar cooling) is covered in Chapter 4 where passive solar energy homes in particular are given generous consideration. Hydropower, wind power, ocean thermal, biomass, geothermal, tidal energy, and wave energy follow in Chapter 5. Unfortunately, small-scale rooftop wind turbines manufactured in Scotland and sold worldwide for domestic use are failed a mention and remarks such as "unsightly appearance of mile after mile of wind machines" are thankfully rare, but nonetheless, unhelpful.

The authors insert tables, images, charts, diagrammatic sketches, and graphs to highlight relevant trends or to illustrate concepts and processes introduced. Here links to ubiquitous web resources including ozone calculators, global temperature charts, 'mean and green' car comparisons, environmental news links, energy tutorials, etc create a huge gap and lost

Christina Mainka
Napier University
Educational Development
Craighouse Campus/Bevan Villa
Rm 101
Craighouse Rd
Edinburgh EH10 5LG
April 2008

Energy and the Environment

opportunity, especially for the novice student. This is compounded unnecessarily by the poor quality of many of the black and white photographs rendering recognition of detail nearly impossible such as in Figure 4.10 in Chapter 4 of a solar thermal power plant. Sometimes the choice of images isn't quite clear either as, for example, of a painting of a full rigged 19th century sailing ship in the section wind energy in Chapter 5 holding priority over even one close-up photograph of a wind turbine despite a total of seven types of rotary blades referred to in the text and highlighted in a graph (Fig. 5.6 'Rate of blade tip speed to wind speed').

A comprehensive and fair account of nuclear energy is given in Chapter 6 'The Promises and problems of nuclear energy'. Separate sections are dedicated to the Chernobyl disaster, nuclear weapons, and radioactive waste problem as depicted by the ongoing Yucca Mountain nuclear waste storage dilemma in Nevada. Slightly puzzling are the final five pages devoted to nuclear fusion, an energy source less likely to be of significant relevance in the near future than any of the renewable sources mentioned previously. As in the chapters before the authors occasionally risk appearing to distort the picture such as on p 192 where France and Japan are highlighted as moving ahead with nuclear energy while failing to mention that equally, other countries (eg, Germany) have abandoned nuclear power altogether. This reminds of Chapter 2 (p 40) where the authors boast of an average fuel efficiency improvement in the US from 13 mpg in 1973 to 27 mpg in 2000 without mentioning Japanese and German compact cars currently reaching rates of 60 mpg and more.

There is much to be said about a chapter dedicated to energy conservation (Chapter 7) but it appears too short and too late in the book, misplaced between the topics nuclear energy (Chapter 6) and transportation (Chapter 8). Presented earlier it would have given the undergraduate student a more informed perspective on renewable and non-renewable energy sources, reserves, and the impact of energy exploration and use on the environment set within the context of conservation of energy and resources as our first and primary goal. While highlighting the obvious energy conservation methods with helpful energy consumption tables and comparisons, simple innovative solutions like rooftop greening, an increasingly popular and effective approach in cities to regulate inner city temperature, purify the air and conserve energy, in the summer including North American cities such as Chicago and Toronto (eg, Viking turf top houses) are forgotten.

Chapter 8 would have also benefited from a section on the government's (including bodies such as the Environmental Protection Agency) instrumental role in sustainable economic development and in the promotion of energy conservation overall. In earlier chapters the reader is faced with terms such as federal wind energy tax credits, solar energy incentives, or green pricing programs, for example, without ever gaining a full understanding of the impact that legislation has on the supply and demand and nature of energy consumed.

The authors make only timid attempts to promote critical thought such as for industrial processes, for example, that in the past have operated in complete disregard for energy consumption (eg, electrical heaters installed in refrigerator exterior walls, p 227). A scant mention of the Kyoto protocol going ahead without the support of the US in Chapter 10, the aftermath of withdrawn tax credits for solar energy (p 110) on the Luz company in Chapter 4, and a short discussion on the uncertain future of the Pavley bill in California (p 256) that would set stringent limits on car emissions demonstrate a critical view on recent decisions made but seemingly always from a safe distance.

A transportation chapter (Chapter 8) that fails to mention the notorious SUV (standard utility vehicle) mileage loophole or tax credits for the gas guzzling, army truck turned passenger car, Hummer, further reflects the half-hearted attempt by the authors to signal controversial decisions made by a federal government pandering to the most wasteful lifestyle in the world. It occasionally isn't clear to the reader how to interpret the information presented, demonstrated by the statement on p 343 that "there are serious problems with the Kyoto protocol" appearing alongside the table on the same page showing US and Canada leading in the per capita CO_2 emissions from fuel combustion. Only a few lines further down we then learn that "powerful lobbying groups from both labour unions and industry are actually opposed to limitations on carbon dioxide emissions". It is hard to believe that the authors are genuinely concerned in the light of their defeatist outlook and lack of faith in the role that scientific enquiry and civic engagement can play as demonstrated elsewhere in the world.

Finally, the environment in general is not given equal consideration as the title might otherwise suggest. While addressing the impact that energy consumption has on the quality of air and its temperature (but seemingly ignoring air traffic entirely) in chapters 9 and 10, the book otherwise fails to even acknowledge the consequences energy exploration and production have on ecosystems, wildlife, and our general well being. Fossil fuel exploration alone causes havoc: coal mining results in aquifer depletion, subsidence, and deaths; petroleum exploration and transportation are riddled with tanker accidents, groundwater contamination, and threatened ecosystems (eg, Arctic National Wildlife Reserve), not to mention the radioactive aftermath of uranium mining. In doing so the authors at least remain consistent in revealing once more only part of the picture.

Enhancing Learning through Formative Assessment and Feedback

Subject area
Education

Description
This book is based on the argument that detailed and developmental formative feedback is the single most useful thing teachers can do for students

Authors
Alastair Irons

Publishers/Suppliers
Routledge - Taylor and Francis Group (www.routledge.com)

Date/Edition
2008

ISBN
978-0-415-39780-3

Level
Teachers

Price
£65.00 (paperback version also available at £15.99)

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

The text is based on six main chapters: principles of formative assessment and formative feedback, student learning environment, using formative assessment and formative feedback in learning and teaching, formative assessment and feedback techniques, making use and ICTs in formative assessment and formative feedback and benefits of formative feedback for academic staff.

Each chapter has a summary and introduction which set out clearly the aim of the chapter and give you, as reader, some background before launching into the main issues. Each chapter is well referenced and draws on a range of contemporary literature. The text closes with a full reference section making it very easy for the reader to trace any citation used in the text. However, rather than make the text too wordy the author does make good use of bullets points, which should appeal to the reader, especially busy scientists, which make neat summaries of the points being made.

Throughout each chapter the reader will encounter *time out sessions;* these are made up of a number of bullet point questions which ask the reader to engage with the material in the text. For example from chapter one, what causes you the biggest amount of frustration in your summative assessment activities? or from chapter six, where do student learning and student achievement rank in your priorities? In his introduction the author says of the *time out sessions;* these sessions are not designed to be tests or tasks, but to encourage you to take a step back and think about the points made in the book in the context of your own work. It is, in my view, here that the text scores most highly, it is not trying to preach or offer a 'one size fits all' but is rather saying that you as the reader are a professional and this text can help you be reflective about your own practice. Given the number of institutions requiring new lecturers to complete a qualification in learning and teaching then this book has certainly captured the spirit of the times. More importantly, I feel, it asks us all to think more about why, when and how we assess students and then ask the same of giving feedback to students. Surely this can only benefit the learning experience of the students.

The text concludes with two chapters; case studies and summary and recommendations. The former of these offers six case studies of formative assessment and formative assessment drawn from architecture, law, chemistry, engineering, computer science and biosciences. The subject matter, whilst no doubt largely of interest to readers of this journal, is not the main focus, it is the diversity of methods, which can transfer to a range of learning experiences, which is of greatest importance.

The final chapter presents a short overview and gives guidance for those who ask the question; where do I go from here? Amongst the advice given is to get involved with HEA subject centres and whilst I echo this, I would also suggest this text is an excellent starting point for both new and established lecturers.

This text should be in every HEI library and any colleague following a course of study in learning and teaching in HE would be well advised to get a personal copy.

Gren Ireson
Nottingham Trent University
Clifton Campus
Clifton
Nottingham
NG11 8NS
April 2008

Enzyme Kinetics and Mechanism

Subject area
General chemistry, physical chemistry, biochemistry

Description
This is a comprehensive textbook on steady-state enzyme kinetics. Organised according to the experimental process, the text covers kinetic mechanism, relative rates of steps along the reaction pathway, and chemical mechanism; including acid-base chemistry and transition state structure

Authors
Paul F Cook, W W Cleland

Publishers/Suppliers
Garland Science - Taylor and Francis Group (www.taylorandfrancis.co.uk)

Date/Edition
2007

ISBN
978-0-8153-4140-6

Level
Post-graduate and researchers/ academics

Price
£40.00

Kieran F Lim (林百君)
School of Life and Environmental Sciences
Deakin University
Geelong, VIC 3217
Australia
April 2008

Enzyme Kinetics and Mechanism is an advanced text with meticulous details. The content will enable post-graduate researchers and academics to plan and undertake studies of enzyme reaction kinetics and to infer the enzyme reaction mechanism from the kinetic measurements.

Summary Review

range: * poor to ***** good

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

This is not a book for the faint-hearted. Although Chapter 2, 'Introduction to Kinetics', does revise the basics of chemical kinetics, readers need a sound knowledge of kinetics to fully understand the book. For example, Chapter 4, 'Derivation of Initial Velocity Rate Equations and Data Processing', has enzyme mechanisms involving up to 13 rate coefficients. These mechanisms do not even consider the action of inhibitors, which are introduced in Chapter 6, 'Initial Velocity Studies: Presence of Added Inhibitors', or the effect of isotopes, which are introduced in Chapter 8, 'Isotopic Probes of Kinetic Mechanism'. Elsewhere it is assumed that readers will have knowledge of early and late transition states, free energy reaction profiles and other physical chemistry concepts.

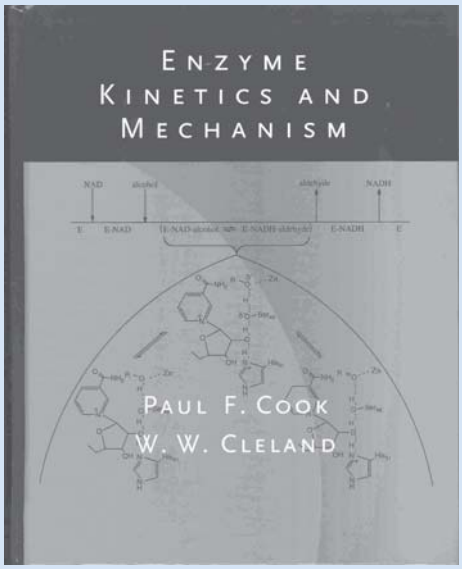
There is a systematic development of the subject material. Chapters 1 and 2 introduce the book's nomenclature and review basic chemical kinetics. Chapter 3, 'Enzyme Assays', is an excellent guide on how to carry out kinetic studies of enzymes. Chapter 4 sets out the theory of uninhibited enzyme kinetics, while Chapter 5 explains the interpretation of the results through primary plots (eg inverse velocity as a function of inverse concentration) and secondary plots (the slope or intercept of the primary plots as a function of a relevant parameter). Chapter 6 explains the effects of the inhibitors and the interpretation of kinetic experiments.

Most undergraduate texts deal only with the cases where substrate concentrations are much larger than the amount of enzyme, leading to steady-state kinetics. Chapter 7 deals with non-steady-state kinetics and the effects of perturbations like temperature-jump methods. Chapters 8 and 9 deal with the use of isotopic labelling and kinetic isotope effects, while Chapter 10 looks at pH dependence. Appendix I is designed as a template, which can aid in the interpretation of experiments. Appendix II has the definitions and detailed mathematical derivations for the kinetics of the various mechanisms.

One frustrating feature of the book is that there is no glossary. Non-standard notation, such as bold variables denoting concentrations of substrate and enzyme, are used. A quick perusal of the index does not find "kinetic isotope effect" or its abbreviation, "KIE", in the "K" listings, although it is listed as a sub-entry under "lactate dehydrogenase" in the "L" listings. All notations, abbreviations and other necessary information are explained in the book, but it does require a careful reading from the beginning. As a consequence, it would be very difficult for students or instructors to use **Enzyme Kinetics and Mechanism** as a reference to quickly look up one isolated bit of information.

Continued on page 22

Enzyme Kinetics and Mechanism



From the publisher...

Enzyme Kinetics and Mechanism

By Paul F Cook, W. W Cleland

Enzyme Kinetics and Mechanism is a comprehensive textbook on steady-state enzyme kinetics. Organized according to the experimental process, the text covers kinetic mechanism, relative rates of steps along the reaction pathway, and chemical mechanism-including acid-base chemistry and transition state structure. Practical examples taken from the literature demonstrate theory throughout. The book also features numerous general experimental protocols and how-to explanations for interpreting kinetic data.

978-0-8153-4140-6 416pp 2007 £40.00

Continued from page 21

The main strength of the book is that it gives 'hands-on' explanations to the target readership – PhD students who are starting research in the subject area of the book. For example, there are practical tips on an implement that can both add and mix a small amount of enzyme to substrate in a 1-cm-square cuvette. There are illustrations of how bubbles or dust in the light path will cause artefacts in spectrophotometric assays. There are references to the primary scientific literature and other monographs.

Fundamentals of Quantum Mechanics

Subject area
Physics, quantum mechanics

Description
A text for final year students studying a course on non-relativistic quantum mechanics, covering both the conceptual and mathematical foundations

Authors
Sakir Erkoç

Publishers/Suppliers
Taylor and Francis
(www.taylorandfrancis.co.uk)

Date/Edition
2007

ISBN
978-1-5848-8732-4

Level
Undergraduate

Price
£35.99

Summary Review

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

The text claims, on the jacket notes, to provide "sufficient breadth and depth both to familiarize the reader with the basic ideas and mathematical expressions of quantum mechanics and to form the basis for deeper understanding later". So how is this achieved? The 406 pages are divided into three sections; fundamentals and one-dimensional systems, three dimensional systems and approximation methods and scattering theory.

Each section is true to its title and takes the reader through the material in a logical way for example, in section one, the author starts with a potted history covering the usual events such as the photoelectric effect, Compton effect, de Broglie's hypothesis, the Davison-Germer experiment and Heisenberg's uncertainty principle before introducing Dirac notation, Hilbert spaces, conservation theorems and one-dimensional Schrödinger equation. Whereas section three covers; time-independent perturbation, WKB (Wentzel-Kramers-Brillouin) approximation, time-dependent perturbation, path-integration methods and scattering theory. Throughout the 19 chapters, which make up the three sections, the author develops a clear pedagogy and provides both worked examples and problems for the reader which would make it a good course book. In addition the worked examples also help develop an understanding of the mathematical and conceptual formalism of the subject. The author makes an important point, in his introduction, that if the reader has a problem they should check whether it is "in the physics or the mathematics" the text makes it relatively easy for them to do so.

The jacket notes claim that "the author has done everything possible to make the math in this book accessible" and given the logical structure and use of example problems this is probably not far from the mark. The text offers some mathematical support when developing an argument and there is a good chance that a student following a lecture course would not need another text. Overall I would be hard pressed to find a reason not to agree with the publishers quote at the start of this review, however if one sets this text alongside Chaddha [1] or, perhaps more so, Rae [2] what extra does one get? Chaddha is, I would argue, an easier read but arguably less complete whilst Rae is a relatively easy read and more complete especially as regards quantum information and the philosophical dimension of quantum mechanics.

This then is my dilemma; the text under review gives a sound introduction to non-relativistic quantum mechanics in a logical manner, which is pedagogically clear, with ample worked examples to make it a good course book for final year undergraduate students or post-graduates without adequate quantum mechanics. However, in my view, it adds nothing new to what is already available. If you are looking for a new, all inclusive, course book covering all the fundamental conceptual and mathematical material then this one is certainly worth looking at but if you already use Rae then get the 5th Edition.

References

1. Chaddha, G S *Quantum Mechanics*, New Age International, New Delhi (2003)
2. Rae, A I M *Quantum Mechanics* 5th Ed. Taylor and Francis, New York (2007)

Gren Ireson
Nottingham Trent University
Clifton Campus
Clifton
Nottingham
NG11 8NS
April 2008

Giant Micelles: properties and applications

Subject area
General chemistry, general physics, biochemistry, chemical engineering

Description
This text summarises the range of behaviours encountered in solutions of micelles and their applications in industrial processes. The book introduces theoretical aspects of the rheological behaviour and formation of giant micelles from different viewpoints including molecular-level thermodynamic theory and computer simulations

Authors
Zana, R and Kaler, E W (eds)

Publishers/Suppliers
CRC Press - Taylor and Francis Group (www.crcpress.com)

Date/Edition
2007

ISBN
978-0-8493-7308-4

Level
Undergraduate, research

Price
£109.00

Dipak K Sarker
School of Pharmacy &
Biomolecular Sciences
The University of Brighton
Lewes Rd
Brighton
BN2 4GJ
March 2008

Summary Review

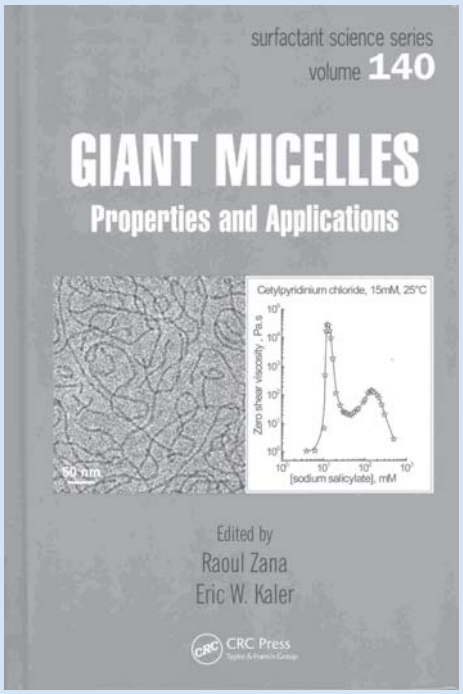
range: * poor to ***** good	
Academic content	*****
Usefulness to student	*****
Usefulness to teacher	*****
Meets objectives	*****
Accuracy	*****

The book traverses distinct themes united under the increasingly nebulous terms of colloid science or nanotechnology [1, 2] integral to the fuller description and understanding of micelles but it does so in a succinct and pragmatic manner by reference to theory [3, 4] and experiment. The latter form of 'cutting edge' non-standard examples of contemporary methodologies being rarely visited except in research or review papers and conference abstracts [5, 6]. The book aims to target more advanced understanding of the interface between the various fundamental disciplines that contribute to the knowledge base in eighteen specialist-authored chapters. The book is essentially pitched at postgraduate (typically masters, MRes level) or established doctoral student or post-doctoral researcher (even senior researcher) level. It does also serve the undergraduate level in providing a limited basic knowledge that can be 'dipped into' but also can be considered to provide a global knowledge of these areas to undergraduates in the more advanced, later stages of a degree programme that might be relevant to final year specialisms in chemistry, physical chemistry or chemical aspects of applied (industrial) sciences, physics and for chemical engineering. The text is also ideally suited to industrialists and those senior investigators in the early stages of introduction to a new area of research that might include biological, medical and pharmaceutical sciences [7, 8]. The rear note suggests the book provides a pooling of expertise in micellar chemistry and surface science and this is certainly the case. The book is however, not particularly 'light' reading and needs some considerable mathematical skill to understand expunged theories but is very clearly constructed and very well written.

The book is presented in a way which does not overstretch the reader in that each chapter is brief and succinct and thereby provides a basic understanding on which to build a more detailed, practical and therefore valuable knowledge [5, 6, 9]. At just over five hundred and fifty pages and flowing over at least six to seven 'physical characterisation methodologies' and several 'computational methodologies' and models Raoul Zana and Eric Kaler's edited work provides the most ideal synopsis of techniques and theoretical current knowledge in one text yet encountered that is specific to this very select area of science. The reader is however, despite simple explanation required to have some formal undergraduate physical science knowledge to get the most from the book.

The text is likely to be of significant interest and essential reading to those scientists and students working in the area of nanotechnology and related chemistry [1], material sciences [9], biophysics and biochemistry, the pharmaceutical and biomedical sciences [7] and aspects of chemical engineering. To this end the objectives of the book are accomplished without flaw as desired by the authors (and editors) in that the book provides the most appropriate synthesis of the everyday [10], adapted research and state-of-the-art understanding and theory yet to be universally adopted under the banner of techniques encompassed by colloid science. There are books which detail themes more extensively [1-3] however, as a rule they do not cover the diversity and penetration or depth of subject matter in as universally a helpful manner as is presented here. As such these snippet-providing texts are of limited use as 'sole purchase', university research-teaching tools and referential guides. The

Giant Micelles: properties and applications



From the publisher...

Giant Micelles: Properties and Applications

By Raoul Zana Institut Charles Sadron, Strasbourg, France
Eric W. Kaler University of Delaware, Newark, USA

Examines the theoretical aspects of giant micelle formation and the rheological behavior of their solutions
Addresses experimental studies and tools including scattering methods, phase diagrams, linear and non-linear rheology, and chemical relaxation
Reviews properties of giant micelles on solid surfaces and of systems of smart micelles
Discusses applications of giant micelles in the oil and gas industry as well as personal care products

978-0-8493-7308-4 576pp 2007 £109.00

book is of significant and appropriate value to newcomers and experts in soft condensed matter theory, nanotechnology and formulation science and because of its more user-friendly approach provides the means to better understanding through an explanation of fundamental themes.

Key themes discussed in the text cover fundamental subject pre-requisites such as, statistical physics, thermodynamics, energetics, kinetics, phase diagrams, rheology (an essential characterisation aid), preparative chemistry, computational predictive modelling and simulation work, state-of-the-art spectroscopic 'light' scattering and reflectance methods, cryogenic-electron (TEM) and atomic force (AFM) microscopy and real experimental data covering a vast array of surfactant-type and polymer molecules [9]. Two examples of this appropriately weighted and accommodating approach are the explanation of 'twentanglement' (Chapter 3), a computational concept and 'rheochaos' a spatio-temporal flow instability (Chapter 4). Yet another is the description and definition of the Cole-Cole plot (Chapters 4 and 13) associated with descriptions of non-linear rheology described at length and very simplistically. This is done in an obvious experience-based manner which provides both a workable synopsis and clearly explains the subject matter that will prove fully comprehensible for scientists that encounter this material for the first time.

The little clichés of anecdotal, practical and factual information and well-explained real data scattered throughout the text chapters also serve to increase the general readability. The book itself provides an ideal synthesis of a research-driven useful teaching text.

It is significant, given contemporary interest and awareness in nanotechnology [1], advanced forms of drug delivery (eg nanobots) and recent increased 'hot topic' engagement across many research laboratories that five sections (Chapters 12, 15, 16-18) and greater than 114 pages are dedicated to applications (eg oil-field usage, tribology, cosmetics and daily uses). Again this information is often difficult to access for students other than via industrial 'insider knowledge' or specific 'trade journals'. One chapter that particularly grabbed my attention was specifically based on response to environment (Chapter 12) and included reference to particle engineering in terms of pH, redox state, temperature, light, applied flow field and solubility and this certainly reflects a very large scale interest in micelles as 'smart' application science tools [1, 4, 7]. There are certainly interesting contemporaneous sections in the book on mechanics and geometric considerations [2, 9]. The range of micelles currently highlighted in the text includes rods, globules, bilayers, worm-like, ring-like, spherical, decorated formats and cross-linked micelles. These are all made easier to visualise by reference to a large number of skilfully

Continued on page 26

Giant Micelles: properties and applications

Continued from page 25

crafted phenomenological schematics. As expected of a text written by eminent scientists of this calibre there are numerous references to the 'founding fathers' of current colloid science knowledge such as Debye, Flory, Maxwell, McBain and Tanford (to name but a few), but also to 'contemporary theory innovators' such as de Gennes, Israelachvili and Langevin and 'up-and-coming' landmark experimentalists such as Biggs. This all serves to boost the enjoyment factor of the text, since these are and have been very public figures and present the information as being entirely relevant to the current thinking, preferences and the state of affairs in colloid and surface science.

Incorporation of newer less conventional methods (Chapters 3, 6, 11) for the scrutiny of colloids is splendid for teaching purposes as reference to research papers for student learning is not always practical or entirely useful and these methods rarely feature in 'standard texts'. Such inclusion proves to be very handy although it is to some extent to be expected from a text of this size that does not sit lightly on the laboratory bench. The book discloses specifics such as non-linear flow and essential aspects of physical behaviour [3, 4, 9] that influence real practices in contemporary product formulation [10], for instance that might be relevant to 'cosmetic' and pharmaceutical products [1, 7]. From a student perception it is often very difficult to understand the working of such approaches other than at a simple level but themes are discussed here in a detailed manner without being unappealing. This is achieved by frequent references to experimental examples, where the conditions are widely varied. As an introduction to the more advanced forms of subject [9] the book works particularly well and delivers a broad swathe of theories, techniques, practical notions and raises discussion points, paradoxes and 'unproven' hypotheses that will be useful in both postgraduate and doctoral lectures and seminars.

The main body of the text thematised and highlighted clearly and with its simple tables (with carefully selected examples) and figures is ideally presented with succinct discussion and evaluation that is undertaken in a consistent manner. Figures are never over-complicated or ambiguous, always well thought-out and coherent in their labelling and annotation and well distributed throughout the text and this makes the subject matter clear and interesting. This book by Raoul Zana and Eric Kaler represents a purchase of appreciable cost yet of excellent value for any readers that will cover colloid chemistry at any significant level on their course or their programme of advanced study.

References

1. Malsch, N H *Biomedical Nanotechnology*, CRC Press, London (2005) 209.
2. Collings, P J and Hird, M *Introduction to Liquid Crystals Chemistry and Physics*, Taylor and Francis, London (2001) 298.
3. Hiemenz, P C and Rajagopalan, R *Principles of Colloid and Surface Chemistry* (Third Ed), Marcel Dekker, New York (1997) 1-404.
4. Pashley, R M and Karaman, M E *Applied Colloid and Surface Chemistry*, John Wiley and Sons, Chichester (2004) 188.
5. Pedersen, J S *Curr Opin Colloid Interface Sci* (1999) **4**(3) 190-196.
6. Hyun, H, Lee, J W, Cho, J S, Kim, Y H, Lee, C R, Kim, M S, Khang, G and Lee, H B *Colloids Surfaces A: Physicochem Eng Aspects* (2008) **313-314** 131-135.
7. Mahato, R I *Pharmaceutical Dosage Forms and Drug Delivery*, CRC Press, London (2007) 300.
8. Florence, A T and Attwood, D *Physicochemical Principles of Pharmacy* (Third Ed), Macmillan Press, London (1988) 199-485.
9. Jones, R A L *Soft Condensed Matter*, Oxford University Press, Oxford (2002) 195.
10. Ezrahi, S, Tuval, E and Aserin, A *Adv Colloid Interface Sci* (2006) **128-130** 77-102.

Inorganic Structural Chemistry

Subject area
Inorganic chemistry, materials science

Description
This book is about the structure of inorganic solids, the description of structures and the relations of the structures with the chemical reactivity and physical properties

Authors
Ulrich Müller

Publishers/Suppliers
John Wiley and Sons Ltd
(eu.wiley.com/WileyCDA)

Date/Edition
2007/2nd Edition

ISBN
978-0-470-01865-1

Level
Undergraduate, research

Price
£29.95

Oscar E Ninán
Av Ramon Herrera 417
Lima 01
Lima
Perú
April 2008

This book has a chemical approach to the solid structure of inorganic compounds and in this sense does not deal with complicated mathematical equations typical in a solid state book but with fundamental qualitative aspects that determine the chemical behaviour of solids.

Summary Review

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

In 21 chapters the author explains classical and modern concepts of structure, the several ways of representation and the importance on the physical and chemical properties of the solids. The language used is relatively simple. The reader of this book has to have a basic knowledge in inorganic chemistry and physical chemistry. Nevertheless, some chapters of this book are dedicated to basic concepts of structure. Chapters 3, 8 and 9 are an example of this.

Chapter 3 is a good description of the concepts of symmetry while Chapter 8 is an excellent description of the valence shell electron-pair repulsion (VSEPR) theory. Chapter 9 deals with the structure of coordination compounds.

Chapter 2 focuses on the description of structures, here lies the concept of effective coordination number which is not easy to understand and a visual example would have helped here.

Chapters from 11 to 18 describe various aspects of the structure in metals, non-metals, alloys, and the different kinds of packing.

The chemical bond is another issue dealt with intelligently. It is not common to find in a book such a varied approach and at the same time conveniently summarised information about the chemical bond in solids. Particularly interesting is the molecular orbital theory and the theory of bonds and the modern models and concepts extracted from quantum mechanics to explain the chemical bond in solid structures.

In chapter 19 the author explains the relationship between structure and the physical properties, especially magnetic properties.

This book has a good number of references, but some parts could have more references with the purpose of helping researchers that take this text as a starting point. This is one of the few deficiencies of this book.

There are a few problems proposed in some chapters. The solutions to all the problems are at the end of the book and they constitute good material for teaching ends.

The last chapter of the book is about the erroneous idiomatic and conceptual expressions which we beginners and experts may use. In my opinion this chapter should be at the beginning of the book.

The book is detailed with a good number of appropriately explained graphics that facilitates the understanding of the diverse topics. In this sense this book is a good teaching resource.

Personally I found this book useful and I would use it in courses of chemistry or physics of the solid state, advanced inorganic chemistry for undergraduate and postgraduate students and as a consultation material for mineralogy chemistry of materials and other related courses.

Laser Chemistry: spectroscopy, dynamics and applications

Subject area
General chemistry, physical chemistry, analytical chemistry

Description
This book provides a basic introduction to laser chemistry, written for students and other novices

Authors
Helmut H Telle, Angel González Ureña, Robert J Donovan

Publishers/Suppliers
John Wiley and Sons Ltd (eu.wiley.com/WileyCDA)

Date/Edition
2007

ISBN
978-0-471-48571-1

Level
Undergraduate, research

Price
£45.00

Kieran F Lim (林 百 君)
School of Life and Environmental Sciences
Deakin University
Geelong, VIC 3217
Australia
December 2007

Summary Review

range: * poor to ***** good

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

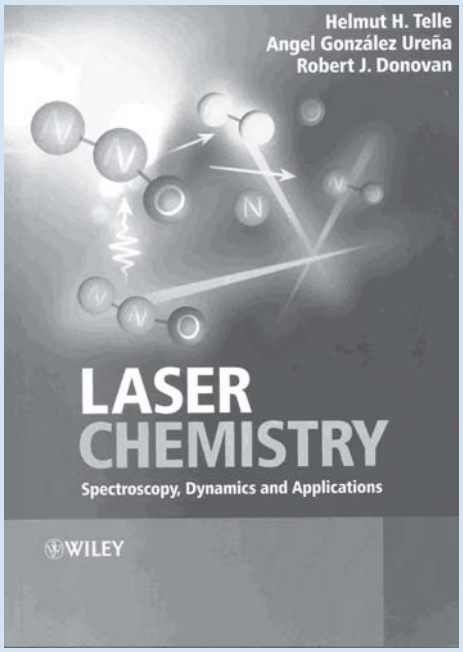
This is a well-written book on laser chemistry, and well-balanced with regard to content. The authors, three practitioners in the field with high international reputations have used their extensive knowledge to include many examples drawn from the scientific literature. A particular feature of the book is the inclusion of many spectra and other diagrams, almost one per page. The authors have made good use of greyscale so that these are easy to read and interpret. It is excellent to see real spectra and schematics of real instrumentation. Over the years, there have been several books on spectroscopy and lasers, but instead of recycling images from other Wiley books, most of the figures seem to be original to this book, or taken fro the journal literature. The journal diagrams are extremely clear and legible. Many teachers, who read this book will wish that the diagrams were available in a format that could be easily incorporated into their lectures.

After the first introductory chapter, the remaining 29 chapters are divided into seven parts:
principles of lasers and laser systems;
spectroscopic techniques in laser chemistry;
optics and measurement concepts;
laser studies of photodissociation, photoionisation and unimolecular processes;
laser studies of bimolecular reactions;
laser studies of cluster and surface reactions;
and selected applications.

The difference between the first part, ‘principles’, and the third part, ‘concepts’, is that one deals with the fundamental quantum mechanical science, while the other deals with the technology of designing and building lasers. The ‘selected’ applications in the last part cover environmental and analytical chemistry (chapter 28), industrial monitoring and process control (chapter 29), and applications in medicine and biology (chapter 30). I was pleasantly surprised by the amount of detail and the extensive coverage of the sections on spectroscopy and laser studies of reactions. At the back of the book, are references to primary sources in the literature, arranged by chapters. There is even a reference to Young’s classic 1803 Bakerian lecture on optics! There are suggestions for further reading, which is a list of books and one review article, grouped by the book part. All but one of the cited websites date from 2005 or 2006. There is no doubt that this book will be an excellent reference for all teachers of physical and analytical chemistry, who have to teach any aspect of laser chemistry.

The book has focused on the concepts, while minimising the number of mathematical equations. The text is written so that is possible to read and understand the book without understanding each equation. On the other hand, there are sufficient equations for those readers who want to follow the details, to do so. Although the equations look simple, this is rather deceptive as many of the equations would require a high level of mathematical ability to fully interpret. Hence the book is suitable for readers across the entire range from extremely weak in mathematics to very confident.

Laser Chemistry: spectroscopy, dynamics and applications



From the publisher...

Laser Chemistry: Spectroscopy, Dynamics and Applications

By Helmut H. Telle, Angel Gonzlez Ureña, Robert J. Donovan

Laser Chemistry: Spectroscopy, Dynamics and Applications provides a basic introduction to the subject, written for students and other novices. It assumes little in the way of prior knowledge, and carefully guides the reader through the important theory and concepts whilst introducing key techniques and applications.

978-0-471-48571-1 516pp 2007 £45.00

One unusual feature of the book is the deliberate omission of question-and-answer sections at the end of each chapter. The stated intention is that lists of questions would be provided on the publisher's website. This is an innovative idea since it would permit the use of large sets of experimental data, for example, in laser studies of reactions. The intention is that there would also be colour versions of selected diagrams from the book, and further material on additional topics. At the time of review (November, 2007) this website for the book was not yet functional, although this reviewer was informed that it should be ready early in 2008. This is the only reason why the book's rating has been downgraded in the 'Usefulness to Student' and 'Meets Objectives' criteria. These ratings will need to be re-evaluated when the website <www.wileyeurope.com/college/Telle> comes online.

In summary, at present, **Laser Chemistry** is an excellent reference book, both for students at the senior undergraduate and graduate levels, and their teachers. When the book's website come online, this book promises to be a excellent textbook if the quality of the website matches the quality of the printed book.

Laser Control of Atoms and Molecules

Subject area
Atomic and molecular physics

Description
This book provides coherent and concise coverage of wide range of modern applications for this area of science

Authors
V S Letokhov

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

Date/Edition
2007

ISBN
978-0-19-852816-6

Level
Research

Price
£58.00

Summary Review

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

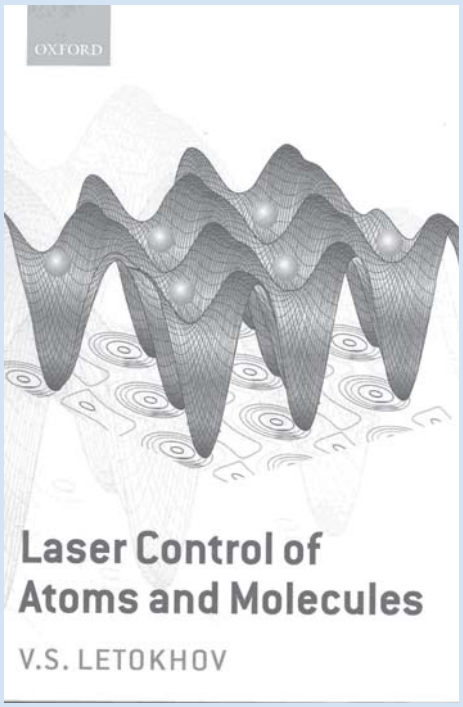
About the time that sex began (at least according to Larkin) "between the end of the Chatterley ban and the Beatles' first LP", the first lasers were being developed. The stimulated emission of radiation in a resonant cavity represented the first demonstration of our ability to coherently control light in space, time, frequency and phase and brought about 'one of the most important instrumental revolutions in the 20th century' which has led to a burgeoning interest in the laser control of atoms and molecules, most recently exemplified by; the birth of ultra-cold matter physics and the study of Bose-Einstein condensates; and the behaviour of atoms and molecules in intense laser fields which has in turn led to the development of table-top x-ray lasers and opened up the field of attosecond physics. Letokhov, working as a diploma student in the Lebedev Physics Institute in the early 60s, was involved in these developments from the very beginning and this book represents a retrospective overview of the past 40 odd years of progress.

Laser Control of Atoms and Molecules is not a textbook in the conventional sense but it could usefully form the basis of an advanced undergraduate or postgraduate course. The opening chapter quickly covers the basics of elementary radiative processes, referring the reader to classic texts such as Loudon, Sargent, Cohen-Tannoudji and Foot, among others, for the detail. Provided that the reader has a reasonable grounding in matrix mechanics the exposition is clear and succinct and there are a number of almost throwaway asides that offer real physical insight; although annoyingly cgs units are often used which may confuse the modern graduate. Chapter 3 describes how lasers can be used to achieve velocity selection of atoms and molecules for (ultra) high resolution spectroscopic applications by elimination of the Doppler effect. Here the treatment is reminiscent of Demtröder, but there is a nice section at the end on parity violation tests on chiral molecules that ought to inspire any young spectroscopist. Chapter 4 looks at polarisation effects and the optical orientation of atoms and nuclei. Sadly molecules don't get a mention here. After the more or less conventional introductory development the chapter concludes with a brief but interesting description of the applications of optically pumped molecules to atomic clocks, optical magnetometry and magnetic resonance imaging with spin-polarised Xe.

The real strength of the book, both within the context of a teaching resource and for the more general student, is to be found in the following eight chapters (5 to 13). These are perhaps best described as a series of review articles on topics ranging from the laser cooling of atoms and atomic optics through to the coherent control of molecular photochemistry and the applications of resonantly enhanced multiphoton ionisation to biology. These are all subjects of intense current research interest and each chapter provides an interesting historical perspective right up to the present day. It is a rare delight to see this breath of material covered in such detail in one volume. Although there is on more than one occasion a bias towards some of the early work done in the Soviet Union in the nineteen seventies and eighties this provides a novel and refreshing perspective.

Benjamin Whitaker
School of Chemistry
University of Leeds
Leeds
LS2 9JT
April 2008

Laser Control of Atoms and Molecules



From the publisher...

Laser Control of Atoms and Molecules

By Vladilen Letokhov

Fast access to a burgeoning field of modern research.
Coherent and concise coverage of wide range of modern applications.
Author one of the pioneers of the whole field.
Large source of references to original works.
Richly illustrated.

978-0-19-852816-6 328pp 2007 £58.00

The overall writing style is clear and precise and well supported by a 30 page bibliography to the primary literature and a comprehensive index. Although primarily intended for a research oriented audience, as supporting material for an advanced undergraduate (MPhys level) or postgraduate course there is much food for thought for the student in this collection of 'essays'. The emphasis throughout is on the physics rather than the maths and, like me, the student should enjoy the privilege of this small insight into the work and perspective of one of the pioneers in this exciting area of atomic and molecular science. Without doubt this book will for some time be on my recommended reading list for new research students.

Mass-spectrometry of inorganic and organometallic compounds

Subject area
Inorganic chemistry

Description
This book treats inorganic and organometallic mass spectrometry simultaneously. It introduces the techniques and gives hints on how to apply the various techniques and it lists all available ionisation techniques for just about any given compound

Authors
William Henderson and J Scott Mclndoe

Publishers/Suppliers
John Wiley and Sons Ltd (eu.wiley.com/WileyCDA)

Date/Edition
2005

ISBN
978-0-470-85016-9

Level
Undergraduate, research

Price
£35.00

Zia Khan
CA/151, 9/A
Muhammad Hussain Rd
Modeltown A
Bahawalpur
Pakistan
May 2008

Summary Review

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

Mass-spectrometry is one of the most powerful instrumental techniques not only for chemists, but also for scientists of other physical and biological sciences. In this book this technique has been applied to inorganic, coordination or organometallic compounds. This book is roughly divided into two main sections. In the first half of the book (Chapters 1-3), the basic principles, of operation of various types of mass spectrometric systems are included, with an emphasis on mass analysis and ionisation techniques. This has been written for chemists, so the treatment is primarily descriptive rather than mathematical. The second half of the book (chapters 4-7) describes the applications of just one ionisation technique - electron spray - that without doubt is the most versatile and widely used mass spectrometric technique for characterisation of organometallic and inorganic compounds today.

The first chapter describes some fundamentals by showing schematic diagrams of a mass-spectrometer. Collision induce dissociation (CID) also known as collision activated decomposition or (CAD), mass resolution and data processing are among the topics covered here.

Chapter 2 moves on to mass analysers; detailing quadrupole mass analysers, quadrupole ion trap, time of flight (TOF) and Fourier transform ion cyclotron resonance. Also here reflection instruments have been described with the help of useful diagrams.

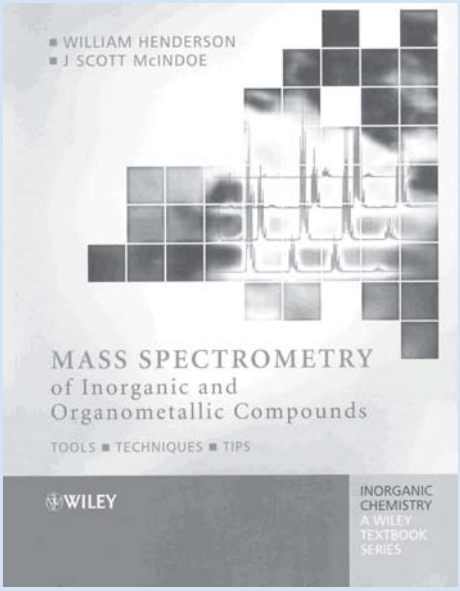
Chapter 3 is about the ionisation techniques. The principles of operation for the major ionisation techniques that have been developed are described in this chapter. Some, like plasma desorption are obsolete but have been included as they provide historical perspective and serve to illustrate the advantages of more recent developments. Others, such as fast atom bombardment are still to be found in many mass-spectrometry laboratories. Matrix assisted laser desorption ionisation (MALDI) is an enormously popular technique in the biosciences, but has been, surprisingly, little used by the organometallic and coordination chemists and as such fails to justify its own chapter. Finally here, electrospray ionisation (ESI) and inductively coupled plasma mass-spectrometry are detailed.

Chapter 4 is about the ESI-MS behaviour of simple inorganic compounds from simple metal salts, through polyanions and oxoanions of main group elements, to borane anions, fullerenes and inorganic phosphorous compounds.

Chapter 5 is about the ESI-MS behaviour of coordination complexes. This starts with some description of cationic coordination complexes followed by the characterisation of metal-based anticancer drugs, their reaction products and metabolites. Several ESI-MS studies have been carried out with such compounds and some useful studies are shown along with spectra in figures.

Chapter 6 deals with the ESI-MS behaviour of the main group organometallic compounds dominated by alkali and aryl derivatives. In this chapter the emphasis has been placed on these compounds, where most studies have been carried out. The chapter is sub-divided according to

Mass-spectrometry of inorganic and organometallic compounds



From the publisher...

Mass Spectrometry of Inorganic and Organometallic Compounds: Tools Techniques Tips

By William Henderson, J. Scott McIndoe

This is the first modern book to treat inorganic and organometallic mass spectrometry simultaneously. It is textbook and handbook in one; as a textbook it introduces the techniques and gives hints on how to apply the various techniques, as a handbook it lists all available ionization techniques for just about any given compound. The book also includes non-mathematical explanations of how modern MS instruments work.

978-0-470-85016-9 292pp 2005 £35.00

periodic table groups. Additionally there are some useful discussions covering organogermanium, organotin and organolead compounds supported by figures wherever possible. Finally, here organophosphorus, organoarsenic, organoantimony and bismuth, plus organomercury compounds have been described with the help of some useful illustrations.

Chapter 7 is about ESI-MS behaviour of transition metal and lanthanide organometallic compounds. The transition and lanthanide metals have an extensive and diverse organometallic chemistry. In this chapter ESI-MS behaviour of transition metal, lanthanide and organometallic compounds have been discussed according to the type of organometallic ligand in the complex. There are some descriptions about ionic mononuclear metal carbonyl compounds, ionic metal carbonyl clusters, neutral metal carbonyl compounds along with some figures and tables. After that oxidation and reduction processes involving metal carbonyls along with characterisation of reaction mixtures involving metal clusters have been described briefly. Other important topics in this chapter include metal isocyanide complexes, monocyclopentadienyl complexes and metal arene complexes. This chapter is well supported by appropriate figures.

Chapter 8 comprises a selection of special topics including the characterisation of dendrimers using ESI and MALDI-TOF MS techniques, investigating the formation of supramolecular coordination assemblies using ESI-MS, using ESI-MS as a tool for directing chemical synthesis and applications of ESI-MS in the detection of reactive intermediates and catalyst screening.

Overall, this book seems to be valuable addition to those already written covering mass spectrometry. Although this book has been specifically written for inorganic and organometallic chemistry, researchers working in other fields can also learn not only about the basic principles and techniques of mass-spectrometry but also can learn of its applications. All techniques have been explained in an easy to follow way providing many applied examples which can be helpful for analysing the mass-spectra of many unknown and difficult compounds.

View an extended, unedited version of this review

Mathematics for Physics

Subject area
Mathematics, physics

Description
This text recognises the challenges faced by students in equipping themselves with the maths skills necessary to gain a full understanding of physics. Working from basic yet fundamental principles, the book builds the students' confidence by leading them through the subject in a steady, progressive way

Authors
Michael M Woolfson and Malcolm S Woolfson

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

Date/Edition
2007/1st Edition

ISBN
978-0-19-928929-5

Level
Undergraduate, professional

Price
£28.99

Usman Iqbal Lula
Department of Radiotherapy (Oncology)
Dorset Cancer Centre
Poole Hospital NHS Foundation Trust, UK
Longfleet Road, Poole Hospital NHS Trust
Dorset BH15 2JB
April 2008

Mathematics for Physics is co-authored by Professor of Physics, M Woolfson and Dr S Woolfson - lecturer: Electrical and Electronic Engineering Department (specialist area: signal processing). The text is stimulating and has a "…motivating approach of demonstrating application alongside the development of mathematical theory...". It is specifically targeted at first and second year undergraduate students in physical sciences as well as 'experimental' physicists. As an "essential core of a scientist's mathematical toolkit", this new text has a broad scope and would be a useful reference for professionals working in the physical sciences and related fields.

Summary Review

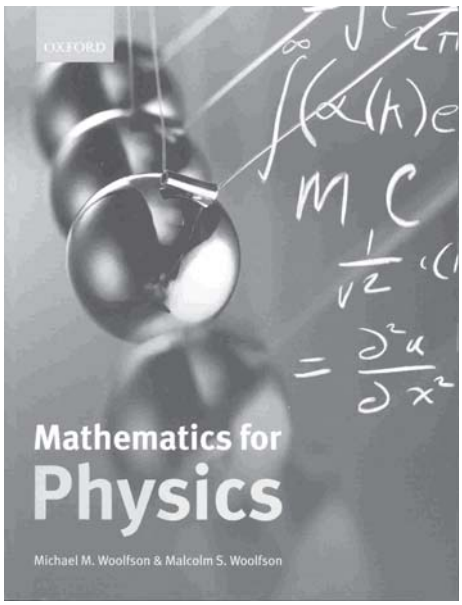
range: * poor to ***** good	
Academic content	*****
Usefulness to student	*****
Usefulness to teacher	*****
Meets objectives	*****
Accuracy	*****

This demanding co-authored 783-page text totals 257 topics spanning 39 chapters. The preliminary chapters cover useful formulae and relationships as well as dimensions and dimensional analysis (base SI and derived units). The following is a 'non-exhaustive' list of **chapters** (with example *concepts and applications*) within the text:

- **Sequences and series** - *arithmetic, geometric, harmonic and power series*
- **Integration and differentiation** - *Chain rule, product and quotient rules; Taylor and Maclaurin series; substitution, partial fractions, integrating by parts and definite integrals*
- **Complex numbers** - *Argand diagram, De Moivre's theorem, and complex conjugates; electrical circuits*
- **Distributions** – *Normal, binomial and poisson distributions*
- **Fourier analysis** – *Fourier transform and series, δ-function, Parseval's theorem, waveform synthesis, power in periodic signals, amplitude and phase spectrum; scattering of EM radiation and Doppler shift*
- **Differential equations** – *Types, homogenous equations, integrating factor, SHM, forced vibrations; LCR circuits*
- **Vector algebra –** *Scalar and vector quantities, products of vectors, relationship between lines and planes, motion under central force*
- **Conic sections and orbits -** *dynamics of astronomical bodies and alpha particles*
- **Probability, statistics and sampling theorem** – *Selection, Bayes' theorem, mean, median, variance and SD; sampling proportions and significance of differences (Students t-test and Chi-squared (X2) test)*
- **Signal, noise and digital filtering** – *auto- and cross-correlation functions, white noise; FT methods (ECG), and constant coefficient digital filters*
- **Quantum mechanics** – *Schrödinger wave equation, simple harmonic oscillators, eigenvalues and eigen functions*
- **Monte Carlo method** – *Random walk, random number generator; fluid simulations by MC methods and nuclear reactor modelling*
- **Matrices and determinants -** *lens systems and special relativity*
- **Interpolation and quadrature** – *Linear, parabolic, Gauss, cubic and multi-dimensional; definite integrals, Trapezium, Simpson's and Romberg methods and quadrature and MC integration*
- **Laplace transforms -** *conservative fields, Gauss's law, Stokes theorem, Maxwell's equations*
- **Linear equations** – *Gauss elimination, Gauss-Seidel and Least-square methods*

Mathematics for Physics

Each chapter commences with a succinct summary of the contents with each topic building sequentially on the previous, helping the reader build a solid platform. The descriptive theory and derivations are concise, derived formulae highlighted and the authors provide exercises after each topic and most sub-topics thus promoting active learning. There are also excellent 'example exercises' prior to these 'set exercises', together with fully-worked solutions to the former in the body of the text. The exercises in most cases make use of the derived formulae and expect the user to have understood the preceding topic and example exercises, where appropriate. There is ample cross-referencing between topics and chapters, especially in relation to the derived and intermediate formulae, which are set out methodically. Also included are 'problem' questions after each chapter, which have partially-worked solutions after the Appendix.



The individual chapters and related topics read very well, though it was felt that it *might* be counter-productive to read them in isolation as later chapters build on early ones. The text does give much useful relationship, differential and comparison tables as well as distribution tables. The authors provide some guide in the main text in using the computer-coded programs and provide information about the variables, input values and expected sample output. The output or program result can be displayed in the form of a graphical plot with the use of *GNUPLOT*, or *MATLAB*'s own graphical output or simply run to produce a numerical result. There are output table values for different combination input variables given in the main text. Readers should note that the actual program outputs are not always exactly the same as those given in the text. Occasionally, the authors do provide a reason for this (eg differences in calculation accuracy of compilers for say, random number generation as in the Monte Carlo method) as well as a guide to improve the results.

The layout of the text is consistent throughout with most formulae numbered and many important equations shaded. Where necessary, the authors provide numerous illustrations to accompany the text to allow visualisation of the abstract physical concepts and thus enhance the learning experience. There are online resources at the Oxford University Press (OUP) online resource centre (ORC) <www.oxfordtextbooks.co.uk/orc/woolfson/) suitable for lecturers to facilitate material preparation as well as students to download the programming source codes.

The preface emphasised that the text would provide a gentle introduction to mathematics to motivate experimental physicists. However, a reader will soon realise that there is less derivation detail in the book than expected though it has a good descriptive content. It would have been extremely useful to have an additional 'worked solutions' book to the exercises and problem questions in addition to detailed derivations. Retrospectively, the book does lead from topic to topic in a progressive way. There are also useful web links in the main text to encourage the reader to delve into further discussion on the topic.

The appendix includes an array of computational techniques and algorithms mostly by way of programming codes (*FORTRAN*, *C* and *MATLAB* formats) in an easily readable format - all well referenced in the main text. This gives the reader the flexibility to choose a preferred language to compile and run the downloaded codes. There is also a short reference list and texts for further reading, a table of integrals, derivation of the inverse Fourier transform and of a sampled and discrete signal. A section at the rear of the text provides solutions to problems set at the end of each chapter and to exercises at the end of topics. Readers should note however that answers to exercises are in the form of 'non-worked' solutions.

The authors give numerous example cases to enhance the grasp and understanding of theoretical concepts. The descriptive theory is very readable and interwoven well with the derivations. This stimulating and informative text is a culmination of a range of application areas. It surely does have a unique approach to active learning, by effortlessly combining both theory and application. I would recommend this *low-cost* book to undergraduate physical science students and it would be a handy reference source for professionals alike.

Molecular Orbitals of Transition Metal Complexes

Subject area
Inorganic chemistry

Description
This book starts with the most elementary ideas of molecular orbital theory and leads the reader progressively to an understanding of the electronic structure, geometry and, in some cases, reactivity of transition metal complexes

Authors
Yves Jean

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

Date/Edition
2005

ISBN
978-0-19-853093-0

Level
Undergraduate, research

Price
£46.00

Zia Khan
CA/151, 9/A
Muhammad Hussain Rd
Modeltown A
Bahawalpur
Pakistan
May 2008

Summary Review

range: * poor to ***** good

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

This book starts from the most elementary ideas of molecular orbital theory, it leads the reader progressively towards an understanding of the electronic structure, of the molecular geometry, and in some cases, the reactivity of transition metal complexes. The author also expressed his concerns over the formal division of chemistry (ie physical, organic and inorganic chemistry) In other words, the author seems to have written this book by removing the boundaries of the various specialisations of chemistry. There are six chapters in this book. The first chapter gives some general introduction such as electron counting in a transition metal complex

In chapter 2 the principal ligand fields are discussed with many orbital diagrams (eg octahedral, square planar, tetrahedral). The structure of the 'd block' is used to trace the relationships between the electronic structure and the geometry of these complexes. Chapter 3 studies the change in analysis when the ligands have pi-type interactions with the metal. The notation 'π' that is used here is almost never strictly correct according to group theory, where it reserved for doubly degenerate orbitals in linear molecules. It is, however, widely used to refer to local symmetry: the expression 'π interaction' is used when the two orbitals share a common nodal plane and have lateral overlaps. This chapter has some beautifully drawn structural and orbital diagrams.

The preceding ideas are then used in Chapter 4 which deals with a series of selected applications of varying complexity (eg structure and reactivity) starting from conformational problems like d^8 complexes. Chapter 5 deals with the 'isolobal analogy'. This demonstrates the resemblance between the molecular orbitals of inorganic and organic species and provides a link between these two areas of chemistry. This chapter has some useful illustrations and some applications have been discussed, using metal-metal bonds and some energy diagrams. Chapter 6 is about the basics of group theory with application to some of the complexes studied earlier. This chapter covers concepts like symmetry elements, symmetry operations and point group with the help of structural diagrams and some useful and easy to understand expressions showing the role of transformation matrices for various symmetry operations.

Overall, this book is very useful not only for inorganic chemists but also for researchers from other fields working on transition metal complexes. Since the author himself writes in the beginning that there is no need for any separate branches of chemistry, he has probably written this book keeping in mind this idea. In other words the book covers the essential knowledge of molecular orbitals of transition metal complexes. The role of symmetry has been described in most cases very well. Molecular orbitals have also been carefully drawn throughout the book. However, some theoretical description and calculations using theoretical and computational methods would have increased the standard of this book. The character tables have been presented in an easy to follow way and energy diagrams for most of the compounds are also very helpful. If one or two additional chapters describing some basic quantum mechanics and spectroscopy along with some applications were added, this book would become a true research-oriented reference book.

View an extended, unedited version of this review

Named Organic Reactions

Subject area
Organic chemistry

Description
A summary of a number of organic reactions, translated from the German

Authors
Thomas Laue and Andreas Plagens, translated into English by Claus Vogel

Publishers/Suppliers
John Wiley and Sons Ltd (eu.wiley.com/WileyCDA)

Date/Edition
2005/2nd Edition

ISBN
978-0-470-01041-9

Level
Undergraduate, research

Price
£32.50

Marie Walsh
Department of Applied Science
Limerick Institute of Technology
Limerick
ROI
April 2008

Summary Review

range: * poor to ***** good

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

This text is the second English language edition of **Named Organic Reactions** by Thomas Laue and Andreas Plagens of Volkswagen AG, in Wolfsburg. It was originally published in German in 1995 as *Namen- und Schlagwort-Reaktionen der Organischen Chemie*. The first edition of **Named Organic Reactions** was published in English in 1998, with English translation by Claus Vogel of the Leibniz-Institute fur Polymerforschung in Dresden. Some of the language used in translation is a bit quaint, but comprehensible none-the less.

This new edition represents a complete revision of the original publication in both style and content, and includes some additional reactions as well as new reference material for the original listings. The authors have set out to provide a useful reference summary of what they consider to be important organic reactions. While they claim to list some 135 reactions, there are in fact just 117 accounts indexed and described over 300 pages in alphabetical order, from the Acyloin ester condensation to the Wurtz reaction. The deficit may be accounted for by new variants being included in the information on some reactions. Some reactions contain only one page of information, while others have up to seven pages. Significantly, the majority of the reactions are named after discoverers, eg Cope Elimination, while the others are named for reaction types, eg Hydroboration.

The text is not intended as a replacement for a standard organic chemistry textbook, but rather as a handy reference or revision aid. It is compact enough to fit in a large lab coat pocket! It is printed in black and white, with equations and mechanisms for each type of reaction. The descriptions for each of the reactions are presented in a standard and consistent format, listing:

- Title as name of reaction, eg Fries Rearrangement.
- A one sentence description of the reaction, eg. Acylphenols from phenol esters
- A general reaction scheme, numbered to refer to the descriptive text.
- Descriptive text with introductory material interspersed with step-by-step mechanisms.
- Details of side reactions and substrate limitations, including information on catalysts.
- Examples of the applications of the particular reaction.

The information for each type of reaction is completed by a list of references, including reference to the very first publication of the reaction, to show the origin of its name and how it was explored or developed. Additionally, review articles are cited, together with relatively recent articles. For example, for the Fries Rearrangement, we can see that the original paper was published in 1908 but that a photochemical variant reaction was described in 1967. These references are not exhaustive listings but they could inspire students to do some research of the literature, review articles and reference works.

All things considered, this is a very useful book for undergraduate and postgraduate reference, giving sufficient detail for comprehension of the reactions and good pointers as to where to go for additional and extra information. At the very least it should be on the science shelves in the library!

Nucleic Acids in Chemistry and Biology

Subject area
Chemical biology, biochemistry

Description
A wide-ranging chemically based reference text on all aspects of nucleic acids

Authors
G Michael Blackburn, Michael J Gait, David Loakes, David M Williams (Editors)

Publishers/Suppliers
Royal Society of Chemistry Publishing (www.rsc.org/Publishing/Books/index.asp)

Date/Edition
2006/3rd Edition

ISBN
978-0-85404-654-6

Level
Undergraduate, research

Price
£44.95

Jim A Thomas
Department of Chemistry
University of Sheffield
Sheffield
S3 7HF
April 2008

Summary Review

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

Nucleic Acids in Chemistry and Biology first came out in 1990, and has recently been issued in its third edition by a new publisher. A textbook with a shelf life of nearly twenty must be doing something right, but how does this new edition measure up?

Well, the overall structure and presentation of the book has not really changed. It still presents an unabashed chemistry-biased description of the area and contains a large number of two colour figures, with a judicious sprinkling of full colour pictures.

One difference that is immediately obvious is that end-of-chapter summaries have gone, being replaced by a list of references to leading papers and reviews, but the major change is in content. After an injection of new blood in the form of several new contributors, the length of most of the chapters have now increased substantially and much of this change is due to entirely new material on recent research.

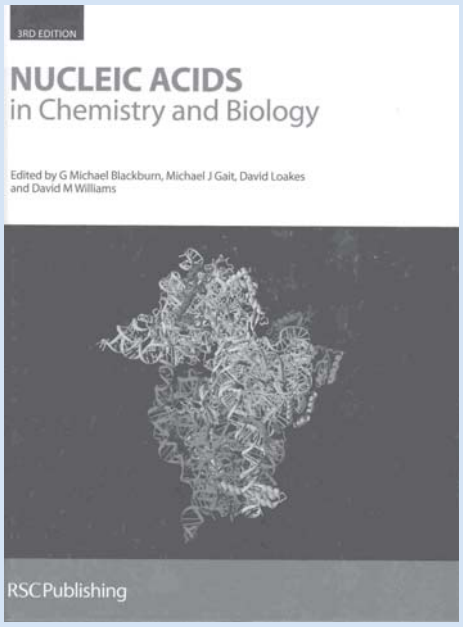
Starting off with a very useful glossary of common terms, the following first introductory chapter covers the discovery of DNA and its structure from a historical perspective. The second chapter is then devoted to detailed descriptions of common DNA and RNA structures and their dynamics. Ranging from canonical duplexes such as A-, B-, and Z-DNA through mismatches, RNA/DNA duplexes triplex and quadruplex structures, to chromatin and helix-coil transitions, each subject is described in an engagingly lively style, which is a common characteristic of the whole book.

Chapter three is concerned with nucleosides and nucleotides; their synthesis, chemistry and therapeutic applications are all covered. A relatively short chapter four discusses methods of synthesising oligonucleotides and modified oligonucleotides, while chapter five provides an overview on the uses of nucleic acids in biotechnology. In this latter chapter, the descriptions of established techniques like mutagenesis, PCR (Polymerase Chain Reaction), and DNA fingerprinting now also includes nascent areas such as SELEX (Systematic Evolution of Ligands by Exponential Enrichment), gene therapy and RNA interference.

Chapter six describes gene structure and function. The packaging and features of prokaryote, eukaryote and viral genomes are first outlined and then the mechanisms involved in processes such as replication, transcription, gene repair, and transposition are discussed.

Chapter seven focuses exclusively on RNA and its role in biological systems. Although common structural motifs are first introduced and described, the bulk of this chapter concerns the dynamic processes that RNAs participate in; transcription, translation and RNA transport are all dealt with clearly. Other less classical functions, for example ribozyme activity and bacteriophage packaging motor, are also mentioned; RNAi is also revisited in more detail.

Nucleic Acids in Chemistry and Biology



From the publisher...

Nucleic Acids in Chemistry and Biology

By G Michael Blackburn (Editor), Michael J Gait (Editor), David Loakes (Editor), David M Williams (Editor)

The structure, function and reactions of nucleic acids are central to molecular biology and are crucial for the understanding of complex biological processes involved. Revised and updated Nucleic Acids in Chemistry and Biology 3rd Edition discusses in detail, both the chemistry and biology of nucleic acids and brings RNA into parity with DNA.
This authoritative book presents topics in an integrated manner and readable style. It is ideal for graduate and undergraduates students of chemistry and biochemistry, as well as new researchers to the field.

978-0-85404-654-6 470pp 2006 £44.95

The next three chapters describe the interaction of other molecules with nucleic acids. Chapter nine begins this sequence with an overview of the covalent interactions of small molecules with nucleic acids, describing the action of carcinogens and antibiotics, and discusses the consequences of irreversible photochemical modifications; it also delineates how this kind of damage is repaired. Chapter ten goes on to explain common reversible nucleic acid interactions involving small molecule, taking in (with examples) electrostatic, intercalative and groove binding modes to duplex, triplex and quadruplex structures, respectively. Chapter ten summarises protein-nucleic acid interactions. Succinct, but authoritative, descriptions of all the common binding motifs are accompanied by a consideration of the kinetic and thermodynamic aspects of these processes.

The final, eleventh chapter discusses physical and structural techniques commonly employed in nucleic acid research. This includes specific applications of general methods like optical and mass spectroscopy but also includes more specialised analytical techniques, for example; circular and linear dichroism, as well as hydrodynamic methods are included. In this reviewer's opinion while this chapter is of interest as an overview, it does not really add a huge amount to the resources provided by the proceeding chapters.

Even with this brief description it should be clear that this book covers a huge spectrum of material. While it is probably not a good primary source for one specific undergraduate course, it will find use as a reference text for a variety of courses in chemistry, biochemistry or molecular biology. Authoritative and dependable, with descriptions of up-to-date research (primary papers up to 2005 are referenced), this excellent book is surely one of the main points of entry for all students or researchers wanting to learn a little bit more on any aspect of nucleic acids. Thoroughly recommended.

Optical Spectroscopy of Lanthanides: magnetic and hyperfine interactions

Subject area
Physical sciences

Description
The book provides a definitive and up-to-date theoretical description of spectroscopic properties of lanthanides doped in various materials

Authors
Brian G Wybourne and Lidia Smentek

Publishers/Suppliers
CRC Press - Taylor and Francis Group
(www.taylorandfrancis.co.uk)

Date/Edition
2007

ISBN
978-0-8493-7264-3

Level
Research

Price
£88.00

Robert Baker
School of Science & Technology
Nottingham Trent University
Clifton Lane
Nottingham
NG11 6NS
April 2008

This monograph covers the theoretical description of the optical spectroscopy of the lanthanoid ions, especially those doped into other materials. The authors are both experts in their fields and the book also reports unpublished work in order to aid the description of f-element spectroscopy. It is squarely aimed at a graduate level audience and as one may expect, is a detailed and in-depth analysis of this field.

Summary Review

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

The book starts off with a few chapters on the basics. The authors first introduce quantum mechanics of the nucleus, angular momentum, Racah algebra, and effective tensor operators and the interactions of one and two electron systems. These chapters are very clearly written and could probably be adapted to undergraduate courses for physics and/or chemistry. The background to hyperfine structures is then described in terms of spin-orbit coupling – a key idea in understanding the unique properties of lanthanoid and actinide spectroscopy. Throughout these chapters, examples of alkali metal spectra are first discussed, before introducing the added complexity of the f-orbitals in the lanthanide series. This section is brought to a close with a short real-life example in the discussion of Laser cooling.

The next section of the book expands on these themes previously developed to include the effects of confining a lanthanoid ion into a crystalline environment, where one has to include spin-orbit interactions and crystal field splitting. This is nicely illustrated with some relevant examples, before describing a number of hyperfine interactions particularly magnetic and electric quadrupole interactions incorporating relativistic effects. There then follows a detailed treatment of f↔f transitions in optical spectroscopy. In particular the descriptions of the Judd-Ofelt theory, which is a powerful theorem for predicting intensities of transitions, and its expansion is very well described. The book is finished by a chapter on current research efforts in the luminescence of doped materials and lanthanoids in bioinorganic chemistry.

By necessity, the book includes a *lot* of maths, but the authors have included routines for the software package *MAPLE* in order to speed up repetitive algebra. This feature would be useful for the presentation of material from this book in a lecture. At the end of each chapter some problems have been included based on the contents. These range in difficulty, although no answers are provided – the instructor also has to work out the answers!

In summary, this book is aimed at PhD students and researchers working in the field of lanthanoid doped materials and is not a book for bedtime reading or dipping in and out of. However, the authors have managed to make a complicated subject accessible to its target audience. As the use of lanthanoid ions grow in materials chemistry (eg the development of phosphors for TV screens) and biological chemistry (eg new drugs for detecting cancer cells) there will be a greater need to understand the physics behind the applications. To the best of my knowledge there is not a comparable book on this subject, and the text provides references to the primary literature if required. The only minor quibble I have is that the IUPAC nomenclature suggests that it should now be Lanthanoid, rather than Lanthanide, although that is the only criticism I can find in this book!

Organic Chemistry II as a Second Language

Subject area
Organic chemistry

Description
This text provides readers with clear, easy-to-understand explanations of the fundamental principles of organic chemistry

Authors
David R Klein

Publishers/Suppliers
John Wiley and Sons Ltd
(eu.wiley.com/WileyCDA)

Date/Edition
2005

ISBN
978-0-471-73808-4

Level
Undergraduate

Price
£21.50

Summary Review

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

The book covers the reactions of aromatic compounds, aldehydes and ketones, carboxylic acids and derivatives, enols and enolates and amines. I actually teach all the topics covered in this book to first and second year undergraduates and have found this book really fascinating. The goal of the book has been clearly defined at the outset and the author has discussed the mechanism of each reaction for a particular functional group in concise detail using curly arrows. Emphasis has been focused on mechanisms of functional group reactivity. The content is very easy to understand and digest. I am impressed with the clarity of explanation using simple language and the vast array of structural features illustrating the various mechanisms. The aim of the author is to encourage students of organic chemistry to develop their own skills in predicting products of chemical syntheses based on their proper understanding and application of reaction mechanisms. I think he has been very successful at that especially by giving numerous problem solving exercises systematically throughout the book with answers to problems also included at the back.

The author starts by showing how to correctly draw curly arrows for ionic mechanisms and subsequently discusses electrophilic aromatic substitution (EAS) reactions in precise detail that is easy for students to follow. His approach is very similar to mine in teaching this topic. Discussion of how to predict the synthesis of di- and tri-substituted aromatic compounds based on the nature of the groups already present (EWG as deactivators or ERG as activators) on the aromatic ring has been beautifully executed with copious number of examples and exercises for reinforcement. However, there are a few transformations which have not received mechanistic scrutiny. For example on pages 40-41 dealing with EAS reaction to form benzenesulphonic acid also shows the removal of the sulphonic acid group by treatment with aqueous sulphuric acid. No mechanism has been proposed to show how this transformation occurs. Furthermore, there is no mention nor any discussion of benzenediazonium salts and the Sandmeyer reaction. Perhaps this has been deliberately done because the mechanisms for displacement reactions of diazonium salts involve radicals. The reduction of the carbonyl group by the Clemmenson method has ben discussed but the reduction of nitro group to amino group, an important transformation in synthesis, has not been dealt with.

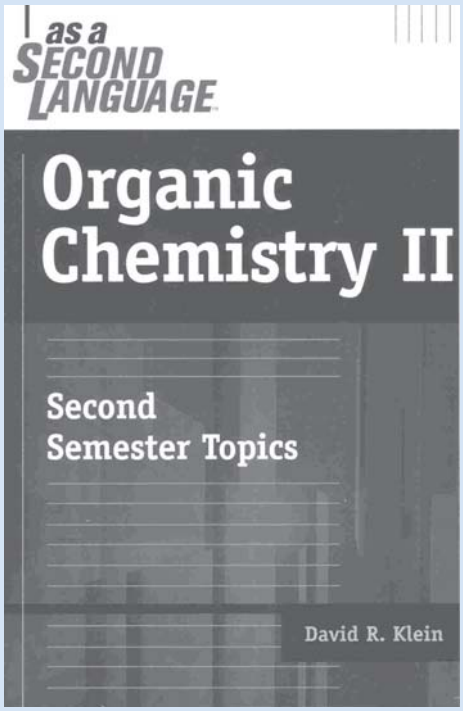
The topic of nucleophilic aromatic substitution (NAS) reactions involving SNAr and elimination-addition reactions has received a measured mechanistic treatment with clear diagrams and examples.

The carbonyl chemistry of the various functional groups has been made extremely easy to follow. Students usually find this topic quite challenging especially enolate chemistry. However, the way it is portrayed and explained in precise detail has made this topic reader friendly and attractive. The protection-deprotection reactions of functionalised aldehydes and ketones is covered exceptionally well with the added feature of brief experimental detail. For example, Dean-Stark apparatus is given on each transformation along with the reagents required for forming acetals from aldehydes and ketones. This has been my approach also and is gratifying to see it. Similarly it is nice to see the complete set of reagents

Continued on page 42

M Akram Khan
Sheffield Hallam University
Faculty of Health & Wellbeing
Biosciences
Sheffield Hallam University
Pond Street
Sheffield S1 1WB
April 2008

Organic Chemistry II as a Second Language



From the publisher...

Organic Chemistry II as a Second Language: Second Semester Topics, 1st Edition

By David R. Klein

Building on the resounding success of the first volume (0-471-27235-3), Organic Chemistry as a Second Language, Volume 2 provides readers with clear, easy-to-understand explanations of fundamental principles. It explores the critical concepts while also examining why they are relevant. The core content is presented within the framework of predicting products, proposing mechanisms, and solving synthesis problems. Readers will fine-tune the key skills involved in solving those types of problems with the help of interactive, step-by-step instructions and problems.

978-0-471-73808-4 320pp 2005 £21.50

Continued from page 41

for doing reactions which is reflected in the detailed mechanism. For example after each LAH reduction it is essential to add water and after each Grignard reaction it imperative to add aqueous acid. Basic reactions of carboxylic acids and derivatives have also received exhaustive mechanistic detail in terms of using the curly arrows approach leaving no room for error.

In the chapter on amines although many of the usual methods for making amines are given, I have failed to find a single example of a nitrile reduction to give an amine. Perhaps the author could add a few examples of this method for completeness. In conclusion I encourage the author to use colour, if possible, to replace the grey highlighting that has been used for emphasis.

In my opinion this is a dream book for students of organic chemistry engaged in understanding how reactions occur. Not only has this book made organic chemistry easy for students but equally for academics to deliver the task of teaching it to students a lot easier. At last a book has been written in the style of the academic practitioners to replace the old lecture notes! I recommend this book to all students of organic synthesis as an invaluable asset.

Organic Synthesis: strategy and control

Subject area
Organic chemistry

Description
An organic chemistry text book concerned with the planning of organic synthetic reactions

Authors
Paul Wyatt and Stuart Warren

Publishers/Suppliers
John Wiley and Sons Ltd
(eu.wiley.com/WileyCDA)

Date/Edition
2007/1st Edition

ISBN
978-0-471-92963-5

Level
Undergraduate, research, professional

Price
£45.00

John Leaver
11 Ridley Road
Bollington
Macclesfield
Cheshire
SK10 5HL
April 2008

Summary Review

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

Anyone who has studied organic chemistry over the last twenty-five years or so, is almost certain to have encountered *Organic Synthesis: The Disconnection Approach* by Stuart Warren. I remember, on first reading that book as a chemistry undergraduate in the late 1980s thinking to myself that it provided a rather different way of looking at things, a different way to attack synthetic problems. This new textbook, written in association with Paul Wyatt is a much more bulky tome than the *Disconnection* book. It will be immediately appealing to anyone who, like me, enjoys the process of thinking about organic synthesis and should prove very useful to those engaged in synthetic organic chemistry whether as a student or a researcher in academic or industrial contexts. The subtitle *Strategy and Control* refers to the dual possibilities of either finding a new method or controlling an existing one to overcome a synthetic problem. This is a very well organised book containing a wealth of information for those working in the field of organic synthesis. It is divided into five main sections A-E and I will next briefly examine the contents of these while also indicating general features and one or two interesting highlights.

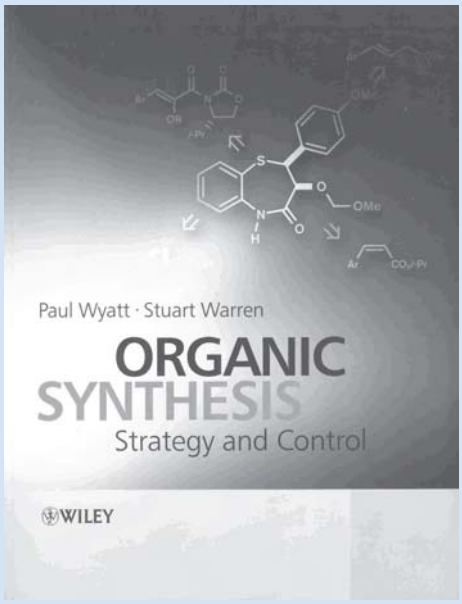
Section A is titled 'Introduction: Selectivity' and is further divided into six sub-sections which cover some basics of planning organic syntheses and important concepts of selectivity (chemo-, regio-, stereo-). These concepts are introduced with specific relevant examples. The style throughout is generally concise but also very clear. Equally clearly presented are the many reaction schemes and reaction mechanisms. These are printed slightly more boldly than the surrounding text and this adds significantly to their clarity. The way in which structures, reaction schemes and mechanisms 'jump out' from the page makes this an excellent book for browsing. Each sub-section has its own collection of references. The final sub-section of Section A is titled 'Choosing a Strategy'. It uses the example of cyclopentanone synthesis and looks at the possibilities provided by more than half a dozen different strategies. This sub-section is full of interesting chemistry and really highlights the broadness of thought required when trying to find a useful synthetic route.

Section B is concerned with making C-C bonds and the variety of possibilities is explored in eight sub-sections. Once more, much interesting and useful ground is covered in a very economical way. For example, in just over a dozen pages in the sub-section titled 'σ-Complexes of Metals' the authors cover a great variety of organo-lithium, organo-magnesium reagents and transition metal complexes. Not a word is wasted and the pages are sprinkled with well-annotated reaction schemes and mechanisms.

Section C looks at C=C bonds and then Section D explores stereochemistry in what is the longest section of the book, divided into twelve sub-sections. Topics covered include controlling stereochemistry, resolution, assorted asymmetric synthetic methods, including biological (enzyme based) reactions. Some very subtle and interesting concepts are covered here.

Continued on page 44

Organic Synthesis: strategy and control



From the publisher...

Organic Synthesis: Strategy and Control

By Paul Wyatt, Stuart Warren

Organic Synthesis: Strategy and Control is the long-awaited sequel to Stuart Warren's bestseller Organic Synthesis: The Disconnection Approach, which looked at the planning behind the synthesis of compounds. This unique book now provides a comprehensive, practical account of the key concepts involved in synthesising compounds and focuses on putting the planning into practice.
The two themes of the book are strategy and control: solving problems either by finding an alternative strategy or by controlling any established strategy to make it work. The book is divided into five sections that deal with selectivity, carbon-carbon single bonds, carbon-carbon double bonds, stereochemistry and functional group strategy.

978-0-471-92963-5 918pp 2007 £45.00

Continued from page 43

Section E concludes the main text with an exploration of 'Functional Group Strategy'. As before, every page is full of interest with many well-chosen examples to elucidate the synthetic points being made. After Section E is a page of general references and the book concludes with a fairly comprehensive index.

Organic Synthesis: Strategy and Control is an interesting and enjoyable account of an enormous variety of concepts and material associated with finding suitable synthetic routes. It is rewarding to read and also acts as a very useful repository of information for both students and working synthetic organic chemists. The production quality of the book is excellent throughout. It would be a useful addition to the bookshelf of anyone working in the field as even experienced synthetic chemists will find themselves being reminded of interesting possibilities or spot relatively new ones that they have not encountered elsewhere. The authors can be commended on producing a really useful and enjoyable new book on Organic Synthesis!

Pericyclic Reaction - a textbook: reactions, applications and theory

Subject area
General chemistry

Description
This textbook presents Diels-Alder reactions, electrocyclic reactions, sigmatropic rearrangements plus many more topics in a highly didactic way

Authors
S Sankararaman

Publishers/Suppliers
Wiley-VCH (eu.wiley.com/WileyCDA)

Date/Edition
2005

ISBN
978-3-527-31439-3

Level
Research

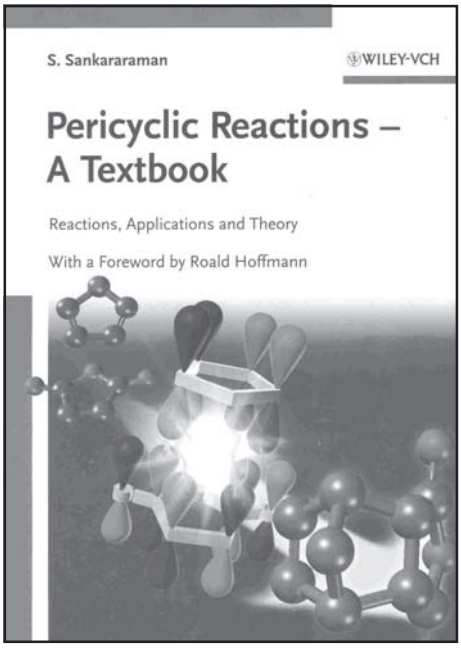
Price
£39.95

Summary Review

range: * poor to ***** good

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

This book is a comprehensive text covering the theory and applications of Pericyclic Reactions. Chapter One sets the background, by giving a comprehensive review of molecular orbitals. Notable is that this chapter covers the necessary detail, and does so in a highly readable format, and this is significant since the entire remainder of the book critically depends on this chapter. The key pericyclic reaction classes – electrocyclic, cycloaddition, sigmatropic and cheletropic processes - are then all covered in separate chapters 2 to 5, and a final chapter covers a range of other topics that do not fit neatly into the earlier ones (eg organometallic and radical cation reactivity, periselectivity). Each of these topics is covered by application of Woodward-Hofmann rules, using frontier orbital, orbital correlation and transition state aromaticity methodology. All of the diagrams in the book are clearly laid-out, and this is imperative for this particular topic. In addition to this comprehensive approach for the explanation of theory for each reaction class, a particular strength of the book is the inclusion of many examples designed to illustrate not only the power of pericyclic reactions, but also the predictive and explanatory power of the Woodward-Hofmann rules. Each chapter contains a wealth of illustrative examples, and is fully referenced to the primary literature, allowing direct access to source material. Modern developments, such as chiral Lewis acid catalysed Diels-Alder and ene reactions, and the use of chiral auxiliaries to control absolute stereochemistry, are included,



This is a superb book which would be fully suitable for the use of postgraduates and teaching staff, and is an excellent resource for lecture and class preparation and examination questions! However, it might prove to be too detailed for all but the most advanced undergraduates, but would still make an excellent reference text for them.

Mark Moloney
Chemistry Research Laboratory
University of Oxford
Mansfield Rd
University of Oxford
OX1 3TA
March 2008

Physical Chemistry of Macromolecules

Subject area
Polymer science, physical chemistry

Description
A summary of key principles of polymer science

Authors
Gary Patterson

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

Date/Edition
2007/2nd Edition

ISBN
978-0-8247-9467-5

Level
Research

Price
£42.99

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

This is a short, 136 pages in total, handy-sized introduction to a particular area of physical chemistry/polymer science. Since most undergraduate chemistry programmes will have some reference to polymer, or as the author names it – macromolecular chemistry, the number of textbooks and reference materials in this area have grown. Gary Patterson is a chemical physicist with special interests in polymer science, who, as well as teaching and researching in these disciplines has also taught in Humanities and Social Sciences. I think this experience of communicating science to non-scientists is evident particularly in the preface and introductory section of the book.

In the preface, Patterson puts his interest in this area in context, describing the book as the "culmination of 40 years of thinking about macromolecules" that began when he read the textbook that inspired his choice of graduate school and study specialisation. That text was *Principles of Polymer Chemistry* by Paul Flory (1953) and the Flory-type theories of polymer behaviour are referred to throughout this book. He gives the impression that he knows the field and 'virtually every major figure in polymer science' extremely well.

The book was developed from a series of lectures for a graduate course in the physical chemistry of polymers, and so it is prerequisite that any reader would have studied physical chemistry to advanced undergraduate level as a minimum. The preface gives some brief key-points in the historical development of this field, but the inclusion of fairly technical ideas indicates that this is not a 'soft' read but a book aimed at the more serious and advanced students.

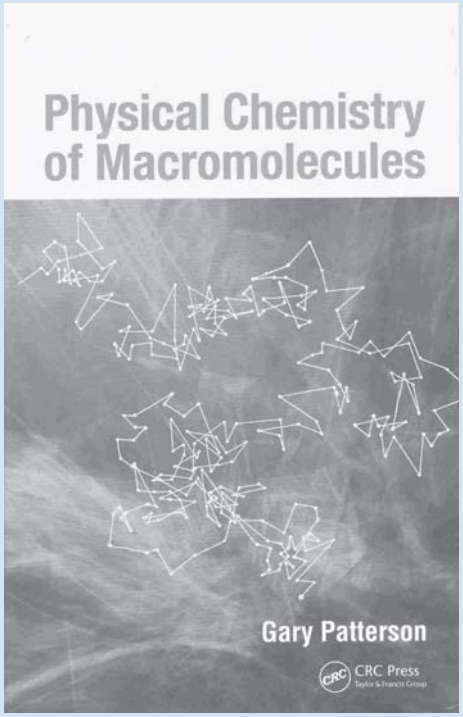
The book contains ten chapters;
1. Introduction to macromolecules
2. Describing polymer structure
3. Measuring polymer structure
4. The macromolecular basis of rubber elasticity
5. Structure and properties of polymers in dilute solution
6. Structure and properties of polymers in semi-dilute solution
7. Structure and properties of polymers in concentrated solution
8. Structure and properties of polymers in the pure amorphous state
9. Structure and properties of rodlike (or stiff-chain) polymers in solution
10. Structure and properties of polyelectrolyte chains in solution

It is a short book, with the shortest chapter at 3 pages and the longest 25. It ends with a list of forty-four references and an index. The references date from 1938 to 2006, giving some idea of the text as being a summary of the historical development of polymer science right up to current ideas.

The overall impression is that polymers are highly flexible materials, whose behaviour, structure and intermolecular properties vary depending on whether in solution or bulk state. All the key topics in terms of characterisation of macromolecules are mentioned, including light scattering, nuclear magnetic resonance, and size exclusion chromatography. Given the quantity of text, none of these ideas is explored in depth, but the material does provide links for further literature searching.

Marie Walsh
Department of Applied Science
Limerick Institute of Technology
Limerick
ROI
April 2008

Physical Chemistry of Macromolecules



From the publisher...

Physical Chemistry of Macromolecules

By Gary Patterson Carnegie Mellon University, Pittsburgh, Pennsylvania, USA

Emphasizes the statistical measures of structure and weight distribution
Discusses structural, dynamic, and optical properties of macromolecules in solution
Presents the experimental evidence underlying current theoretical and mathematical principles governing macromolecules
Explores the use of light scattering, nuclear magnetic resonance, vibrational spectroscopy, and other experimental techniques
Explains how and when to apply rotational isomeric state, Gaussian chain, wormlike chain, and random coil models
Clarifies the Flory-Orwell theory of polymer solutions and free volume equation of state

978-0-8247-9467-5 152pp 2007 £42.99

In addition, the author emphasises the importance of mathematical principles, from statistical measures of structure and weight distribution to quantification of characterisation methods. It is not a text for the mathematically inept! It is in black and white, with very limited illustration apart from a few graphs, phase diagrams and sample spectra.

I would recommend this book for library shelves, and as reference material for advanced courses. I cannot see it as a recommended course text as it doesn't give sufficient detail. However, it would be useful as a stepping stone to this particular area of physical chemistry.

Planetary Science: the science of planets around stars

Subject area
Astronomy, physics and related fields (such as seismology, mineralogy, geochronology)

Description
An outline of the science of planets and the stars they orbit

Authors
George H A Cole and Michael M Woolfson

Publishers/Suppliers
Institute of Physics Publishing - Taylor and Francis Group (www.taylorandfrancis.co.uk)

Date/Edition
2002

ISBN
978-0-7503-0815-1

Level
Undergraduate, research

Price
£33.99

Fran Riga
University of Cambridge Faculty of Education
184 Hills Road,
Cambridge
CB2 2PQ
April 2008

Twenty years ago Campbell, Walker and Yang claimed to have detected a planet outside our Solar System. However, it was not until 2003 that advances in techniques enabled scientists to put to rest any lingering doubts and the object associated with the star Gamma Cephei, was finally confirmed as a planet. To date 287 extra-solar planets have been discovered.

Summary Review

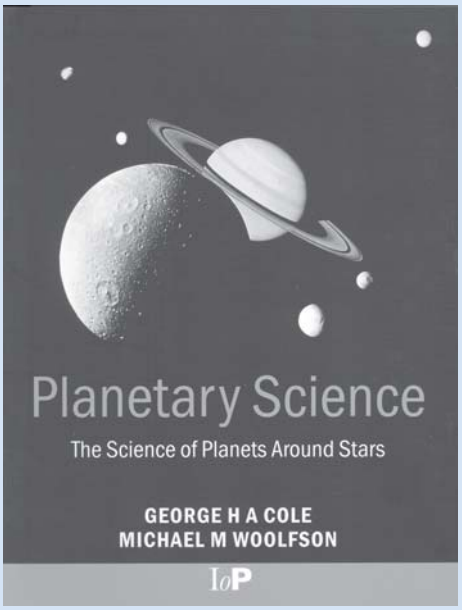
range: * poor to ***** good	
Academic content	*****
Usefulness to student	*****
Usefulness to teacher	*****
Meets objectives	*****
Accuracy	*****

The authors state that their primary concern in writing this book is to study planets, the stars they orbit, and the interactions between them. Since the planetary objects within our Solar System are relatively more accessible, the book focuses on these. Nevertheless, underpinning this study of the structure and formation of planetary objects, is the appreciation that such knowledge might enhance our understanding of other extra-solar systems.

Although the text is intended principally for senior undergraduate students of physics or astronomy, and graduate students requiring an overview of planetary science before selecting a particular area for more detailed study, it would also be of significant interest to students of such related fields as mineralogy, seismology and geochronology. The particular approach employed by the authors has been to organise the text so as to make it conveniently accessible to this target audience. To this end the book is divided into two sections, namely, *A review of the Solar System* and *Topics*. The former consists of 12 chapters, takes up just over one-third of the book, and offers “a general overview of the nature of stars and of the Solar System”. The latter comprises 43 topics of varying length, which discuss the underlying science necessary for understanding the Solar System. Each chapter of the first section and most of the *Topics* chapters, end with a few problems to be solved by the reader. A striking advantage of this two-section layout is that the two segments of the book can be read independently of each other, thus allowing a newcomer to planetary science to obtain a more qualitative feel for the subject before possibly moving on to more quantitative studies in the *Topics* section.

The first 12 chapters of book give a comprehensive account of what is known at present about the science of planet-like objects and their respective star(s), also historically tracking the impact and momentum of those discoveries which culminated in the knowledge we have today. It is significant that the opening chapter of this section discusses the similarities in chemical composition of objects in the Universe such as galaxies, stars and planetary nebulae. The authors pose the argument that since it appears that similar groupings of chemical materials are present throughout the cosmos, it would not be untoward to assume that the chemical composition of the Solar System would likely be similar to other such systems in the cosmos. This sets the stage for studying our Solar System with a view to better understanding comparable systems elsewhere.

Planetary Science: the science of planets around stars



From the publisher...

Planetary Science: The Science of Planets Around Stars

By George H A Cole and Michael M Woolfson

...focuses on the structure of planets and the stars they orbit and the interactions between them. The book is written in two parts, making it suitable for students at different levels and approaching planetary science from differing backgrounds. Twelve independent descriptive chapters reveal our solar system and the diverse bodies it contains, including satellites, planetary rings, asteroids, comets, meteorites, and interstellar dust. These chapters are accompanied by 42 detailed topics that discuss specialized subjects in a quantitative manner and will be essential reading for those in higher level courses. Coverage includes mineralogy, stellar formation and evolution, solar system dynamics, atmospheric physics, planetary interiors, thermodynamics, planetary astrophysics, and exobiology.

978-0-7503-0815-1 528pp 2002 £33.99

The next chapter is entitled 'The Sun and other stars' and describes how stars form from the transformation of the interstellar medium into dense cool clouds. The text here, as is the case throughout the first section of the book, treats the discussion of concepts primarily qualitatively, interspersed with limited quantitative analysis. The mathematical formulae which appear in the body of the text in chapters 1 to 12 constitute part of the narrative and, as such, contribute to it, their main purpose being to complement the text without distracting the reader from the flow of the narrative. Where more detailed mathematical explanations are required, the reader is directed to refer to the relevant topic in the second section of the book, ie the *Topics* section. For instance, a discussion of 'Orbital Motions' and 'Kepler's Laws' forms part of the narrative of Chapter 3 ('The Planets'), but an exploration of the detailed mechanics of orbits follows in Topic M, entitled 'Newton, Kepler's Laws and Solar-System Dynamics'.

Subsequent chapters follow the same format, covering the following areas: 'The Terrestrial Planets', 'The Major Planets and Pluto', 'The Moon', 'Satellites and Rings', 'Comets', 'Meteorites', 'Dust in the Solar System'. The final chapter of this first section of the book rounds off the discussion with a review of current 'theories of the origin and evolution of the Solar System'.

The *Topics* section of the book is aimed at the student who is more seriously engaged in grappling with the underlying concepts which attempt to explain the main features of the Solar System. This section brings together under one umbrella specific areas of interest, such as 'The Jeans Critical Mass', 'The Chandrasekhar Limit', 'Neutron Stars and Black Holes', 'Seismology-the Interior of the Earth', and 'The Safronov Theory of Planet Formation' among others.

The diagrams throughout the book are large and easy to comprehend, and although the majority of photographs are monochrome, they are numerous and of excellent quality.

On the whole, the subject-matter is presented in an unambiguous, accessible way, and anyone with an interest in planetary science will find the topic discussed from the refreshing perspective of viewing the Solar System as one of many such systems found throughout the universe, rather than viewing it as a closed entity, disconnected from the rest of the cosmos.

Polymers: chemistry and physics of modern materials

Subject area
Polymer chemistry, polymer physics, materials science

Description
This book provides a broad-based, high-information text at an introductory level that illustrates the multidisciplinary nature of polymer science

Authors
J M G Gowie and V Arrighi

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

Date/Edition
2008/3rd Edition

ISBN
978-0-8493-9813-1

Level
Research, professional

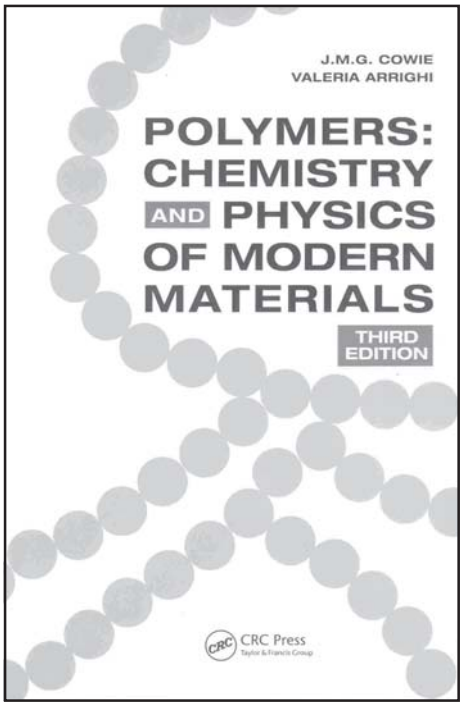
Price
£29.99

Summary Review

range: * poor to ***** good

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

This Third Edition of the well-known Gowie text is revised and updated to include modern developments in polymer chemistry and characterisation techniques, modern polymer applications especially in the biological and electronics arenas, as well as the inclusion of problems and exercises at the end of each chapter. After the general introduction of Chapter 1, Chapters 2-4 and 7 of the book cover methods for polymerisation (step-growth, radical, ionic, and metal catalysed polymerisation), Chapters 5-6 cover polymer structure (block, graft polymers, dendrimers, crystalline, partial order and glassy states, stereochemistry), Chapter 8 details solution behaviour, Chapters 9 and 10 cover polymer characterisation (molar mass determination and morphology) and then Chapters 11-13 cover partial order, glass transition, rheological and elastomeric behaviour. The final Chapter 16 is devoted to a detailed consideration of the important case study of polymer applications in the electronics industry. The book therefore gives a detailed overview of all aspects of polymer science, starting from key chemical and physical concepts, which are required for a proper understanding of their structure, function and applications. Noteworthy is that each chapter has a list of references and bibliography.



This book continues the tradition of a well-known and respected textbook; it would be appropriate for the use of postgraduates on taught or research programmes working in this and closely related areas, such as materials science, and provides teaching staff with an excellent resource for the preparation of teaching material, and the inclusion of questions at the end of each chapter is notable in that regard. This text is probably not suitable for undergraduate use, unless their course is strongly focused in this area, although could be suitable for advanced topics covered by final year undergraduates for example.

Mark Moloney
Chemistry Research Laboratory
University of Oxford
Mansfield Rd
University of Oxford
OX1 3TA
March 2008

Quality Assurance in Analytical Chemistry

Subject area
Analytical chemistry

Description
This book introduces the reader to the whole concept of quality assurance

Authors
Elizabeth Prichard and Vicki Barwick

Publishers/Suppliers
John Wiley and Sons Ltd
(eu.wiley.com/WileyCDA)

Date/Edition
2007

ISBN
978-0-470-01204-8

Level
Professional

Price
£35.00

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

Quality Assurance in Analytical Chemistry by Elizabeth Prichard and Vicki Barwick is an open learning text in the Analytical Techniques in the Sciences (AnTS) series published by John Wiley and Sons Ltd. Although it is based on an earlier book entitled *Quality in the Analytical Chemistry Laboratory*, published in 1995, it is not merely a cosmetic revision but contains significant updates to bring it into the 21st century, covering ISO9001:2000, ISO17025:2005, ISO15189:2003 and GLP. The aim of the book is to teach the analyst about best practice by taking the reader through the whole process of analysis from sampling to reporting. It is written in a clear manner and the authors have made allowance for the wide range of analytical work undertaken by generous use of a variety of practical examples. Therefore the advice offered to readers is applicable to all analytical laboratories. Each chapter contains a set of learning objectives and includes both discussion questions, with the answers in the chapter, and self-assessment questions with responses at the end of the book.

The first two chapters provide a clear introduction to the importance of analytical measurement and the principles of quality assurance. This is followed in Chapter 3 by a detailed discussion of sampling for analysis, including aspects of storage and handling. The next chapter focuses on choice of a suitable method for analysis, with examples of the criteria used for selecting appropriate analytical techniques. It addresses important concepts such as bias, precision, limits of detection, sensitivity and working range. Chapter 5, entitled 'Making measurements' has an emphasis on calibration and traceability. This is followed in Chapter 6 by simple statistics and use of control charts. Chapter 7 covers proficiency testing schemes with an explanation of the use of z and zeta scores. Chapter 8 on documentation is short but to the point and finally Chapter 9 covers aspects of the quality management system, including audits.

In all aspects the authors have a pragmatic approach and clearly their experience provides valuable insight into the key areas to be addressed. It is particularly helpful regarding how to approach analysis and select instrumentation and there are significant sections devoted to control charts, uncertainty, validation and traceability, all important areas in the latest versions of the standards. Nothing is neglected and there is even a page devoted to cleaning and drying of equipment. Anyone developing a quality system will appreciate the example contents list for a quality manual and there is also an excellent guide for the internal auditor. The book contains many useful references to the publications, including a website listing proficiency testing schemes.

The book is an excellent open learning text which could equally be used as part of an in-house training programme or on a module of a postgraduate analytical science course. It is very readable and practical in its approach and the self-assessment questions provide a good test of understanding. Everyone will learn something from this book and I recommend it to anyone involved in analytical chemistry from junior laboratory technician to UKAS assessor.

Susan Parry
Imperial College London
Silwood Park
Ascot
Berks
SL5 7PY
April 2008

Superconductivity, Superfluids and Condensates

Subject area
Physical sciences

Description
This book provides a clear and concise introduction to the subject area. It is part of the Oxford Master Series in Condensed Matter Physics

Authors
James F Annett

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

Date/Edition
2007 (reprint)

ISBN
978-0-19-850756-7

Level
Undergraduate, research

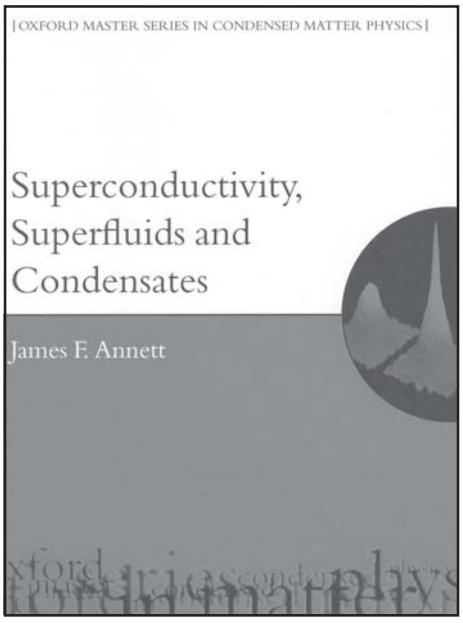
Price
£24.95

Summary Review

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

This is a corrected edition of a book first published in 2004, which mainly concentrates on Superconductivity and Superfluids, with a little bit on modern Bose Einstein Condensation.

It is aimed at advanced undergraduate students - maybe postgraduate ones as well. It is a lovely book that could well be used in conjunction with a 4th year MPhys or MSc course on the subject. It covers all the fundamental topics in the basic subject of Superfluidity and Superconductivity, and introduces most of the theoretical tools. The author does not overdo the depth of derivation, but does not shy away from mathematics where required. It covers Bose Einstein condensates (BECS), Superfluid helium-4 and helium-3, Ginzburg-Landau Theory, Coherent States and BCS theory (named after its creators, Bardeen, Cooper, and Schrieffer).



I am not aware of any other book that is able to do all of this, and still fits our standard UK teaching pattern so well. If a criticism needs to be raised, it would be that it is rather succinct on the topic of atomic BECs/BCS condensates, probably one of the most active frontiers in this area. Also, black-and-white images don't show the full elegance of the results - but they do keep the price of the book down!

The lack of depth to the book means that it will not be of long term use to postgraduates, but if they want to quickly refresh their understanding of some of the basic properties, this is an excellent book. There are useful problems at the end of each chapter, with selected solutions at the end of the book, that will make it a valuable tool for self study of the subject.

In short, this book is highly recommended for any advanced course on Superfluids and Superconductors or for self study.

Niels Walet
School of Physics and Astronomy
University of Manchester
Manchester
M13 9PL
March 2008

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...

Physical Sciences Centre
Department of Chemistry
University of Hull
Hull HU6 7RX
Phone: 01482 465418/465453 Fax: 01482 465418
Email: psc@hull.ac.uk Web: www.heacademy.ac.uk/physsci