ISSN 1471-7166

Volume 7 Issue 2 *December 2006*

Physical Sciences Educational Reviews

The journal of the Physical Sciences Centre *Number 13*

Reviewed in this issue:
32 books

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Physical Sciences Educational Reviews

Physical Sciences Educational 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.

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Editorial

In this issue, the 13th, we have passed the 250 mark for book reviews since we started (as the LTSN) in 2000 (in fact including this issue we have reviewed 277 books, 63 software packages and 39 web sites). This is a significant achievement and I would particularly like to thank all those who undertake reviews for us, both in this country and, increasingly, overseas.

Lately, we have found that teaching software to review is becoming more difficult to find, as more publishers move to a web base for delivering this type of material, hence we need to concentrate more on finding web resources to review (any suggestions would be welcomed) for the future.

Good reading!

Roger Gladwin
Editor

In this issue...

Book reviews...

Reviews...

Analytical Mechanics for Relativity and Quantum Mechanics

Subject area
Theoretical Physics

Description
A comprehensive and mathematically careful treatment of the foundations of variational methods in mechanics

Authors
Oliver Davis Johns

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

Date/Edition
2005/1st edition

ISBN
0-19-856726-X

Level
Undergraduate, research

Price
£39.95

Summary Review

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

This book has a beautiful jacket photograph of a statue of Gudea, a Mesopotamian king of four thousand years ago. The statue is housed in the British Museum galleries representing the Ancient Near East. Now imagine yourself on an organised tour of these rooms in the company of a fastidious guide, anxious that no shard of pottery or fragmentary inscription pass you by, keen to impress upon you the solid foundations on which an invisible ancient world can be mentally recreated. Oliver Johns is such a guide and displays a similar zeal in promoting Lagrangian and Hamiltonian methods in classical, quantum and relativistic mechanics. The book is pitched at graduate level and Johns has an ambitious aim in writing "in the hope that a reader may emerge from the thicket of classical-quantum analogies with ideas for a more comprehensive theory of matter" that might provide a natural cohesion to wave and particle pictures of motion. It is not uncomplimentary to say that this book itself is a pretty thick piece of undergrowth, with nearly five hundred pages of dense but controlled mathematics and a hundred pages of appendices. It is clear however that the author wants to encourage the reader to hack through the algebraic bracken, a task lightened by the inclusion of very carefully constructed exercise sets at the end of each chapter. These have no doubt been honed by use in the accompanying course at the author's home institution in San Francisco for, like those pottery shards, they seem to say 'study me carefully, learn, and then move on'. I suspect very few UK universities would run a graduate course with the coverage of this book although a suggested syllabus occupying about a semester is listed at the book's website. My guess is that most readers will study it alone, so it would be nice to see worked solutions (or at least answers) to these exercises posted on the website.

This book will appeal to those with a legal insistence on proof and a real interest in using variational methods in developing new mechanical paradigms. However before suggesting reading it, I would send any student to Silvan Schweber's gripping article, 'Feynman and the visualization of space-time processes', from *Reviews of Modern Physics* (vol 58, no. 2 1986). The anarchic way that Feynman and Wheeler, inspired by a small remark in Dirac's *Principles of Quantum Mechanics*, set about rewriting quantum dynamics using an action principle should inspire Johns' intended reader on the long tour ahead. Toward the end of that tour, we have an all too brief summary of Hamilton-Jacobi theory, Feynman's method, quantum potentials and the like that I would happily have seen expanded at the expense of some of the longueurs in earlier, perhaps unnecessary, proofs.

This is not a book for those who need quickly to learn variational techniques (try *Classical Mechanics* by Kibble and Berkshire or *Analytical Mechanics* by Hand and Finch both of which adopt a practical approach aimed at physicists), or understand their historical development (where we have the peerless *The Variational Principles of Mechanics* by Lanczos). There are however good problems and interesting formulations of manifestly symmetric Lagrangians eg for relativistic mechanics: these arise from a general theme of the book outlining the theory of extended systems in which time is treated as an additional dynamical variable. Hopefully Oliver Johns will find his intended readers with this thoughtful book, and perhaps they can show us how to penetrate the ancient secret held in Gudea's distant gaze.

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October 2006

Assessing Skills and Practice

Subject area
General

Description
This text outlines how to ensure fair, consistent and reliable assessment of practical activities

Authors
Ruth Pickford and Sally Brown

Publishers/Suppliers
Routledge
(www.routledge.com)

Date/Edition
2006

ISBN
0-415-39399-X

Level
Teachers

Price
£22.99

Bill Muirhead,
University of Ontario Institute of Technology,
2000 Simcoe Street North,
Oshawa,
Ontario L1H7K4,
Canada
October 2006

Ms Ruth Pickford, CELT Institute for Enterprise at Leeds Metropolitan University and Ms Sally Brown, Pro Vice Chancellor at Leeds Metropolitan University have written an engaging and thought-provoking book concerning how faculty can consider best practices in assessing student learning. As the authors state in the introduction to their text, “students in higher education today are expected to demonstrate a wide-range of skills and abilities to show that they have mastered not only subject content but also the ability to put their learning into practice in real life contexts”.

Summary Review

range: * poor to ***** good

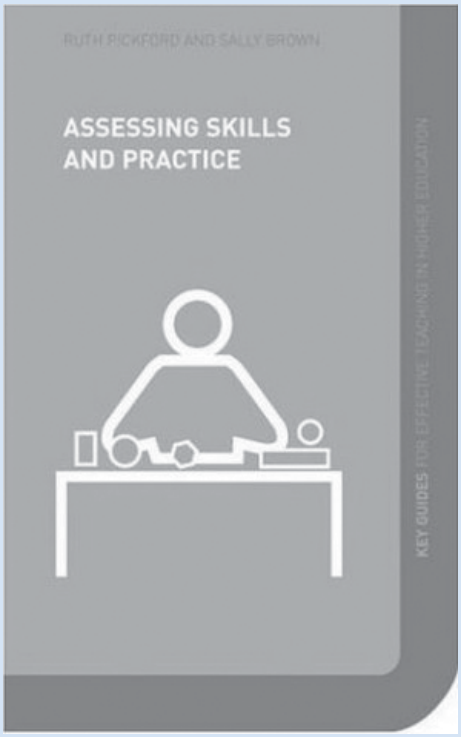
Academic content	****
Usefulness to student	*****
Usefulness to teacher	****
Meets objectives	****
Accuracy	*****

The requirement to broaden assessment practices from an emphasis on factual recall and demonstration of skills to assessment strategies which evaluate the application of skills is required in the first half of the 21st century. The requirement that learners can, upon completion of their studies, know and apply new skill sets (eg, team skills, problem-solving, evaluation of multiple resources and critical thinking) to contemporary situations presents faculty with challenges about how to conceptualise student evaluation. The authors state that for too long discussions of assessment have focused upon traditional practices around knowledge retention and skill acquisition from single or sequential testing opportunities. They move the discussion from how to assess, to the more fundamental and practical questions which include: ‘Why we assess?’, ‘What specific approaches can faculty employ to evaluate students?’, as well as considering, ‘What should higher education practitioners value and test for at the beginning of the 21st century?’

The authors point out that the introduction of communication and information technology (C&IT) continues to significantly affect the higher education sector. The availability of powerful personal computing devices as well as powerful software challenges time-honored notions of what knowledge students should possess and what they are expected to learn. The discourse raises this question: ‘Should assessment continue to be based upon the recall of factual knowledge or upon numerical problem-solving when new technologies facilitate students having ubiquitous access to rich online knowledge sources and computational computer-based tools?’ Questions about the summative vs formative evaluation are discussed in practical terms through the presentation of case studies which appear throughout the book. The use of case studies helps to illustrate the complex decisions that faculty must make about balancing assessment for grading with grading for feedback and learning. Rather than seeing this as an either/or choice, the authors focus upon how to develop multiple assessment criteria.

Assessment decisions are becoming more complex partly as a result of the growing diversity of the student population as well as the continuing expansion of higher education participation rates. Growing numbers of students with physical disabilities and learning disabilities require careful consideration about how to construct practices that can address the multiplicity of student needs. Also, the nature of the physical sciences and emerging pedagogies incorporating virtual experiences and the use of significant multimedia resources necessitate new approaches to assessing student learning.

Assessing Skills and Practice



From the publisher...

Assessing Skills and Practice

By Sally Brown, Ruth Pickford

Assessing Live and Practical Skills outlines how to ensure fair, consistent and reliable assessment of practical activities. With a particular focus on formative feedback and its role in helping students to understand what is required of them, this guide is packed with advice, examples and case studies covering the key areas, including:
- assessing across the arts, humanities and sciences – from labwork and clinical practice to dance
- assessing oral work
- using feedback
- ensuring inclusive and fair assessment.

This volume is an ideal introduction for new or part-time lecturers, and will also be valued by experienced teachers who are new to this area of assessment or who want to improve their current practice.

0-415-39399-X 160pp 2006 £22.99

Ruth Pickford and Sally Brown make a valuable contribution in expanding instructors' understanding about new practices related to assessing how students acquire new knowledge. Considerations such as assessing oral presentations [Chapter 7], assessing the process of learning [Chapter 10], assessing practical skills [Chapter 2] and using assessment to foster independent learning skills [Chapter 5], are but four of the 12 chapters in this book. Each chapter presents both theoretical considerations as well as practical suggestions, using case studies, for considering how instructors can better plan assessment strategies to provide feedback to students while also gathering data which faculty can use to enhance their teaching practices.

One theme that runs throughout the text is the belief that assessment practices are value-driven and thus are fundamentally based on a faculty member's personal belief system. Ruth Pickford and Sally Brown use narrative case studies to illustrate that faculty members' decisions about assessment are grounded in their beliefs about how students learn, their beliefs and backgrounds within their academic disciplines, and their personal beliefs about higher education in general. Consequently, the authors suggest that faculty must engage in personal reflection about their decisions to utilise specific testing methods, assigning projects and papers, and whether assessing practical, theoretical as well as performance skills are legitimate means for gauging student comprehension.

In conclusion, the content associated with this slim volume is fortuitous because it will help faculty understand the complexities of assessment especially, at least in North America, where the retirement of many experienced faculty has resulted in hiring many new faculty members. New faculty require practical resources to help them plan their initial teaching experiences. This book will be widely used and valued by new and experienced faculty who will benefit from the wisdom of its authors about assessment and instructional practice.

Astrochemistry: from astronomy to astrobiology

Subject area
Astrochemistry

Description
An introductory text in astrochemistry, which would be most suitable for chemistry students taking an ancillary second year course in this topic

Authors
Andrew M Shaw

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

Date/Edition
2006/1st edition

ISBN
978-0-470-09137-1 (paperback)
978-0-470-09136-4 (hardback)

Level
Undergraduate

Price
£32.50 (paperback)
£80.00 (hardback)

Colin D Kennedy,
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September 2006

Summary Review

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

At a time when attracting students to read chemistry is becoming difficult, the introduction of attractive and academically relevant ancillary courses is to be welcomed. Such courses are aided by specifically written texts such as the one reviewed here.

This book is aimed mainly at undergraduate chemistry students. It is written in a relaxed but enthusiastic style. I am not aware of any recent comparable text. The unifying theme behind the 10 chapters is the origin of life. For each chapter, basic principles and methods are described and examples of the calculations often given. Chapters have summaries and final sets of problems with answers at the back of book. Appendices giving physical, astronomical and thermodynamic data provide information for the problems set. A glossary and a bibliography are provided. The book is well illustrated with diagrams and photographs and a set of colour plates.

Unfortunately there are more errors in the text than one would expect even for a first edition. More careful checking before going to press would have significantly improved the final product. The two web sites mentioned, one in the Preface and the other on the back cover, were not available, so I was unable to check for belated corrections. I list some of the errors found at the end of the review. The content and structure of the book are excellent and should engender a constructive curiosity among students.

I give below brief accounts of the chapter contents.

1. ‘The molecular universe’. This chapter provides an introduction to themes explored more fully later. There is a very brief account of the history of the universe from its origin to the formation of galaxies, stars and planets. The definition of life is discussed and theories as to its origin introduced.

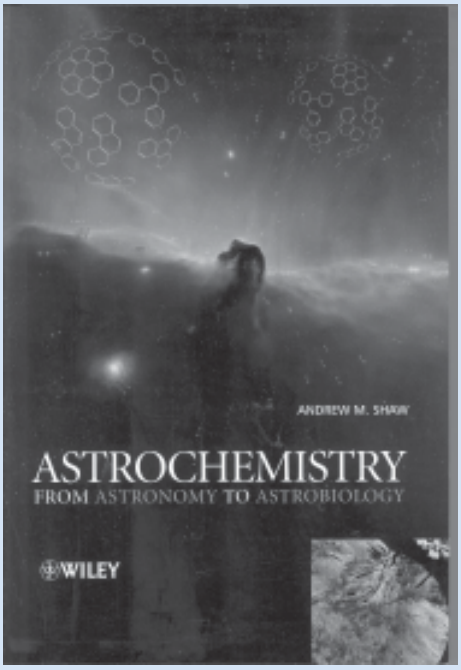
2. ‘Starlight, galaxies and clusters’. This is an account of elementary astronomy for students who are not majoring in the astronomical sciences. For some topics the coverage is very sparse indeed. Students whose main interest is in the chemistry of the cosmos should find adequate background here for their immediate needs.

3. ‘Atomic and molecular astronomy’. This chapter explains the basic principles and uses of spectroscopy for the study of atoms and molecules in space. Relevant techniques are well described and particular attention is paid to the use of microwave spectroscopy in identifying molecules in space.

4. ‘Stellar chemistry’. At an appropriate introductory level this chapter covers stellar classification, the H-R diagram, stellar evolution and the origin of the elements, stellar spectra, binary stars, Cepheid variables and black holes.

5. ‘The interstellar medium’. This fascinating chapter is one of the longest in the book and is concerned with the detection of molecules in the ISM and also considers the likely reaction mechanisms for their formation. Particular attention is paid to organic species thus linking with the ‘origin of life’ theme of the book.

Astrochemistry: from astronomy to astrobiology



From the publisher...

Astrochemistry: From Astronomy to Astrobiology

By Andrew M. Shaw

The dynamic field of astrochemistry brings together ideas of physics, astrophysics, biology and chemistry to the study of molecules between stars, around stars and on planets. Astrochemistry: from Astronomy to Astrobiology provides a clear and concise introduction to this rapidly evolving multidisciplinary subject. Starting with the Molecular Universe, the text covers the formation of the elements, simple models of stars and their classification. It then moves on to draw on the theme of the Origins of Life to study interstellar chemistry, meteorite and comet chemistry as well as the chemistry of planets. Prebiotic chemistry and astrobiology are explored by examining the extremes of the biosphere on Earth, seeing how this may be applied to life in other solar systems.

0-470-09137-1 352pp 2006 £32.50

6. 'Meteorite and comet chemistry'. The classification and chemical analysis of meteorites is described, particularly for the carbonaceous chondrites, and more recent techniques such as by microprobe laser desorption studies explained. There is a consideration of the possible interplanetary transfer of organic material. In the section on comets the wide range of compounds found and their physical environments is discussed.

7. 'Planetary chemistry'. The physical nature of the Earth is described and compared with other planets. The formation of the Earth-Moon system is discussed. The concept of a habitable zone for planetary systems is explained. Much of this chapter is concerned with the physics and chemistry of planetary atmospheres, largely centred on that of the Earth.

8. 'Prebiotic chemistry'. After a brief review of possible solvents for life processes, there is an account of the uses of thermodynamics and chemical kinetics in predicting the possible chemical constituents in various physical environments. Ideas about the prebiotic atmosphere of the Earth are described and possible mechanisms for the formation of molecules having biological significance considered. The exogenous delivery of organic molecules to the planets and possible mechanisms for the origin of chirality are discussed. There are short discussions on the role of surface catalysis by clay minerals, the chemical environment of geothermal vents and the RNA world hypothesis.

9. 'Primitive life forms'. Having recognised that life on Earth might prejudice our views as to its likely progress elsewhere, the author considers various physicochemical processes that are likely steps on the route to life. Recent thoughts on nanobacteria and the minimal viable genome are introduced. The author discusses whether organisms similar to some known extremophyle bacteria might be viable elsewhere in the solar system.

10. 'Titan'. The final chapter explores the physics and chemistry of Titan as revealed by satellite observatories and space probes, including the ongoing Cassini-Huygens mission. Mechanisms for the origin of the mainly nitrogen atmosphere are described. The importance of photon and cosmic ray induced reactions, and the prevalence of free radical chemistry under the low temperature conditions of the Titan atmosphere are demonstrated. The possibility of organisms adapted to these conditions is considered.

Continued on page 8

Astrochemistry: from astronomy to astrobiology

Continued from page 7

Errors and other points

In the list below, the first number is the page number, the second the line number. If counting from the bottom of the page, the line number is followed by a 'b'.

18, 10, b: Wrong value for Planck's constant, h.

20, 3, b: 'the Sun towards the centre of...'. I think 'the Sun around the centre of...' is intended.

29, 6, b: 'in the same galaxy' is correct, but is 'in the same star cluster' intended?

31, 10: 'These objects are galaxies' would be more accurate as 'Some of these objects are galaxies'.

34, 2: '(or the equivalent unit s^{-1})'. The equivalent unit is about 2.4 x 10^{-18} s^{-1} not 23 s^{-1}.

35, 10, b: 'the halo of globular clusters…'. I think that 'the' here should be 'its'. Also globular clusters make up only a small fraction of the stars within the halo.

43, 15: 'transmission' should be 'transmittance' or 'transmission coefficient'.

44, 14-15: Young's double-slit experiment was carried out with light not electrons.

46, 15: In Equation 3.7, I believe 'h' should be the h-bar symbol equal to h/2ð.

48, 10, b: 'same speed' should be 'same angular velocity' and 'similarly on Earth' should be 'as on Earth'.

52, 11, b: 'regions of the atmosphere' should be 'regions of the electromagnetic spectrum'.

62, Example 3.4: Converting to frequency from B = 6.55 cm^{-1} gives B = 196.5 GHz not 1.96364 Hz. Putting this corrected value for B into Equation 3.22 yields the given value for I.

64, Last equation on this page and after the second equals sign: the ratio of moments of inertia is upside down. This would affect the working on page 65.

71, Example 3.6: Planck's constant is missing in the term between the two equals signs in the second equation.

73: The second term in Equation 3.31 should be multiplied by Planck's constant, h. Also 'x_e', the anharmonicity constant, is not defined.

94, 12: 200 years!?

98, 1-3: 'old stars from the primordial explosion'. These would be Population III stars, containing only elements formed in the Big Bang. As yet they have not been observed. Globular clusters contain mainly Population II stars, generally old and metal poor, but not primordial.

107, First line after Equation 4.13: R_S is in metres not kilometres here if the terms in Equation 4.13 are SI.

146, 7: 'observed mass in the Universe'? Should this be 'observed mass of GMCs in the Galaxy'?

203, 10: The expression for F_{Earth} should be L/4ð(1.5 x 10^{11})^2 where L (not F) is the luminosity of the Sun. The value given for F_{Earth} is correct. Using F here would be confusing as it is already defined by Equation 7.4. In fact L = 4ðR^2F, where R is the radius of the Sun.

210: In the line following Equation 7.8, 'M' should be the mass of the planet's atmosphere not the mass of the planet. A similar error occurs in the first line on page 211.

217, Equation 7.18: The $[O_3]$/[O] ratio should not appear on the right hand side of the final equation.

227, 9-12, b: The internal energy of a system is the total potential plus kinetic energy of the system.

227, Equation 8.2: I think the equation is correct if 'dH – TdS' is omitted. Also applies to Equation 8.6.

228, 2: 'exoergic' should be 'exergonic'

229, Equation 8.8: I think there should be a '$\sum_i$' after the summation sign and before 'ln'.

230: In the sentence after Equation 8.13, free energy changes not enthalpy changes are intended here.

230, 15, b: 'ozone' should be 'oxygen'.

231, Equation 8.17: I think the subscript 'eq' should be omitted.

250, 3, b: 'the amino acid adenylate'? Is this correct?

259, 8: 'high pH' should be 'low pH'.

273, 9, b: 'no cell membranes'. I think 'no internal compartments' is intended.

279, Figure 9.12: Errors in labelling of both axes.

279, Figure 9.13: Equation 4 not balanced.

321, Appendix B: The surface temperatures seem to be in Kelvin not Fahrenheit as stated.

Basic Concepts of Environmental Chemistry

Subject area
Environmental Chemistry

Description
The text covers the fundamental concepts and main theoretical principles of environmental chemistry

Authors
Des Connell

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

Date/Edition
2005

ISBN
1-56670-676-9

Level
Undergraduate

Price
£29.95

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

A first glance at the table of contents of the book, **Basic Concepts of Environmental Chemistry**, suggests a comprehensive but manageable coverage of the fundamental concepts and main theoretical principles of environmental chemistry. The book is divided into 18 chapters sectioned into five main parts ('Principles of environmental chemistry'; 'Basic properties of chemicals in the environment'; 'Contaminants in the environment'; 'Processes in the natural environment'; 'Management of hazardous chemicals'). Each chapter is shown to be helpfully summarised in key points supported by end of chapter question and answer sets.

Skimming over the book, however, the lack of photography and colour images gives rise to immediate surprise, especially for an environmental chemistry text also aimed at the undergraduate science student population. It could be argued that the rudimentary black and white sketches, diagrams and line graphs fulfil their purpose of aiding visualisation of molecular structure or concentration trends without distracting the novice chemist from key points of the text. Upon closer inspection, the many inconsistencies and mistakes within the figures throughout beg a reason for even including them in the first place.

In Figure 2.7 the partial negative charge sits on hydrogen; Table 5.4 shows the structure of 2-methyl hexane instead of 2-methyl pentane; page 212 displays sodium in a covalent bond to oxygen in soap and further down the page in an ionic bond. The inconsistent use of font, size and style in the structural drawings overall distracts further and leads to confusion for the undergraduate reader (eg, compare benzene in Table 5.4 and Figure 5.1). Anthracene (eg, compare Figure 9.1 and 9.2) appears with and without double bonds, while the bonds in cyclohexane in Table 5.4 are of unequal length. Seemingly minor flaws such as these would have easily been overlooked were there not so many of them. Table 13.2 lists temperatures without units, the alcoholic oxygen atom in Figure 2.8 has no partial charge, a double bond to carbon is misrepresented as two single bonds to carbon and hydrogen in a fulvic acid component in Figure 13.6, and a numeric zero sits within a molecular chain where an oxygen atom belongs (p. 151, bottom condensation polymer), etc.

The failure to supplement a section (17.3) about absorption spectrophotometry and chromatography with colour photography stands out particularly unfavourably, as do the persistent references throughout to outdated statistics (eg, US detergent consumption in 1994, Fig. 10.1, p. 209) and antiquated literature in a recently updated (2005) publication. Why the author fails to include a complete periodic table of the elements, glossary and relevant web resources in the new edition of his book is equally hard to excuse.

Even while focusing on the content of the written text the reader feels strained to overlook spelling mistakes (beginning on p. 28 with 'charcteristic' if one ignores 'valves' rather than 'values' in Figure 2.5 on p. 25). Clumsy introductions to new topics followed by patchy explanations characterise the first four chapters in particular. Organic compounds such as alcohols and ketones are mentioned in early chapters but not defined until Chapter 5. Similarly, descriptive terms like abiotic, aerobic, redox,

Continued on page 10

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October 2006

Basic Concepts of Environmental Chemistry

Continued from page 9

heterotrophic, xenobiotic are used before their definitions (but not always) unhelpfully follow chapters later on. Why in Ch. 5 the author refers to Ch. 2 for a closer explanation of the solubility differences between benzene and n-hexane when neither finds notable mention there either, leaves the reader guessing. Later on the chapter about soaps and detergents (Ch. 10) would have been better placed after the chapter about chemistry of water and water pollution (Ch. 13).

In the very few instances where chemistry is put into relevant and topical context one can't help but notice the author's tendency to downplay or simply omit serious environmental consequences of poor past and even present practice. The chapter about dioxins (Ch. 8) fails to make note of the Bhopal incident (1984) entirely and while the Nobel Prize awarded to the creator of pesticides (Mueller in 1948) is heralded, no mention of the same distinction, albeit 20 years late, is found of the chemists Molino and Rowland who in 1974 accurately modelled and predicted the depletion of the ozone layer by CFCs. This omission, however, isn't as apparent as ozone depletion failing to appear in more than one sentence altogether in which only potential environmental effects are alluded to. Surely the Australian author is aware of the world's highest skin cancer rate in Australia?

One can't help but wonder as well if the author is familiar enough with the book, *Silent Spring*, by Rachel Carson which he makes reference to in Chapter 8 ('Pesticides'). In it Carson not merely "raises possible ecological problems" of DDT as the author suggests but she rather diligently lists and documents case after case of mass poisoning and species decimation at the hands of indiscriminate and careless pest control measures in the United States in the 1940s and 50s (eg, fire ant eradication programme using dieldrin and heptachlor that killed 90% of the songbird population and contaminated the groundwater in treated southern states).

Overall it proves hard to ignore the stylistic inconsistencies, grammatical flaws, poor quality graphics, often unhelpful explanations and confusing arrangement of topics, which makes it difficult to capture even tentative positive features of the book.

These however could be said to reside toward the end of part IV. Ch 14 ('Soil contamination') and Ch 16 ('Genotoxicity') in particular provide an interesting and accurate read with a fair amount of relevant examples and case studies to underpin presented compound reactions or characteristics. Finally the last chapter of the book (part V), Ch 18 'Human health and ecological risk assessment', encouragingly contributes a practical example of adults exposed to dieldrin in soil to demonstrate exposure assessment, but unfortunately the author neither reminds (from Ch. 8) of the nature of the toxicity of this chlorohydrocarbon nor includes a real case study and as such fails to give the exposure assessment example meaningful relevance. Quite coincidently, Rachel Carson's insecticide data which includes measured levels of dieldrin in contaminated cow's milk subsequently fed to small children would have easily served the purpose.

The otherwise comprehensive account of dose-response relationships, ecological risk assessment and ecotoxicology falls short, as so many times before in previous chapters, of selected examples that would easily have demonstrated and/or clarified the effects of toxicant discharge, decreased biodiversity and nature of laboratory tests to model both. Unsurprisingly at this point in the book the author mentions the "unintentional, and often unplanned, risks [.....] involved in the disposal of waste chemical products" which appears worryingly unbalanced in the light of past and current environmental injustice cases worldwide bringing to light deliberations of hazardous waste facility and municipal landfill managements to position their operations in the poorest and most powerless of communities.

In summary, **Basic Concepts of Environmental Chemistry** does not deliver what it promises in the preface. Students reading the book most certainly will need more than a basic understanding of chemistry and only armed with a vivid imagination will they manage to associate presented concepts and processes to the natural environment around them. Even supported by a committed tutor for ironing out the inconsistencies and for filling the gaps with relevant case study examples and web-based tools such as NASA's ozone spectrometer or carbon dioxide emissions calculator, the book doesn't attract an audience to whom it could be recommended.

Chaos and Time-Series Analysis

Subject area
Mathematics, Physics

Description
The subject of this book is the detection and characterisation of chaos in dynamical systems, based on measurements of the system state as a function of time. It is intended for a physics course for either advanced undergraduates or graduate students

Authors
Julien Clinton Sprott

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

Date/Edition
2003

ISBN
978-0-19-850840-3

Level
Undergraduate, research

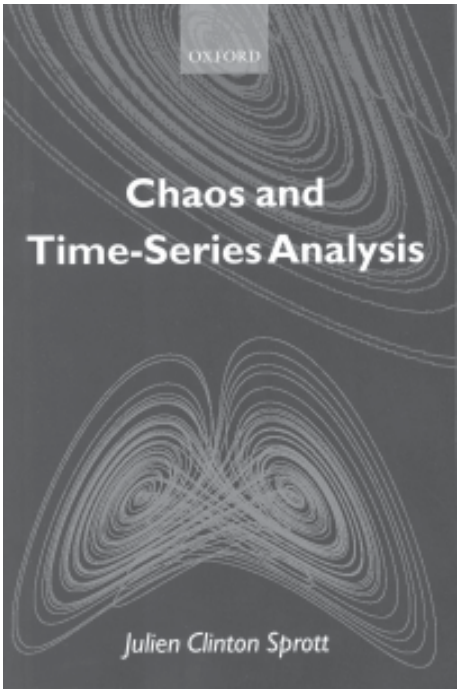
Price
£31.00

The author of this book, an introduction to developments in chaos and related topics in nonlinear dynamics, has employed a practical point of view, presenting the concepts clearly and providing the appropriate mathematics when needed.

It is intended for advanced undergraduates or graduate students or for researchers interested in an introduction to this field.

Summary Review

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



The 15 chapters cover the following topics: ‘Introduction’, ‘One-dimensional maps’, ‘Nonchaotic multi-dimensional flows’, ‘Dynamical systems theory’, ‘Lyapunov exponents’, ‘Strange attractors’, ‘Bifurcations’, ‘Hamiltonian chaos’, ‘Time-series properties’, ‘Nonlinear prediction and noise reduction’, ‘Fractals’, ‘Calculation of the fractal dimension’, ‘Fractal measure and multifractals’, ‘Nonchaotic fractal sets’, and ‘Spatiotemporal chaos and complexity’. Also, there are three wonderful appendices.

The later chapters attempt to compress too many topics. For instance, the treatment of spatiotemporal chaos and complexity in the final chapter is a bit superficial. But, as a whole, this book is a wonderful introduction to the subject. It provides a good foundation in almost all aspects of dynamical systems theory. For those with a minimal mathematical background, the explanations and support material will be enough. The explanations are clear, and cover almost all related aspects of each subject.

An additional resource is the website:
http://sprott.physics.wisc.edu/chaostsa/
that is being updated regularly and that provides the student with complementary material.

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Spain
September 2006

Crystals and Crystal Structures

Subject area
Crystallography

Description
An introductory text for students and others who need to understand the subject without necessarily becoming crystallographers

Authors
Richard J D Tilley

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

Date/Edition
2006

ISBN
0-470-01821-6

Level
Undergraduate

Price
£32.50

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October 2006

From the outset this book provides a clear introduction to crystal structures. The author has obviously tried to provide a text that does not overpower the reader with extensive mathematics. Where it is required it is used clearly and is not confusing – this can be difficult particularly when explaining reciprocal space.

Summary Review

range: * poor to ***** good

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

At the beginning of each chapter there is a paragraph which provides some questions that it is hoped the chapter will answer, indeed at the end of the chapter an answer is given to each question asked. This is a valuable teaching/reading aid as it allows the pertinent points in each chapter to be isolated and understood. The provision of abundant figures is very useful in explaining a great deal of the ideas outlined in the text, in some cases it provides the missing information for a purely text based explanation. To use the example of reciprocal space the images provide that extra bit of information that helps make the generation of the reciprocal lattice easier.

The explanation of symmetry is a bit 'non-standard' but in this case it works. The explanation for two-dimensional symmetry provides information that in the majority of cases is overlooked or explained poorly, this book provides simple images that are then expanded upon later. This information is then expanded upon to three-dimensions where chirality and polarity in crystals are introduced, both areas that are important in modern research.

Diffraction theory is introduced using reciprocal space as a basis, starting with Bragg's law and then moving to the Ewald sphere, here the derivation is clear and concise. It should be noted that single crystal X-ray diffraction, transmission electron microscopy and X-ray powder diffraction are explained using the same basic terminology, this is very useful as it means you do not have to convert between 'languages'. The determination of structures from crystals is explained clearly, starting from the generation of the structure factor to solving the phase issue.

The final section on quasicrystal, modulated structures and defects is interesting and provides information that many of the classical texts overlook. The determination that quasicrystals can have 5-fold symmetry – thus breaking classical symmetry, allows a student to understand that crystallography is not a yet a complete science. If you factor in the existence of modulated (incommensurate) structures that can have supercells > 5, while at the same time giving indications of a much smaller unit cell, the possibilities of solving new and important crystal structures hopefully will show that crystallography is not a complete science.

Overall I can recommend this book for anybody teaching crystallography to undergraduates, while at the same time providing a refresher/back-up for those who use crystallography in their research.

Environmental Chemistry at a Glance

Subject area
Environmental Chemistry

Description
This book illustrates both the operation of chemical processes in the environment and their integration with physical and biological processes. While the emphasis is on environmental chemical processes, the text is placed in the context of the physical and biological sciences, giving an integrated approach to the environment from a chemist's point of view

Authors
I Pulford and H Flowers

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

Date/Edition
2006/1st Edition

ISBN
1-4051-3532-8

Level
Undergraduate

Price
£17.99

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September 2006

Summary Review

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

This book forms part of a series of 'At a Glance' texts that follow the 'bite size' approach used successfully in many revision guides at GCSE and A-levels and applies this to introductory degree level chemistry (and some other science) topics. This approach serves as both the book's main strength and weakness. Its main strength is the breadth of topics (over 50) covered from straightforward environmental chemical topics such as pH and buffering, to other 'contextualising' topics which include essential environmental issues such as global atmospheric and marine processes. The weakness though is that these topics are only given a brief overview with no room for depth or discussion. Each topic is typically covered in 2 pages and whilst the key aspects of the topic are articulated clearly and concisely there is no room for the student to further develop ideas and concepts. This means that whilst the lecturer can recommend the text to summarise concepts, the student may need additional material found to offer more depth. The addition of 2-3 key references at the end of each topic would go a long way to addressing this issue.

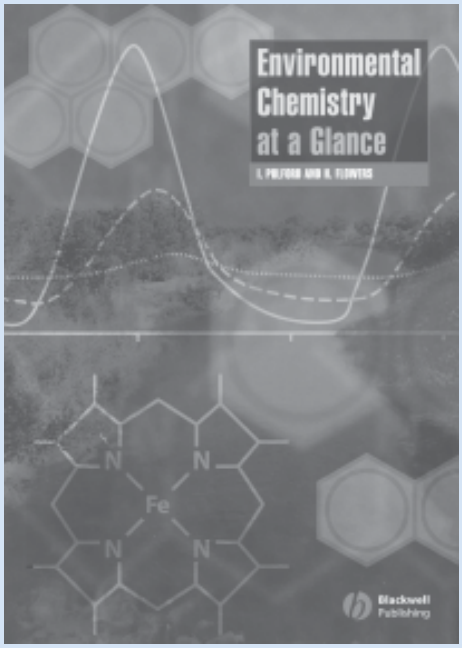
The book is well organised and laid out, with simple and straightforward navigation around the topics. The authors have used a clear and concise descriptive approach, keeping formulae to a minimum, although using chemical equations frequently where necessary. In this the authors have assumed a typical 1st year undergraduate's knowledge of chemistry, but the book does not cover some of the basic chemistry concepts that other introductory environmental chemistry books often include. The text is assisted by the presence of many summary tables and simple clear black and white diagrams that work well within the book's context.

The material within the text is particularly strong when relating to the 'physical earth' processes with several sections devoted to soils, sediments, and biogeochemical cycles; and related pollution topics such as contaminated land and pesticide use. As a study of the environment tends to require a holistic approach, within these sections the authors can be congratulated on clearly showing the links between chemistry and the physical and biological environmental processes, whilst maintaining a chemical focus. The authors also clearly demonstrate the wider environmental significance of these chemical processes.

Conversely atmospheric processes are not given the same breadth of coverage so whilst processes such as global scale climatic movement, and global warming are included there is little/no material on urban scale air pollutants such as photochemical smog. I would also have expected at least one topic to consider power generation given its importance in current environmental thinking.

Continued on page 14

Environmental Chemistry at a Glance



From the publisher...

Environmental Chemistry at a Glance

By Ian Pulford (Lecturer, Department of Chemistry, University of Glasgow) and Hugh Flowers (Lecturer, Department of Chemistry, University of Glasgow)

Environmental Chemistry at a Glance illustrates both the operation of chemical processes in the environment and their integration with physical and biological processes. While the emphasis is on environmental chemical processes, the material in the book is placed in the wider context of the physical and biological sciences, giving an integrated approach to the environment from a chemist's point of view and providing background information in these other disciplines for the environmental chemist.

1-4051-3532-8 144pp 2006 £17.99

Continued from page 13

Whilst some students (and lecturers) may require a little more depth in the subjects covered by the book, this text acts as a good revision guide and summary text particularly for those environmental chemistry courses which take a strong 'earth science' focus. However for the student who requires more depth there are several slightly more expensive alternative books on the market, such as texts by Williams[1] or O'Neill[2] that cover similar material, but with more case studies and depth. However given that the text is priced very competitively, in these circumstances the book should prove popular with students.

References

1. Williams, Ian, *Environmental Chemistry* John Wiley and Sons, UK (2001).
2. O'Neill, Peter, *Environmental Chemistry* 3rd Edition Blackie Academic and Professional, UK (1998).

Essentials of Organic Chemistry: for students of pharmacy, medicinal chemistry & biological chemistry

Subject area
Organic Chemistry

Description
This text is designed to provide fundamental chemical principles and focuses on key elements of organic chemistry illustrated with pharmaceutical and biochemical examples

Authors
Paul M Dewick

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

Date/Edition
2006

ISBN
0-470-01666-3

Level
Undergraduate

Price
£34.95

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October 2006

Essentials of Organic Chemistry covers not only basic organic chemistry theory but emphasises biochemistry through the organic chemistry mechanisms of biological processes. The author presents the fundamental chemical principles illustrated by several good examples and the most relevant and essential material to understand biological molecules.

Summary Review

range: * poor to ***** good

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

The book does not introduce organic chemistry theory in the traditional way, with nomenclature, functional groups, reactivity and most typical reactions. Dr. Dewick introduces this topic with the focus on undergraduate students from pharmacy, medicinal and biological chemistry beginning with a (review of) nomenclature and functional groups in the first chapter, called 'Molecular Presentations and Nomenclature'. In a sequence the author moves straight from the well constructed initial chapters on molecular orbitals and stereochemistry to one of the most interesting parts of chemistry: reactivity. He presents all the examples and even the theory with the main focus on the bio-organic molecules and then finishes with biochemistry.

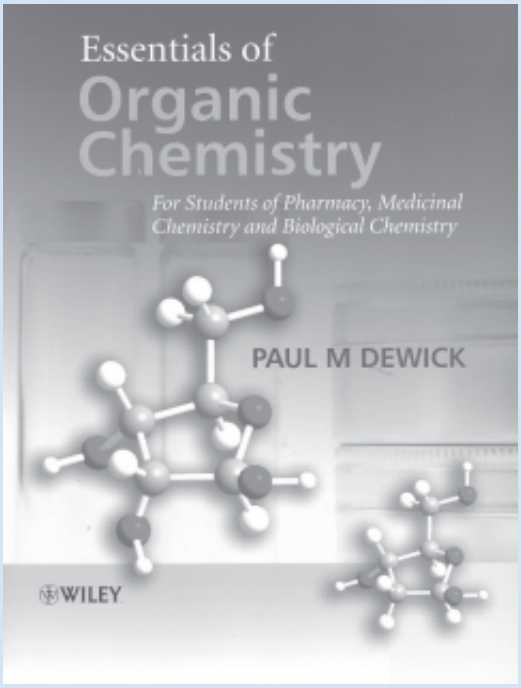
The book is clearly divided into three parts: 'Introductory Aspects', 'Organic Chemistry Reactions' and 'Biochemistry'. The first part shows, after the initial chapter, 'Atomic Structure and Bonding'; 'Stereochemistry' and 'Acids and Bases'. After that are the six chapters: 'Reaction Mechanisms'; 'Nucleophilic Reactions: nucleophilic substitution'; 'Nucleophilic reactions of carbonyl groups'; 'Electrophilic Reactions'; 'Radical Reactions'; and 'Nucleophilic Reactions involving enolate anions'. The eleventh chapter highlights some important features of 'Heterocycles', including some specific syntheses. The next chapters demonstrate extensive topics that are almost exclusively from biochemistry books and very rarely seen in organic chemistry books: 'Carbohydrates'; 'Amino acids', 'Peptides and Proteins'; 'Nucleosides, nucleotides and nucleic acids'; and 'The Organic Chemistry of Intermediary Metabolism'.

Atomic and molecular orbitals and hybridisation, usually difficult topics for students, are clearly explained. It is deliberately oriented to conjugation, leading the reader to aromaticity. The several boxes of examples at the middle of the chapters are very useful to demonstrate the biological application of the chemistry topic studied, like the importance of the hydrogen bonds to the DNA molecule and the correlation between the ð electron systems from carotenoids and the vision mechanism.

From the 610 pages of the book, there are 64 pages dedicated to stereochemistry in which a lot of illustrations will help the students to view the 3D molecules and prepare them for the mechanistic approach that will come next. After the initial theory, a chapter on acids and bases makes the first look at the reactivity of the organic molecules. It is followed by an introduction to the most common mechanisms then proceeds with a very short view at kinetics, thermodynamics, bond polarity and an explanation of the several different arrows used to show electron movement and reaction equilibrium. At the end of this chapter, an interesting explanation shows some mechanisms and the common mistakes made by students

Continued on page 16

Essentials of Organic Chemistry: for students of pharmacy, medicinal chemistry & biological chemistry



From the publisher...

Essentials of Organic Chemistry: For Students of Pharmacy, Medicinal Chemistry and Biological Chemistry

By Paul M. Dewick

Essentials of Organic Chemistry is an accessible introduction to the subject for students of Pharmacy, Medicinal Chemistry and Biological Chemistry. Designed to provide a thorough grounding in fundamental chemical principles, the book focuses on key elements of organic chemistry and carefully chosen material is illustrated with the extensive use of pharmaceutical and biochemical examples.

0-470-01666-3 710pp 2006 £34.95

Continued from page 15

that try to write then. It is certainly a very didactic approach that is not usually observed in general textbooks.

From the sixth chapter to the end of the book, even for the biomolecules and metabolism chapters, mechanism will be the centre of the theory. Nucleophilic, electrophilic and radical mechanism reactions are well explained. They are followed by heterocycles and some specific chapters on biochemistry molecules.

This structure appears to be very functional for the study of the biological sciences and chemistry but sometimes it is not successful. Most of the connection between biochemistry and organic chemistry is made by enzymatic mechanisms examples, eg the Sarin gas activity on acetylcholinesterases or the transesterification from aspirin to COX that inhibits pain and inflammation. It would be very interesting if the concept of the 'serine residue' and the theory of enzymes had already been explained, which will not occur until one of the last chapters. Several example boxes have this problem; they make a reference to a theory from the next chapters. Also, the excessively mechanistic approach to the metabolism of the Glycolysis and the Krebs cycle is too fragmented and it is really difficult to understand the whole picture of these processes. The nonexistence of references and especially end-of-chapter exercises leave the students without a second point of view from the topics presented. The last chapter is full of exercises but they are very confused, since they are designed for the student that has finished several chapters of study.

Finally, the book is a very good experience of an organic chemistry mechanistic approach to the study of biochemistry but it could be improved for the next edition.

Evolution of Stars and Stellar Populations

Subject area
Astrophysics

Description
A detailed, essentially descriptive, survey of stellar evolution theory and its application to stellar populations

Authors
M Salaris and S Cassisi

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

Date/Edition
2005/1st edition

ISBN
0-470-09220-3

Level
Undergraduate, research

Price
£32.50

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

Galaxies are made visible (close to the optical waveband) by the large numbers of stars they contain. The visible global properties of a galaxy are simply a composite of the properties of these individual stars. However stars of different mass and composition evolve in quite diverse ways and only relatively close galaxies can be resolved into stars and stellar populations. As a result quite subtle modelling must be undertaken to deduce the relative numbers and types of stellar inhabitants within individual galaxies: this book takes a timely look at the physics underlying this census. The bulk of the book is taken up with a discussion of stellar evolution but the last four chapters address the way in which composite populations evolve and their observational fingerprints.

The jacket suggests this book would be useful for undergraduates but there are caveats here. This is a field where, even without consulting original papers and possibly even afterwards, one has to take a lot on trust. The coverage of the evolution of stars, after the customary preamble into the equations of state, mechanical equilibrium and radiative transfer, is pre-dominantly descriptive. The difficulty in incorporating this later material into undergraduate courses is the lack of relevant numerical exercises - indeed there are no problems in this book. Many universities tackle the physics of stars at this level but good texts (eg Phillips' *The Physics of Stars* and Prialnik's *An Introduction to the Theory of Stellar Structure and Evolution*) already exist. So I suspect the likely readership of this book will be graduate students and researchers.

They will find this book a useful resource - I wished I'd appreciated Figure 11.1 as a graduate student, showing the way in which the light from a galaxy depends so markedly on different evolutionary phases of its constituent stars. I also appreciated the nice discussions of resolved and unresolved stellar populations in the later chapters. Future editions will no doubt be able to talk more about chemodynamics - the way in which the composite dynamical families within the galaxy, mergers and accretion affect chemical tracers such as abundance gradients. There is also likely to be much progress made in understanding the impact of Population III stars on the early chemical evolution of the galaxy, a topic hardly mentioned here. There are the usual editorial slips that might be expected in a first edition, but some are more serious. In the discussion of opacity in section 3.1.4, the averaging process is subtly changed mid-page, which might lead to a lot of head-scratching for the unwary. Equally, the hydrostatic equilibrium radius of a white dwarf with non-relativistic degeneracy is not inversely proportional to its mass, as we are told after (the correct) equation 7.5. Curiously, a topic that does lend itself to questions at an undergraduate level, simple chemical evolution models, is sketched only lightly. Readers will find however plenty to interest them on this topic in Pagel's distillation of a lifetime's inquiry, *Nucleosynthesis and Chemical Evolution of Galaxies*, a monograph that passes surprisingly unreferenced here.

However it would be wrong for such comments to take away from the considerable achievement of collecting many fascinating and useful graphs and figures in one place. With beautiful datasets, such as those from the Sloan Digital Sky Survey, now making modelling of local galaxy populations both credible and startling, books in this field will be increasingly useful.

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October 2006

Fluorine in Organic Chemistry

Subject area
Organic Chemistry

Description
A reference work on Organic Fluorine Chemistry

Authors
Richard D Chambers

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

Date/Edition
2004

ISBN
1-4051-0787-1

Level
Research

Price
£105.00

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

A long time ago, in the 1980s, I was a research student at the University of London at the no longer extant Bedford College in Regent's Park. My project was concerned with various aspects of organo-fluorine chemistry and one of the most valued texts in my small personal collection of books related to the subject, was an earlier version of the book being reviewed here. I was, therefore, quite eager to see this new edition of a text which was originally published in 1973!

This new book, like the original, explores the topic of 'Fluorine in Organic Chemistry' from a number of viewpoints; each covered with an admirably adept combination of comprehensiveness with concision. The language is beautifully clear throughout, if one assumes the reader has the relevant vocabulary and prior knowledge, which is of course a pre-requisite with a book aimed at this level. It will be accessible to anyone having successfully completed degree level training in chemistry.

The book is divided into ten sections which follow the sequence:

Chapter 1 is a general discussion of organic fluorine chemistry and outlines: properties, history, industrial applications including biological, pharmaceutical and medicinal (anaesthetics, diagnostic imaging etc), surfactants, dyes. This chapter also looks at the electronic effects of the presence of fluorine in an organic molecule and considers the nomenclature of organo-fluorine compounds.

Chapter 2 covers the topic of preparing highly fluorinated compounds and the variety of different reagents and conditions which may be used in the production of per- and poly-fluorinated organic molecules. This chapter, along with all the others (but here of course it is particularly important) is well provided with references to the literature. Each reaction is clearly linked to a source of information where the necessary experimental details will be found. This chapter therefore provides a useful summary of synthetic techniques for highly fluorinated organic compounds.

Chapter 3 goes on to consider partial and selective fluorination of organic molecules. As with the previous chapter, a wide range of synthetically useful reagents is summarised with examples and clear references to the original literature. This chapter is an excellent source of ideas and information for anyone wishing to achieve a particular transformation involving the introduction of one or two fluorine atoms at specific locations within an organic molecule.

Chapter 4 moves on to the area of how the introduction of fluorine atoms into organic molecules may effect the chemistry of the resulting molecule in terms of steric effects, activation or de-activation of other reaction centres, strengths of acids and so on. It also discusses the perfluoroalkyl effect, fluorocarbocations, fluorocarbanions and fluoro radicals of various types.

Chapter 5 looks at nucleophilic displacement of halogens from fluorinated organic systems and Chapter 6 looks at elimination reactions.

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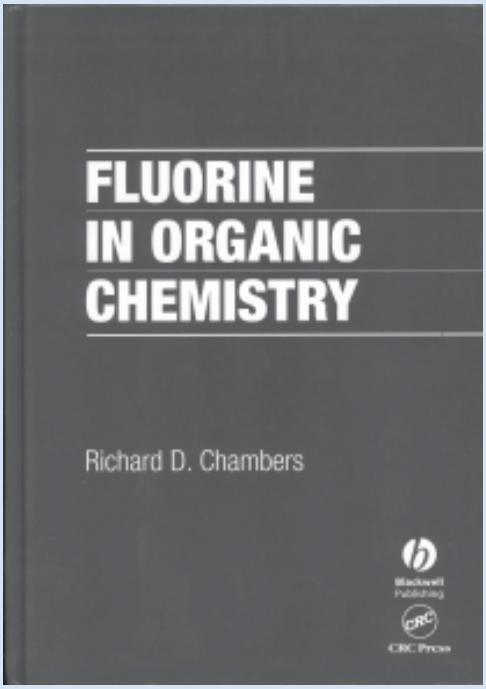
November 2006

Fluorine in Organic Chemistry



From the publisher...

Fluorine in Organic Chemistry

By Richard Chambers (Emeritus Professor, Department of Chemistry, University of Durham, UK)

In this new book the author, internationally known for his contribution to organic fluorine chemistry, covers both the preparative methodologies and chemical properties of partially and highly fluorinated organic systems. Written as an authoritative guide to the subject for organic chemists in universities and the pharmaceutical, agrochemical, specialty organic and polymer industries, the book will also be an important resource for university advanced courses.

1-4051-0787-1 424pp 2004 £105.00

Chapter 7 considers the perfluoro-alkanes, alkenes and alkynes in detail, in terms of structure, bonding, physical properties, synthesis and reactions; this is the area that most concerned me back in the 1980s!

Chapter 8 describes the chemistry of a variety of fluoro-organic compounds with functional groups containing oxygen, sulphur or nitrogen. A wide range of types of compounds is considered: carboxy compounds, alcohols, sulphides, amines and azo compounds to mention just a few.

Chapter 9 explores polyfluoroaromatic chemistry and Chapter 10 concludes the book by looking at the very interesting topic of fluorinated organometallic compounds.

This book is very well written and very attractively produced. The quality of production is also excellent with beautifully clear typeface (not too big, not too small) and excellent reproduction of reaction schemes. The references at the end of each chapter are well chosen, spanning the relevant chemical literature both in content and time.

Fluorine in Organic Chemistry is an essential addition to the library of anyone involved in the field but also to any university library as a standard reference on the topic. Most users are likely to employ the book as a reference and source of ideas but several of the chapters contain such a wealth of interesting chemistry that it would be a shame if they were not read in their entirety, for pleasure!

Fundamentals of Ceramics

Subject area
Materials Science

Description
This book provides an introduction to the structure and properties of ceramic materials

Authors
M W Barsoum

Publishers/Suppliers
Institute of Physics
(www.crcpress.com/default.asp)

Date/Edition
2003

ISBN
0-7503-0902-4

Level
Undergraduate, research

Price
£34.99

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London WC1E 6BT
October 2006

Summary Review

range: * poor to ***** good

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

Taking as a working definition of a ceramic a material that is not a metal, a semiconductor or a polymer, ceramics encompass an enormous range of both crystalline and amorphous materials. To the layman, a ceramic means a piece of pottery or an item of sanitary ware, and its important properties are moderate mechanical strength, water resistance, and hardness. What is so impressive, though, about ceramics is the range of properties they exhibit. They may be electrical insulators, forming key components in power lines or spark plugs, sufficiently conducting to be used as furnace heating elements, or high-temperature superconductors. They may be inert porcelain crucibles or catalytically active zeolites. They can be used in dense form as heat sinks for electronic components or in porous form as thermal insulators. What Professor Barsoum aims to present in **Fundamentals of Ceramics** is a description of ceramics from the atomic scale upwards which will explain what lies behind this richness of behaviour.

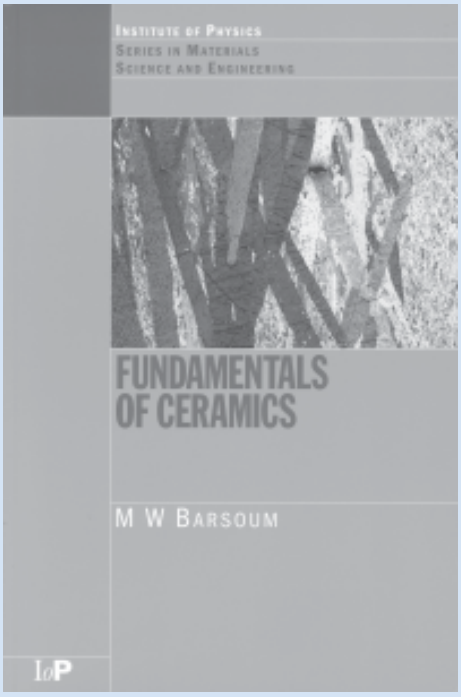
The bulk of the book is concerned with the structure and mechanical properties of ceramics. There are clear descriptions of the crystalline forms, defects and diffusion processes, as well as relevant thermodynamic and kinetic properties. Phase equilibria, glasses, and the evolution of structures through sintering and grain growth are covered at a good level of detail. The discussion of mechanical properties is rounded off with chapters on fast fracture and on creep and fatigue. The last quarter of the book discusses thermal, dielectric, magnetic and nonlinear dielectric, and optical properties. These are all rich fields in themselves, but the reader is given a good survey of the important effects.

The overall structure is well suited to use as a course text. As well as explaining the phenomena and the theories, the author gives practical details of how effects may be measured. There are summaries at the ends of chapters, and even separate summaries of the key points of longer sections within chapters. Worked examples are included, and there are problems for which numerical solutions are given where relevant. The suggestions for further reading are well chosen, and include a range of books, papers from the recent research literature, and collections of reprints of classic papers.

There is a lot of useful tabular material in the book. This is important: there is no point in providing detailed explanations of phenomena without giving students a grasp for how these manifest themselves. Although this is a book about ceramics, it would be useful in some of the tables to have some data for other materials for comparison. For example, the introductory chapter mentions the exciting machinable ternary carbides and nitrides, the so-called MAX phases, and says that they have electrical and thermal conductivities comparable to those of metals. It would be useful, then, to have some thermal conductivities for metals to compare with the figure given for Ti_3SiC_2 in table 13.3.

One of the author's aims was to derive as many as possible of the equations from first principles, and in many cases he does so, with some of the lengthier work being relegated to appendices. Sometimes the starting point and the assumptions of the model being solved are stated, the final result is given, but the intervening steps are explained in words.

Fundamentals of Ceramics



From the publisher...

Fundamentals of Ceramics

By M. W. Barsoum, Drexel University, Philadelphia, USA

Updated and improved, this revised edition of Michel Barsoum's classic text Fundamentals of Ceramics presents readers with an exceptionally clear and comprehensive introduction to ceramic science. Barsoum offers introductory coverage of ceramics, their structures, and properties, with a distinct emphasis on solid state physics and chemistry. Key equations are derived from first principles to ensure a thorough understanding of the concepts involved.

0-7503-0902-4 624pp 2002 £34.99

This is not always totally successful: for example, in discussing the Kronig Penney model of electronic structure (which is stated to be the same as the tight binding approximation, despite containing both tight-binding and free electron limits) a symbol E is introduced which does not appear in the original Schrödinger equation, it is not stated that the solution obtained is for the limit of a delta-function potential, and mention is made only of the continuity of the wave-function, not of the wave-function and its derivative, at boundaries.

In some places descriptions are oversimplified or slightly misleading. When discussing magnetic properties, it is stated that electronic angular momenta may lie at any angle to the magnetic field, and credit is given to Langevin for the derivation of the high-temperature susceptibility. As the derivation is not given, it would be better and no more complicated to describe this in terms of quantised directions and credit Brillouin. Sometimes the choice of words gives the wrong impression: discussing the transmission of light through a slab, mention is made of “multiple reflections at the various planes of the crystal”. To this reader, that suggested something to do with scattering by planes of atoms, whereas the reflections in question are from the surfaces of the slab. The description of the Fermi function in Section 7.3.3 is inadequate. Figure 7.11 plots the Fermi distribution for a fixed Fermi energy (the term Fermi energy is being used here, as in the book, as synonymous with chemical potential for electrons): it is useful to see the broadening of the change from occupation probability 1 to 0 as the temperature increases, to conclude that the graph shows that the Fermi energy does not change is to argue circularly. In fact, as is well known, the Fermi energy changes with temperature, quite slowly in metals but very significantly in semiconductors.

The material in **Fundamentals of Ceramics** covers most of what is needed to appreciate what these materials are and how they work, and as such it provides an excellent introduction, and would be a good accompaniment to a first course in materials science. The structural, mechanical and thermal features are treated well, but some caution is needed in the chapters on electronic and magnetic properties, as some of the oversimplifications made might need to be unlearnt in a more advanced course.

Gauge Theories in Particle Physics

Subject area
Particle Physics

Description
This two volume book is an accessible text for an undergraduate audience to introduce the gauge principle, and to sketch the theoretical foundations of the Standard Model of particle physics

Authors
I J R Aitchison and A J G Hey

Publishers/Suppliers
Institute of Physics
(www.crcpress.com/default.asp)

Date/Edition
3rd Edition

ISBN
0-7503-0864-8 (volume 1)
0-7503-0950-4 (volume 2)

Level
Undergraduate, research

Price
£34.99 each

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University of Warwick,
Coventry CV4 7AL
August 2006

Summary Review

range: * poor to ***** good

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

Previous editions of this work comfortably occupied the niche market of advanced undergraduate level, or basic graduate level study. By skipping over all but the rudiments of quantum field theory, the authors were able to extend relativistic quantum mechanics, to introduce the gauge principle, and to sketch the theoretical foundations of the Standard Model of particle physics, and to keep it all accessible to an undergraduate audience. Consequently, the book was a popular choice of recommended text, and found a large readership.

The fifteen or so years since the publication of the second edition have seen the Standard Model resiliently hold firm against increasingly precise experimental tests - notably in the electroweak sector. The authors claim that an appreciation of these results requires more understanding of quantum field theory (in particular, of loop contributions and hence of renormalisation) than the previous edition allowed, thus providing the motivation for a major revision of the text. To quote the introduction to the second volume, they key point seems to be to show that “Nature has indeed made use of the subtle intricacies of a renormalisable, spontaneously broken, non-Abelian chiral gauge theory.” This is undoubtedly a laudable ambition, and for the most part it is elegantly achieved.

However, it seems likely that undergraduate courses on gauge theory will find it difficult or impossible to extend their curricula to cover this additional material. On the other hand, graduate level courses may prefer yet more detailed treatments of field theory. Consequently, the revisions may have an adverse effect on the popularity of the book. Furthermore, if appreciation of the experimental results is the aim, then the discussion of QCD - being nonperturbative and hence comparatively unpredictive - is overlong. The treatment of QCD brings with it discussion of the renormalisation group and of lattice field theory, which are beyond the level of most graduate courses.

The authors state another aim of the latest edition: to ease the path into the subject by providing more background material. This is achieved through extended introductory chapters, and numerous (seventeen, over the two volumes) appendices. The reader is confronted with this dichotomy in Chapter 4, where the pleasingly gentle discussion of the preceding chapters ends abruptly and frequent appeals to the appendices, and to the problems, are invoked in order to revise relativistic quantum mechanics. A student would require a solid prior grounding in this material in order to get through this chapter unperturbed.

Having cleared that hurdle, the pace relents somewhat in a refreshing introduction to quantum field theory, which makes ample use of classical concepts such as the Lagrangian action and the simple harmonic oscillator. It is also pleasing to see reference made to applications in areas of physics other than particles. The new material on renormalisation is similarly readable. Meanwhile, in the second volume, an expanded discussion on non-Abelian symmetries is particularly helpful. The treatment of global symmetries (isospin and flavour SU(3)) in a separate chapter before the introduction of the local symmetries of the electroweak and QCD interactions illuminates this tricky material, which is expanded upon in the subsequent, concluding chapters.

Gauge Theories in Particle Physics

From the publisher...

Gauge Theories in Particle Physics

By I. J. R. Aitchison Oxford, UK
A. J. G. Hey Southampton University, UK

This is... the third edition of a successful text, now substantially enlarged and updated to reflect developments over the last decade in the curricula of university courses and in particle physics research. Volume I cover[s] relativistic quantum mechanics, electromagnetism as a gauge theory, and introductory quantum field theory, and end[s] with the formulation and application of quantum electrodynamics (QED), including renormalization. [The] second volume provides a complete, accessible, and self-contained introduction to the remaining two gauge theories of the standard model of particle physics: quantum chromodynamics (QCD) and the electroweak theory.

Vol I	*0-7503-0864-8*	*406pp*	*2002*	*£34.99*
Vol II	*0-7503-0950-4*	*466pp*	*2003*	*£34.99*

On the whole, the revisions to the book are clearly a success, and the reasons provided for making them are unarguable. Nevertheless, the feeling remains that the scope has expanded somewhat beyond much of the target audience. As for much how of the readership will be prepared to pay for both volumes remains to be seen.

Innovative Assessment in Higher Education

Subject area
General

Description
The book is made up of a collection of chapters written by different authors from around the world, giving their experiences and approaches to innovative assessment

Authors
Cordelia Bryan and Karen Clegg (Editors)

Publishers/Suppliers
Routledge
(www.routledge.com)

Date/Edition
2006

ISBN
0-415-35642-3

Level
Teachers

Price
£24.99

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

Picking this book up, the back cover says “More than a ‘how to do it’ manual, **Innovative Assessment in Higher Education** offers a unique mix of useful pragmatism and scholarship”. The book is made up of a collection of chapters written by different authors from around the world, giving their experiences and approaches to innovative assessment. From this, I would hope the book will give me a balanced overview of the topic since the book claims in the introduction that “a defining feature of this book which sets it apart from many other books on assessment is its conceptual framework”.

However I become a bit sceptical since the introduction starts with “Research of the last twenty years provides evidence.” yet no references are cited. A further ambiguity is when the introduction mentions the structure of the book and says how part II of the book relates to the “seven principles of good feedback” without explaining what they are. As a book aimed at informing the reader about innovative assessment I’m not initially convinced it will offer what it claims due to such unexplained statements and a couple of undefined acronyms. It also doesn’t state who the book is for. However, buried within the ‘Introduction’, it states:
“Can you honestly claim that your assessments: Enhance the student learning experience?; Provide useful and timely feedback?; Help students to understand and recognise quality?; Lead to improved performance?
If you have reservations about answering ‘yes’ to any of these questions, this book is for you.” I think if this statement was on the cover it would immediately grab the reader’s attention to the potential benefits of engaging with the book.

The first chapter by Gibbs was a good introduction to the ‘political’ issues that affect assessment (resources, increasing student numbers etc) but I thought it was strange that it ended in a conclusion that set the tone for the rest of the book. Given this context I felt this chapter would have been more suited to an introduction to set the scene for the book, rather than the actual introduction given, which I felt was somewhat confusing given the random references to themes and concepts which were not fully explained in my opinion.

Both the first and second author contributors make reference to later chapters almost as if they are the editor writing the introduction. However, the way they are written show that this book is not simply a collection of ad hoc writings by different authors but a coherent text linking all aspects of assessment together, which I liked. Chapter 3 gave some good insights into the problems of good assessment practices but one minor quibble I had was that the writing style was difficult to follow, given that the author wrote in sentences that often stretched several lines resulting on over-long paragraphs.

These chapters were contained in part I of the book, covering the ‘pedagogic context’ and I found all the chapters in this section informative and provided much food for thought. Part II covered ‘implementing feedback’ and again, I found the topics interesting and offering practical advice. Part III on ‘stimulating learning’ was also good and gave a range of examples embedded in practice which were based on sound pedagogic approaches. Unfortunately, when it came to part IV on ‘encouraging

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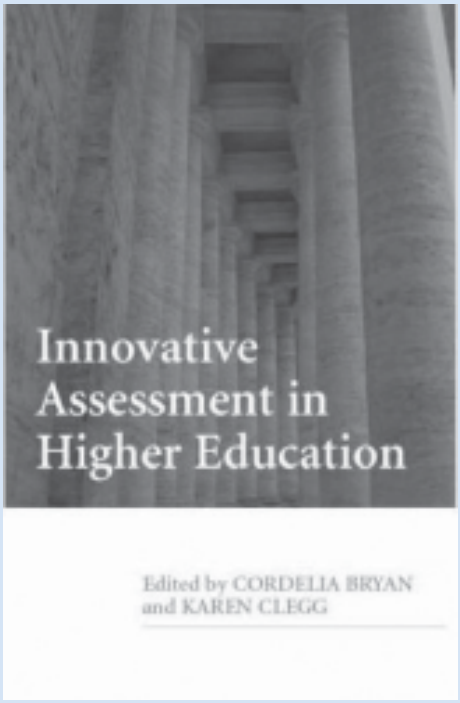
December 2006

Innovative Assessment in Higher Education



From the publisher...

Innovative Assessment in Higher Education

Editor(s) - Cordelia Bryan, Karen Clegg

Throughout higher education assessment is changing, driven by increased class size, changing curricula, and the need to support students better. At the same time assessment regulations and external quality assurance demands are constraining assessment options, driven by worries about standards, reliability and plagiarism. Innovative Assessment in Higher Education explores the difficulty of changing assessment in sometimes unhelpful contexts.

0-415-35642-3 256pp 2006 £24.99

professional development' I felt some of the chapters had very tenuous links to innovative assessment. Each chapter in this section was useful and interesting to read in its own right, but I felt didn't really have any direct connection to the theme of the book. For example, there were chapters on PDP innovation and e-Portfolios with no real reference to how they are innovative assessments.

In terms of style, I thought this book was well structured and most chapters were an easy read. Whilst each chapter was written by different authors it did feel like a coherent read, apart from part IV where I felt the content fell off topic for the book. Having said that, I felt I had been given enough of an overview of assessment in the first three parts not to be disappointed by the tenuously linked context of the last part.

The book says it is more than a 'how to' book and I wonder if a subtle point is being made here. Certain chapters certainly gave good examples of how the authors innovated with assessment with enough detail for the reader to adopt the approach for themselves. Other chapters however, only gave scant detail of how to do things and there were a few discrepancies or omissions. For example, in the opening chapters by Gibbs, he discusses his eleven conditions for assessment to support learning. Later in the book another author refers to Gibbs 'ten' conditions. In another chapter, the author talks about using the 'Delphi method' but doesn't explain what this method is or reference it later.

The final chapter in this book was a reflective account about assessment and how the contributing authors had taken steps to implement good practice based on sound pedagogical practices. I couldn't help but feel however, that this summary was a bit of a eulogy about the importance of assessment to support learning, preaching to the converted reader. The only real disappointment I had with this book was that I didn't feel I had been given a full idea of the 'conceptual framework' mentioned at the start. I wasn't sure whether it was some concrete methodology or some more abstract ethos being referred to - and I didn't feel I was given a clear answer to this by the editors.

In general I found most of this book very informative and good to read. Each chapter was well written and succinct so the reader could quickly gain an understanding of the topic. The early chapters gave a good theoretical grounding to why the reader should engage with innovative assessment and later chapters showed how innovation happened in practice. I felt the latter part of the book went slightly off topic but overall I thought this was a good book that made a thoroughly convincing argument as to why the reader should engage with innovative assessment.

Introduction to Enzyme and Coenzyme Chemistry

Subject area
Organic Chemistry

Description
This textbook provides a concise introduction to the underlying principles and mechanisms of enzyme and coenzyme action from a chemical perspective

Authors
T Bugg

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

Date/Edition
2004/2nd (revised) edition

ISBN
1-4051-1452-5

Level
Undergraduate

Price
£29.99

Valdir Florêncio da Veiga Junior,
Rua Gal. Rodrigo Octávio Jordão Ramos,
3000 - Japiim,
Manaus - AM - Brazil, 69077000
October 2006

Enzymology is treated in this book as an exciting subject in modern chemical biology. In the first four chapters, Dr. Bugg introduces enzyme properties, structure and catalysis. In chapters 5 to 11, he covers the major classes of enzymatic reactions. The last chapter introduces other types of biological catalytic processes.

Summary Review

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

Since the first edition, this very popular textbook has been thoroughly updated; new topics, a new chapter and new illustrations were included and many recently published articles have been added to update the reference section.

The introductory chapter, named ‘From Jack Beans to Designer Genes’, describes the discovery of enzymes and coenzymes and some commercial applications of them. The biosynthesis of enzymes, their biotechnology applications and use as targets for drug discovery are then presented. This first chapter is really introductory. It is small and was written in the first person, bringing a personal approach that make the reader feel like a student watching Dr. Bugg’s classes.

Actually, the main goal of the book appears to be the very readable writing style and the care about the transmission of the knowledge. Three features are specially selected: the ‘Further Reading Section’, which contains several references to each topic, inside the chapters; the end-of-chapter ‘Problems’, very well organised, all of then solved in ‘Appendix 4’; and the ‘Case Studies’ in each chapter, with colored PDB enzyme figures that facilitates the visualisation of the enzymatic process.

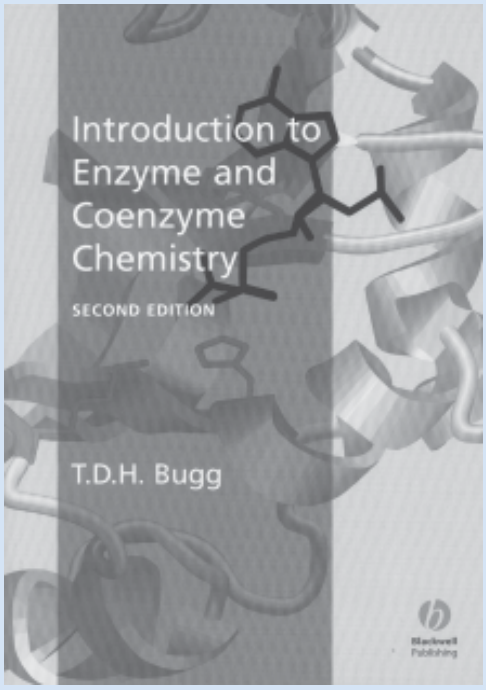
The second chapter, ‘All Enzymes are Proteins’, shows the structure of the enzymes, from the α-amino acids to the three-dimensional spatial structure of the proteins, including some prosthetic groups, like metals and sugars. It passes too fast through an important part of the enzymes and medicinal chemistry study: the structure of the active site. The enzyme-substrate interactions at the molecular level are also too quickly presented.

The enzymatic theory of the so termed ‘Wonderful Catalysts’ and the methods for studying them are presented at the third and fourth chapters. The Michaelis-Menten kinetics model, thermodynamics, inhibitions, proximity and some stereochemistry effects are also presented.

These four first chapters are sometimes insufficiently detailed for a specific book like this. In some general biochemistry books the elementary thermodynamics and enzymatic inhibition, for example, are better explained. Maybe here, at the most essential part of the theory, resides the idea of the title of the book, which begins with: ‘Introduction…’

The next two thirds of the book are much better. Updated and full of examples, chapters 5 to 11 use an organic chemistry approach to explain the mechanisms of action of the main classes of enzyme-catalysed reactions. Some familiar mechanisms like hydrolysis, redox reactions, making and breaking carbon-carbon bonds will be found in the next chapters together with the specific action of isomerases, the transformations of amino acids and radical catalysis.

Introduction to Enzyme and Coenzyme Chemistry



From the publisher...

Introduction to Enzyme and Coenzyme Chemistry

By Tim Bugg (Professor of Biological Chemistry, Department of Chemistry, University of Warwick, UK)

Enzyme catalysis is a topic of fundamental importance in organic, bio-organic and medicinal chemistry. This new edition of a very popular textbook provides a concise introduction to the underlying principles and mechanisms of enzyme and coenzyme action from a chemical perspective.

As a concise but comprehensive account, Introduction to Enzyme and Coenzyme Chemistry will continue to prove invaluable to both undergraduate and post-graduate students of organic, bio-organic and medicinal chemistry.

1-4051-1452-5 304pp 2004 £29.99

Non-enzymatic organic catalysts using catalytic RNA and antibodies are the subjects of the last chapter. The principles of action of the synthetic enzyme models are incorporated in this last chapter too. I am not sure, but I believe that it was done deliberately that way. Thus including one of the most fascinating subjects at the end of the book: the amazing possibility of designing and synthesising unnatural proteins that could be catalysts as good as enzymes, the author tries to keep the students dreaming about enzymes longer than the time occupied to read the book.

The huge number of schemes showing the mechanisms of the enzymatic action, the excellent quality of the proposed and solved problems, the care adopted to choose each chapter's case studies and an incredible power to show the very recent advances in this theme in a easy way, turns this book into an outstanding choice for those that want to be inside the fabulous world of enzymes and are not concerned by the initial deficiency in the most fundamental theory.

Lanthanide and Actinide Chemistry

Subject area
Inorganic Chemistry

Description
The text is an introduction to the chemistry of Lanthanides and Actinides

Authors
Simon Cotton

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

Date/Edition
2006

ISBN
0-470-01006-1

Level
Undergraduate

Price
£35.00

Karl Whittle,
Department of Engineering Materials,
Sir Robert Hadfield Bldg,
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Mappin St,
Sheffield S1 3JD
October 2006

After writing one of the best books on lanthanide and actinide chemistry, Simon Cotton has updated an important area of research and provided a very useful textbook. This new text can be utilised in undergraduate teaching, while at the same time providing a useful reference text for those of us investigating the chemistry of lanthanides and actinides.

Summary Review

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

The book is divided into two main parts, logically separated into lanthanide and actinide chemistry. In both sections the elements are introduced with a brief background and history on their discovery and synthesis/extraction from the environment. After a good grounding they then proceed to discuss the chemistry in a logical and clear manner.

The lanthanide section provides very useful information on the lanthanide contraction which can sometimes be explained in a manner that confuses the reader. In this book the explanation is clear, and uses it to explain why certain 5d-transition elements eg Hf^{4+} have a similar ionic radius to their brethren above them in the group eg Zr^{4+}.

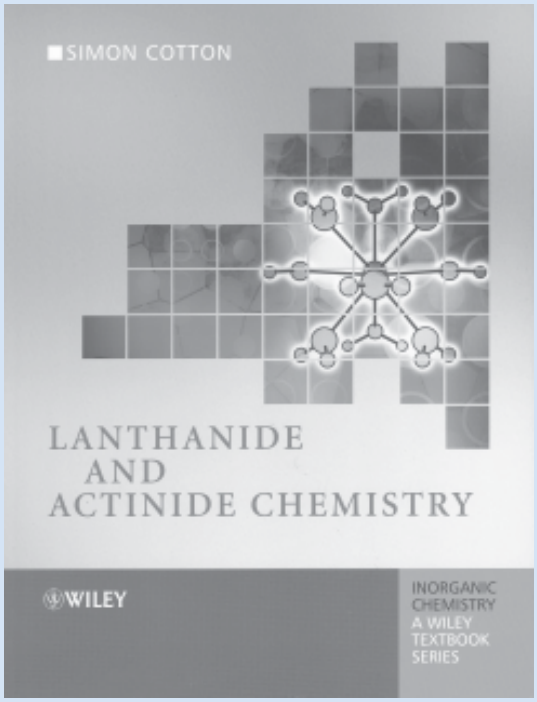
After providing information on the ionic radius, redox behaviour, some thermodynamical information (it can never be complete as that would involve a text on its own!), it moves on to discuss the simple chemistry of lanthanides, before proceeding to organometallic compounds. All of these sections provide a basis for the reader to begin to understand the importance of the lanthanide elements in modern science. There is even a chapter on those elements that are often considered to be similar to lanthanides, yttrium and scandium; these are presented clearly and in those cases where they are very similar to lanthanide elements these are highlighted eg the similar ionic radius of Y^{3+} and Ho^{3+}.

The one chapter in the lanthanide section I found most useful was the discussion of the magnetic and electronic properties and their importance to modern life, eg MRI scanners using Gd complexes. It has provided a 'new' way of explaining such properties to students that should help to minimise the confusion which can often arise.

The actinide section uses the lanthanide section as a stepping stone to discuss one of the areas of chemistry that is constantly changing. The synthesis of elements was presented in a manner which should hopefully show that even when synthesising elements a chemist/physicist can be creative, and needs to be careful in the interpretation of results particularly when studying the trans-actinide elements.

A feature that can be missed while reading this section is the seemingly lack of bias when actinide elements are discussed and the question of nuclear fission arises. The problems have been highlighted, discussed and the current means by which the problem is solved are discussed, without being overly dramatic. This approach should be recommended for all such texts.

Lanthanide and Actinide Chemistry



From the publisher...

Lanthanide and Actinide Chemistry

By Simon Cotton

Lanthanide and Actinide Chemistry is a one-volume account of the Lanthanides (including scandium and yttrium), the Actinides and the Transactinide elements, intended as an introductory treatment for undergraduate and postgraduate students. The principal features of these elements are set out in detail, enabling clear comparison and contrast with the Transition Elements and Main Group metals.

0-470-01006-1 280pp 2006 £35.00

One of the better features in the book is the provision at the beginning of each chapter of what the reader is expected to understand at the chapter's end, this is very useful as it provides a check on the important information that should be assimilated from each chapter.

Overall I can recommend this text for use by anybody studying chemistry from undergraduate through to laboratory researcher. It provides a general background, which can then be used to study any fields of interest in more depth, eg the chemistry of Pu is constantly changing and any textbook is almost certainly behind when it is published, but this text has avoided that by being a bit more general.

Modern Raman Spectroscopy: a practical approach

Subject area
Analytical Chemistry

Description
This book is aimed at providing those who are either just developing or reviving an interest in Raman spectroscopy with enough practical understanding and theoretical information to know how to carry out the experiments and to interpret the data

Authors
W E Smith and G Dent

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

Date/Edition
2006

ISBN
0-471-49794-0

Level
Research

Price
£24.95

Nigel Young,
Department of Chemistry,
University of Hull,
Hull HU6 7RX
October 2006

Summary Review

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

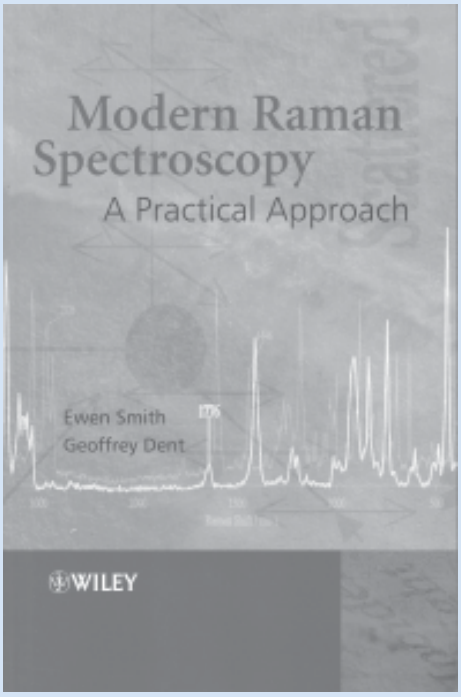
This book by Smith and Dent sets out to "provide the information necessary to enable new users of Raman spectroscopy to understand and apply the technique correctly". Therefore, it does not intend itself to be taken as an undergraduate textbook to accompany a formal lecture course, but rather a book to help those either new to, or returning to, Raman spectroscopy to understand its fundamentals and applications, particularly in a more applied environment. Therefore, it might be helpful for undergraduates carrying out project work involving Raman spectroscopy, but other than examples, it is hard to see it supporting more formal teaching. However, it will be useful as a starting point for those setting out in Raman spectroscopy.

The book is divided into seven chapters. The first chapter deals with an introduction to the basic theory and principles, whilst the second and third chapters cover the details of the Raman experiment and Raman scattering theory, respectively. The fourth chapter deals with resonance Raman scattering and the fifth with both surface enhanced Raman scattering (SERS) and surface enhanced resonance Raman scattering (SERRS). The sixth chapter covers applications, and the final chapter deals with more advanced Raman variants.

Of the first three chapters the one dealing with the details of the Raman experiment and how the samples should be prepared is the best, the other two only set out to give a cursory treatment of the theory, and the dedicated reader would need to consult other more specialist books for the necessary details. In the theory chapter I found a number of errors such as the statement that in the vibrational ground state the molecule is not vibrating, which is not the usual interpretation of the zero point energy, as well as some incorrect diagrams and interpretation of vibrational modes. I also found the treatment of symmetry elements and group theory very confusing, including some errors such that an Sn axis is a combination of a rotation and an inversion, rather than a rotation and a reflection. (S2 is equivalent to an inversion though). In the chapters on resonance Raman scattering and SERS and SERRS the clarity of the explanation was reduced by some poor figure captioning, where it was sometimes not possible to identify which spectrum the text referred to, or where the spectra in the figure seemed reversed to the text. However, these chapters did make it very clear that being able to use either resonance or surface enhancement (or preferably both) to improve the signal level, opens up a large number of new areas where Raman spectroscopy can be applied.

The applications chapter contains a wide selection of examples drawn from inorganics and minerals; art and archaeology; polymers and emulsions; colour; electronics applications; biological and pharmaceutical applications; forensic applications; plant control and reaction monitoring all of which demonstrate the power of Raman spectroscopy, and especially its resonance and surface enhanced variations. This chapter is much better written, and the figure captions now contain enough material to interpret the spectra etc. There is also a very useful table of the Raman bands for a wide range of inorganic species.

Modern Raman Spectroscopy: a practical approach



From the publisher...

Modern Raman Spectroscopy: A Practical Approach

By Ewen Smith, Geoffrey Dent

This book reflects the dramatic increase in the number of Raman spectrometers being sold to and used by non-expert practitioners. It contains coverage of Resonance Raman and SERS, two hot areas of Raman, in a form suitable for the non-expert.
Builds Raman theory up in stages without overloading the reader with complex theory
Includes two chapters on instrumentation and interpretation that shows how Raman spectra can be obtained and interpreted
Explains the potential of using Raman spectroscopy in a wide variety of applications
Includes detailed, but concise information and worked examples

0-471-49794-0 222pp 2004 £24.99

The final chapter outlines some recent developments and well as describing some of the more challenging Raman techniques which are usually restricted to a few research labs. I personally was disappointed that more was not made of the use of CARS for high temperature sensing in engines.

Overall the book achieves its aims of outlining a very wide range of applications of Raman spectroscopy, and this will no doubt encourage some to either take up the technique themselves, or find collaborators to assist them. The chapters on sample preparation and applications are the best. However, on the whole I was left disappointed by this book, as I found the literary style a little wearing, but more importantly there are just too many errors in the text, figures and figure captions to make it easy reading. Given that it seems it has already been reprinted with corrections in 2005, it is shame that these were missed.

Nanochemistry: a chemical approach to nanomaterials

Subject area
Materials Science, Chemistry, Physics

Description
A textbook for teaching nanochemistry and adopting an interdisciplinary and comprehensive approach to the subject

Authors
Geoffrey A Ozin and André C Arsenault

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

Date/Edition
2005/1st Edition

ISBN
0-85404-664-X

Level
Undergraduate, research

Price
£39.95

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Callaghan NSW 2308,
Australia
October 2006

On nanomaterials, before, I only held a rather narrow vision; now, I can "look at the subject in its entirety and as it stands today" (pp. 568) thanks to this wonderful book written by a leading scientist and one of his students. More than once during reading I was astonished by scientific achievements spurred by curiosity and imagination of human beings!

Summary Review

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

For me, the three books, from which I enjoyed the similar breathtaking and enlightening reading experience, are *Feynman Lectures on Physics* by Richard Feynman, *I Want to be a Mathematician* by Paul Halmos, and *Modern Electrochemistry* by Bockris and Reddy.

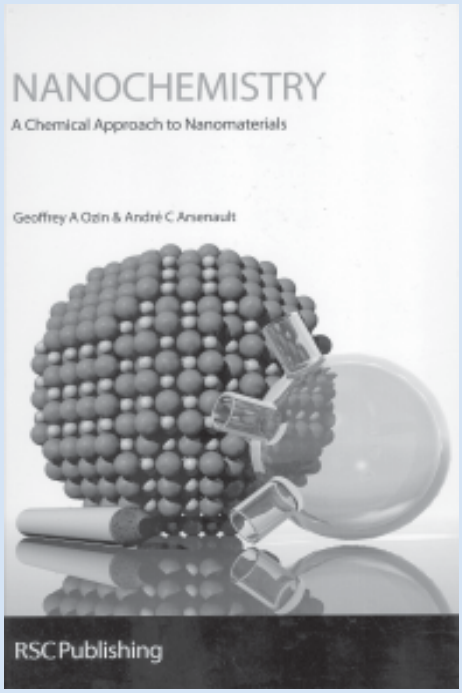
Important topics on nanochemistry are covered in 11 chapters starting from nanochemistry basics. They shows clearly and elegantly "how *building blocks* can *self-assemble* amongst themselves or co-assemble with structure directing templates or chemically patterned substrates, over *length scales* from nanometres to centimetres, to make new kinds of electrical, optical, photonic and magnetic materials with *hierarchical structures* and *complex form*." (pp. 580).

These 11 chapters are:
'Nanochemistry Basics' (49 pages);
'Chemical Patterning and Lithography' (46 pp);
'Layer-by-Layer Self-Assembly' (36 pp);
'Nanocontact Printing and Writing – Stamps and Tips' (36 pp);
'Nanorod, Nanotube, Nanowire Self-Assembly' (98 pp);
'Nanocluster Self-Assembly' (60 pp);
'Microspheres – Colors from the Beaker' (64 pp);
'Microporous and Mesoporous Materials from Soft Building Blocks' (56 pp);
'Self-Assembling Block Copolymers' (38 pp);
'Biomaterials and Bioinspiration' (58 pp);
'Self-Assembly of Large Building Blocks' (22 pp).

The 12th chapter 'Nano and Beyond' (26 pages) presents an insightful perspective on nanochemistry. The 13th chapter 'Nanochemistry Nanolabs' (6 pages) is noteworthy: it outlines *20 nanochemistry experiments* to enable readers to obtain first-hand experience! Seven short appendices are on the 'Origin of the Term *Self-Assembly*', and six topics presenting the latest nanochemistry achievements published in 2005 – 'Cytotoxicity of Nanoparticles'; 'Walking Macromolecules Through Colloidal Crystals'; 'Patterning Nanochannel Alumina Membranes With Single Channel Resolution'; 'Muscle Powered Nanomachines'; 'Bacteria Power'; 'Chemically Driven Nanorod Motors'.

Every chapter contains plenty of graphs, figures and illustrations; publications including all seminal articles up to 2004 are well cited. Readers will be led to explore original papers published in high impact magazines and journals like *Science*, *Nature*, *Nature Materials*, *Advanced Materials*, *Nano letters*, *J. Am. Chem. Soc.*, *Angew. Chem. Int. Ed.*, and *Langmuir*. So hot an area is nanomaterials! - a new journal *Nature Nanotechnology* – will be launched soon. To satisfy hungry readers for further brain-storming, a total of *282 problems* as nanofoods are put at the end of each chapter.

Nanochemistry: a chemical approach to nanomaterials



From the publisher...

Nanochemistry
A Chemical Approach to Nanomaterials
By G Ozin, A Arsenault; University of Toronto, Canada

Nanochemistry: A Chemical Approach to Nanomaterials is the first textbook for teaching nanochemistry and adopts an interdisciplinary and comprehensive approach to the subject. It presents a basic chemical strategy for making nanomaterials and describes some of the principles of materials self-assembly over 'all' scales. It demonstrates how nanometre and micrometre scale building blocks (with a wide range of shapes, compositions and surface functionalities) can be coerced through chemistry to organize spontaneously into unprecedented structures, which can serve as tailored functional materials. Suggestions of new ways to tackle research problems and speculations on how to think about assembling the future of nanotechnology are given.

0-85404-664-X 628pp 2005 £39.95

The minor flaws I spotted are that occasionally a single publication is mistakenly listed twice, such as ref. 2 and 92, ref 117 and 224 in Chapter 5.

I strongly recommend this book (only £39.95 for a hardcover copy!) to every student and researcher on materials chemistry, physics, materials science, engineering and biology. Used with a good nanophysics textbook, what a wonderful course can be expected on NANOSCIENCE!

Natural Product Chemistry at a Glance

Subject area
Organic Chemistry

Description
Natural Product Chemistry at a glance provides a concise overview of the main principles and reactions of natural product biosynthesis

Authors
Stephen P Stanforth

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

Date/Edition
2006

ISBN
1-4051-4562-5

Level
Undergraduate

Price
£17.99

Elizabeth Barron,
Science Dept,
Inverness College,
Crown Ave,
Inverness IV2 3NF
September 2006

Natural Product Chemistry at a Glance by Stephen P Stanforth, is aimed at those who already have an understanding of organic chemistry but who require information on the underlying concepts of natural product biosynthesis.

Summary Review

range: * poor to ***** good

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

It should be stressed that **Natural Product Chemistry at a Glance** does not cover the uses or ecology of natural products in any depth. This is by no means a shortcoming of the text as the many existing publications in this area are helpfully included in a further reading section. Instead the author's focus lies in the construction of these substances and the important pathways that are involved. These are topics which are normally either lightly touched on in lengthy organic chemistry texts or described in depth in much more expensive, specialised tomes and as a result this book would be ideal as a core text for an undergraduate course. Indeed, the author created this text based upon notes he had gathered for teaching natural product biosynthesis in Northumbria University.

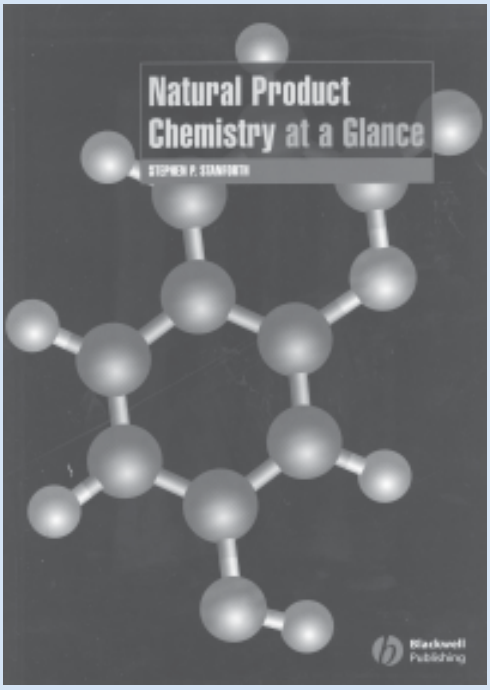
Personally I would have expected a more extended introduction, providing an overview of the importance of the subject matter. Instead, the author's 'Introduction' reads more as a preface which outlines the production of the book and its purpose. On page 6, in a short section entitled 'Properties and Purpose of Secondary Metabolites' the reader is gently informed that if they are interested in the properties and purpose of the metabolites that they are studying then they should consult the further reading list. This would perhaps be more appropriate in the introduction of the book, as it would clarify the author's purpose from the beginning but this is a minor complaint!

More importantly, the 'Primary and Secondary Metabolites' section (an outline of the content of the book), although well written, could easily have been laid out in a more 'user friendly' way. Instead, large blocks of text with bold section numbers scattered throughout were split only by big blocks of molecular structures. This made for difficult reading and with the increase in dyslexia among undergraduate students, the use of sans serif text and increased line spacing could have made a big difference to the book's 'readability'. It should be stressed however, that this criticism is not specific to **Natural Product Chemistry at a Glance**.

The rest of the book is much easier to follow though and is divided into well thought through sections and sub-sections, each describing a different key 'biosynthetic building block' and how it is assembled into different products. In addition, there are problem solving tasks scattered throughout the text (with answers at the end) which allow the reader to consolidate the information gathered.

The first chapter (Section 2) entitled 'Acetyl Coenzyme A: A Key Biological Intermediate' describes both the structure of acetyl coenzyme A and the reactions it takes part in, then goes on to describe how it is used in biosynthesis. A sub-section which compares organic and acetyl coenzyme reactions is particularly well explained and a subtle way of reminding students 'what they already know' before they go any further.

Natural Product Chemistry at a Glance



From the publisher...

Natural Product Chemistry at a Glance

By Stephen Stanforth (School of Applied Sciences, University of Northumbria, UK)

Natural Product Chemistry at a Glance provides a concise overview of the main principles and reactions of natural product chemistry, for students studying chemistry and related courses at undergraduate level. Based on the highly successful and student friendly "at a glance" approach, the material developed in this book has been chosen to reinforce the principles of elementary organic reactions and to highlight the similarity between many organic reactions and biological processes. It will also serve as an initial platform for more advanced excursions into the origin of natural products.

1-4051-4562-5 152pp 2006 £17.99

The author then goes to look at the biosynthesis of fatty acids, describing their occurrence and function in biological systems, their synthesis and how they can undergo further structural modifications. This is followed in section 4 by an in depth description of polyketides and their biosynthesis. After first clearly defining what polyketides actually are, the text then goes onto describe and explain the pathways that lead to their formation, as well as the pathways that can lead to their further modification. An additional subsection describing how isotopes can be (and have been), used to investigate biosynthesis is well placed.

The Shikimic Acid pathway is next to be covered and after first emphasising the importance of shikimic acid, chorismic acid and prephenic acid in biosynthesis, the author then goes onto describe transamination and the biosynthesis of natural products from cinnamic acid. Lignans are next, followed by a longer piece on the biosynthesis of alkaloids.

Section six looks at the terpenes. As in the other sections, they are first clearly defined, then their biosynthesis investigated. Students are reminded of their carbocation chemistry with terpenes utililised to illustrate the main points, then terpene biosynthesis is looked at in more depth.

Section seven is shorter than the others and is entitled ‘Natural products derived from amino acids’. Firstly the aliphatic alkaloids are described, along with how they can be produced from amino acids , then follows a series of short sub-sections describing the biosynthesis of penicillins and related compounds, macrocyclic peptides and porphyrins respectively.

On the whole I would highly recommend this text to undergraduates. It is concise, clear and easy to follow and the comments I have made above about ‘readability’ could equally be applied to many chemistry texts. A very useful text.

Pitfalls and Errors of HPLC in Pictures

Subject area
Analytical Chemistry

Description
A handbook for the user of HPLC methods. A practical guide for the laboratory

Authors
Veronika R Meyer

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

Date/Edition
2006/2nd Edition

ISBN
978-3-527-31372-3

Level
Undergraduate, research

Price
€44.90
(£30.87 at www.amazon.co.uk)

Roger M Smith,
Department of Chemistry,
Loughborough University,
Loughborough,
Leicester LE11 3TU
October 2006

Summary Review

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

Most books on high performance liquid chromatography (HPLC) tell the reader how the technique works, describing the pumps, columns, and detectors, etc and give an indication of how the different parameters, such as mobile phase solvents and column material can be altered. They will provide some suggestions for the selection of suitable conditions for an analysis. Some will go as far as suggesting how you can optimise the system. However, very few texts or guides describe what can go wrong and more importantly how you can recognise that there is a problem,

The aim of **Pitfalls and Errors of HPLC in Pictures** is to fill this gap and to be a true 'how to do book', but also a 'what not to do book', which follows on from Veronika Meyer's very successful more conventional *High Performance Liquid Chromatography* textbook, which has now reached its 4th Edition. The idea is that by providing copies of good and bad chromatograms, the user (note - not the reader - this means to be a book actively used in the laboratory) can examine the output from their instrument and use the comparison to identify potential problems. The text then suggests possible solutions to the problem. The approach, as implied in the title, is that not all that goes wrong is an error, sometimes the technique of HPLC has pitfalls for the newcomer and even the more experienced user. The less obvious problems can be caused without a mistake being made but are an inherent effect of the conditions being employed.

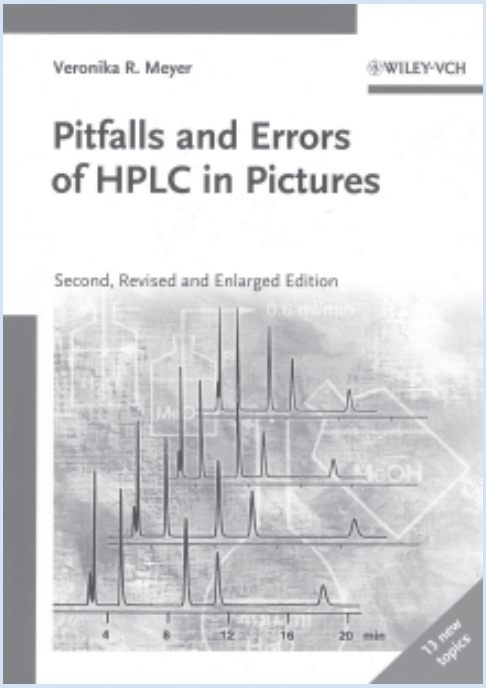
This book is not really a text for students to learn about the basics of HPLC. It will be much more meaningful and valuable if the reader is currently using the technique on the bench, either in a project, research studies, or in industry. It starts with a short section on fundamentals to place the analytical parameters of retention, efficiency, peak shape, etc in context and to define their measurement. Often changes in these values are the first guide to a problem. It also cover areas, such as ruggedness and reproducibility, and what can go wrong with calibration curves.

The main part of the book examines the problem areas starting with the preparation of the eluent and how the simple act of mixing two solvents to prepare a mobile phase is fraught with pitfalls and can easily lead to incorrect retentions. Together with pH, an important message is that the methods for mobile phase preparation must be closely defined and followed by the user. It illustrates how a change of just of 0.2 pH units can cause peaks to merge or be resolved.

Then come the extra peaks found in some assays, caused by impurities in the mobile phase components or additives and unexpected system peaks. This is followed by the odd peak shapes resulting from incorrect sample preparation or the wrong sample solvent. The next section describes some of the pitfalls, including by-products with a much strong absorbance than the sample components, decomposition peaks and artefacts.

Problems are then described which can be caused by operational problems with sample loops, air peaks, sample absorption, retention changes with temperature, the effect of dwell time on gradient reproducibility and transferability. Unexpected changes due to problems

Pitfalls and Errors of HPLC in Pictures



From the publisher...

Pitfalls and Errors of HPLC in Pictures

By Meyer, Veronika R.

Adding 13 new examples to this third edition, Veronika Meyer now offers solutions for nearly 100 of these problems. All examples are presented with a concise, instructive text and an informative diagram. Practical help for getting correct and reliable analytical results.

978-3-527-31372-3 188pp 2006 €44.90

with columns, and on-column changes in the analyte due to isomerisation or reactions in the column are discussed. There are many examples of detection and quantitation problems and how these can be corrected and compensations applied. In each case the problem is illustrated, usually with chromatograms, so that the user can visualise the outcome.

The last section of the book is entitled 'Useful Strategies' and is a series of suggested methods to ensure good chromatography. A good start is to have a test mixture, whose separation is stable and known, and can be used in a check procedure. Most quantitative assays need a form of internal standard and a strategy for checking that the system is operating within acceptable limits. The last section covers the transfer of methods between laboratories and the details needed to make a successful transfer. Finally, the book describes how you should validate the method to show that it is operating satisfactorily, with a brief look at formal quality assurance systems.

This is one of those books that should be near the instrumentation. It is not a library book but a handbook for the laboratory, to be on hand when needed. Sooner or later one or other of these problems will occur and the chromatographer needs to be expecting them and to be able to identify the causes and identify a solution. Close-by should also be *Practical Problem Solving in HPLC* by Stavros Kromidas from the same publisher. The two books are complementary and coupled with the problem solving columns from *LC-GC Magazine* should place the chromatographer in a position to handle most of the frustrations thrown up by a HPLC system and to ensure robust and accurate results are be obtained.

Pitfalls and Errors of HPLC in Pictures is clearly written and well presented, as the full name implies is well illustrated with numerous pictures to guide the reader and at a cost that leave no excuses why it should not be on the bench. It is also available in a German language edition.

Practical Organic Synthesis: a student's guide

Subject area
Organic Chemistry

Description
A concise, useful 200 page guide to good laboratory practice in the organic chemistry lab. Paperback, and handy size for carrying and for access in the lab or in private study/preparation

Authors
R Keese, M P Brandle, T P Toube

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

Date/Edition
2006/1st Edition (in English)

ISBN
0-470-02966-8

Level
Undergraduate

Price
£24.95

Marie Walsh,
Department of Applied Science,
Limerick Institute of Technology,
Limerick,
ROI
September 2006

Summary Review

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

If only there was a category higher than 'good' in the summary rating! This book is based on a successful course in basic organic chemistry laboratory practice which has run for several years in ETH, Zurich, and the University of Bern. It is the English translation of the course book *Grundoperationen*, which is now in its sixth edition. If I have one tiny quibble it is with the translation of the title, because I would see it more accurately as a student's guide to good organic laboratory practice - in that it covers much more than just methods of synthesis. In fact there is just one chapter of 'hints' on successful synthesis.

The text draws on the authors' thirty plus years of organic laboratory teaching experience, summarising in an easy-to-read volume procedures and protocols which are essential on a day to day basis in the organic laboratory. Their mission is to encourage the students to undertake safe, careful and successful synthesis of organic compounds. This has resulted in the compilation of a user-friendly text, with a clear style and a wealth of information of use not just to new students but also experts.

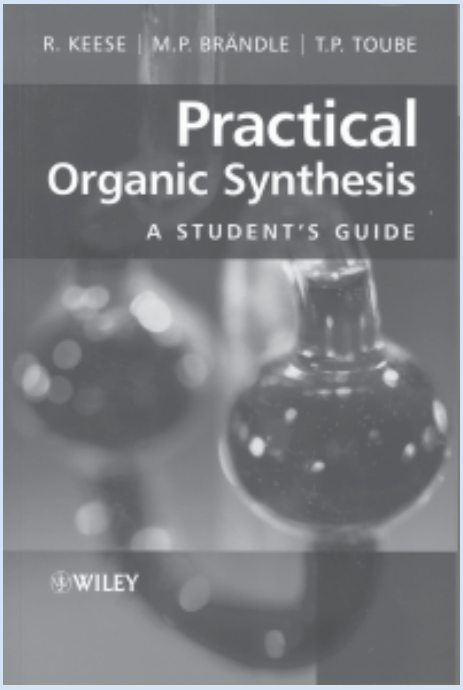
The book has fifteen short chapters, and in the interests of being concise not every aspect of every topic can have been covered. However, the salient points are outlined (and illustrated in some cases) and each chapter ends with a bibliography for those who may wish a bit more depth.

The chapter topics include:

- Safety: accident prevention and first aid, EU risk and safety phrases
- Environmentally responsible handling of chemicals and solvents
- Essential techniques like distillation, chromatographic methods, extraction and isolation, purification and drying of solvents
- Spectroscopic determination of structures
- Searching the chemical literature
- Notebooks and report writing
- Waste disposal

Only seventeen pages are devoted to hints for successful synthesis but within this chapter the authors have contributed tips borne as 'the fruit of bitter experience' with which anyone who has partaken in preparative organic chemistry will empathise. As they say, it is a "variable amalgam of science, art and craft, with the quest for new compounds or conversions its goal". The authors summarise the methods for choosing the most appropriate route to successful synthesis of a desired product, and then guide students (and teachers) through the best way to organise laboratory time and procedures to practically carry out the synthesis. They include tips on handling water- and air-sensitive substances, working at low temperatures, synthesis and analysis of chiral compounds, and synthesis of isotopically labelled compounds. This particular chapter ends with 32 references, ranging in date over some forty years - again indicating the overall 'sense' that this book isn't just something else to take up space on the shelves, but a highly useful companion book derived from a wealth of real-life practical experience.

Practical Organic Synthesis: a student's guide



From the publisher...

Practical Organic Synthesis: A Student's Guide

By Reinhart Keese, Martin Brändle, Trevor Toube

Success in an experimental science such as chemistry depends on good laboratory practice, a knowledge of basic techniques, and the intelligent and careful handling of chemicals.

Practical Organic Synthesis is a concise, useful guide to good laboratory practice in the organic chemistry lab with hints and tips on successful organic synthesis.

Practical Organic Synthesis is based on a successful course in basic organic chemistry laboratory practice which has run for several years at the ETH, Zurich and the University of Berne, and its course book Grundoperationen, now in its sixth edition.

0-470-02966-8 208pp 2006 £24.95

We would all like to think that we are teaching our undergraduates thoroughly and training them well to achieve laboratory success, but we can all learn from sharing others ideas. This book gives us access to the authors' wealth of experience in the undergraduate lab. It is an essential guide for those new to the organic laboratory, but also a useful for those who aren't new to it any more.

I showed it to a colleague, who has been teaching the same syllabus area for just about the same length of time as the authors' and I don't think there's any more I need add to the note she left on it: "This is a great little book. I'd certainly recommend it to a friend!"

Quantum Optics: an introduction

Subject area
Quantum Physics, Optics

Description
This text covers quantum optics from an intuitive physical understanding viewpoint rather than by mathematical derivations

Authors
Mark Fox

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

Date/Edition
2006

ISBN
0-19-856673-5

Level
Undergraduate, research

Price
£24.95

Derek Raine,
Department of Physics and Astronomy,
University of Leicester,
Leicester LE1 7RH
November 2006

Summary Review

range: * poor to ***** good

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

In the quantum world history appears to run counter-intuitively: the particle nature of light seems more familiar than the wave nature of the electron or nucleon, but genuinely quantum effects in nuclear physics and electron physics were known well before those in optics. Even the photoelectric effect turns out to have an explanation in terms of quantised atoms and classical fields. Thus quantum optics is new and difficult, both theoretically and experimentally. The secondary literature to date has therefore been directed at the research level.

However, quantum optics is becoming too important to marginalise it in the undergraduate curriculum any longer. This book may be a rather ambitious attempt to provide support for an undergraduate course in quantum optics, but it is certainly welcome.

The text covers much of what one might expect to find: lasers and laser cooling, atoms in cavities, photon statistics including both theoretical and experimental details as well as the standard background to radiation-atom interactions. Beyond this a significant fraction of the book is devoted to pure quantum effects in light which, unlike the treatment of the hydrogen atom favoured in traditional introductions to quantum theory, develops an understanding of quantum behaviour. Also covered in some detail in this second half are quantum computation and cryptography, and quantum teleportation. Backing up this newer material are standard reviews of electromagnetic theory, quantum mechanics and the interactions of matter and radiation, so the book should be accessible to advanced undergraduates from diverse backgrounds.

In a book of this size and audacity one might expect a few niggles: I am not sure that the quick tour of Maxwell's electrodynamics, as far as optical correlation functions, is not a little too quick for anyone who needs it, and contrasts strangely with the detailed derivation of Poisson statistics as the limit of the binomial distribution, which I would have thought was part of any physics course. The introduction to photon statistics is repetitive, except at a crucial point in the chapter, which will challenge some readers, and I am not sure about the extent to which sub-Poissonian statistics can be understood prior to the treatment of photon number states. (My experience is that undergraduates imagine all photon states to have definite numbers of photons.) But when it comes to it, the treatment of the photon field in terms of harmonic oscillators seems to focus on essentials and seemed to me to be at the right level. But do we really have to base a modern introduction to quantum mechanics around the Copenhagen interpretation?

These are minor niggles. If you do not have a quantum optics course in your curriculum or if you are looking for a textbook for your quantum optics course, start here.

Smectic and Columnar Liquid Crystals

Subject area
Physical Organic Chemistry

Description
Part of a series of seven authoritative accounts on the theoretical and experimental aspects of liquid crystals. This series provides an excellent grounding in the subject and is an excellent reference source for researchers in the field

Authors
Patrick Oswald and Pawel Pieranski

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

Date/Edition
2006

ISBN
0-8493-9840-1

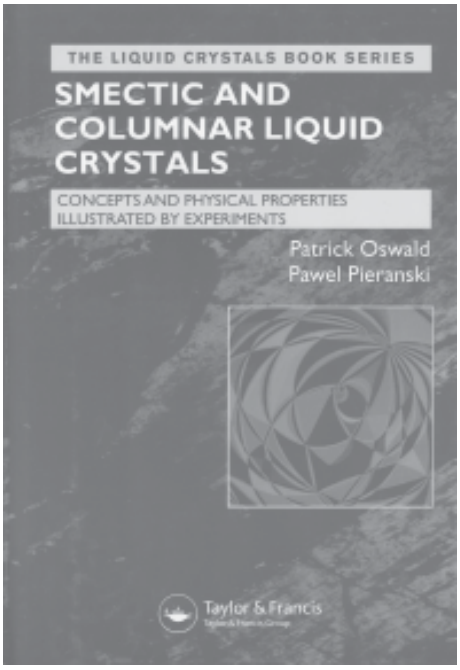
Level
Undergraduate, research

Price
£79.99

Summary Review

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

This is an excellent book and covers the theoretical aspects of smectic and columnar liquid crystals in a thorough manner. It is well illustrated by diagrams and very good accounts of experiments which amply illustrate the important and fascinating properties of these materials. The physical properties of these more ordered Liquid crystal phases are very well described and the authors give very clear descriptions of how various liquid crystalline textures arise both from an experimental and theoretical standpoint. The great strength of the book is the marrying of these two which allow the reader to form a good concept of what is happening on a molecular level.



The series is entitled 'concepts and physical properties illustrated by experiments' and very much does what it says *on the tin*. It concentrates on smectic and columnar phases but usefully gives the contents of another book in the series *Nematics and Cholesterics* which treats the subject in a similar fashion and is probably the most useful for the liquid crystal chemist.

If I have one problem with the book it is the complete lack of colour photographs. This is almost certainly the result of the need to keep costs down but is a great pity as one of the most exciting aspects of liquid crystal research for me is the beauty of the results when viewed by hot stage polarising microscopy and reproduced in all their colourful glory. Nevertheless, the monochrome photographs do the job of highlighting the salient features very well and in some cases may be clearer; so the lack of colour is not really problematic from the point of view of the main purpose of the book.

It is a timely publication too: the field has moved on apace and to have the current understanding of the field collected together in one place is a great boon. I would recommend this to any liquid crystals research group: chemists or physicists. It would also be an invaluable asset to any chemistry degree or masters course with a 'liquid crystals' content.

David Harwood,
Institute for Science Education,
University of Plymouth,
Portland Square,
Plymouth PL4 8AA
October 2006

Statistical mechanics: algorithms and computations

Subject area
General Science

Description
This book discusses the computational approach in modern statistical physics in a clear and accessible way and demonstrates its close relation to other approaches in theoretical physics

Authors
Werner Krauth

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

Date/Edition
2006

ISBN
0-19-851536-7 (paperback)
0-19-851535-9 (hardback)

Level
Undergraduate, research

Price
£24.95 (paperback)
£49.95 (hardback)

Alan Hinchliffe,
School of Chemistry,
The University of Manchester,
Manchester M13 9PL
December 2006

The Oxford Master Series is pitched at senior undergraduates and beginning graduates in physics and related disciplines. I can't do better than quote from the Series descriptor.

Summary Review

range: * poor to ***** good

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

"…The emphasis is on clear physical principles like symmetry, quantum mechanics and electromagnetism which underlie the whole of physics. At the same time, the subjects are related to real measurements and to the experimental techniques and devices currently used by physicists in academe and industry. Books in this series are written as course books and include ample tutorial material, examples, illustrations, revision points and problem sets…"

The 15 titles published so far are distributed between:
Condensed Matter Physics
Atomic, Optical and Laser Physics
Particle Physics, Astrophysics and Cosmology
Statistical, Computational and Theoretical Physics

Werner Krauth's book opens with children computing ð on a Monte Carlo beach by throwing pebbles at random into a square with an inscribed circle, drawn in the sand. My attention was caught by this opening hot button statement (as salesmen call it), and I think it will make students want to read the rest of the book. It's a well-trusted technique known to all successful salesmen, but I gave the author 100%.

This childrens' game is used to illustrate the difference between direct sampling and Markov-chain sampling. Nicely done.

For the record, the Chapters are exactly what experienced workers in the field might expect.
'Monte Carlo Methods'
'Hard disks and spheres'
'Density matrices and path integrals'
'Bosons'
'Order and disorder in spin systems'
'Entropic forces'
'Dynamic Monte Carlo methods'

The author gives algorithms, written in his own 'pseudocode' but instantly translatable into a real programming language. There is a CD full of figures, tables etc. There is also a primitive website.

This is a short review, but this book is the best one I have reviewed all year. It does exactly what it says *on the tin* (to use the hackneyed language of the commercial break).

Statistical mechanics: entropy, order parameters, and complexity

Subject area
General Science

Description
This book presents a broad perspective of statistical mechanics, emphasising its concepts and its diverse range of applications

Authors
James P Sethna

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

Date/Edition
2006

ISBN
978-0-19-856677-9 (paperback)
978-0-19-856676-2 (hardback)

Level
Undergraduate, research

Price
£24.95 (paperback)
£49.95 (hardback)

Richard Henchman,
Manchester Interdisciplinary Biocentre,
University of Manchester,
131 Princess St,
Manchester M1 7ND
September 2006

Summary Review

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

Sethna presents a broad perspective of statistical mechanics, emphasising its concepts and its diverse range of applications, not only in the more traditional molecular examples, but spanning from black holes to stock markets. As well as to physicists and chemists, he aims to appeal to students in mathematics, biology, engineering, computer science and social sciences. In doing so, there is a necessary compromise on the assumed knowledge. Notably, he does not assume quantum mechanics and introduces various elements of it where necessary. This does still limit the text's development of certain classes of problem such as molecular partition functions.

The work is intended as an introduction to the subject for postgraduate students or even final year undergraduates. Topics are introduced quite rapidly, often in a condensed fashion and sometimes developed more mathematically without the supporting conceptual explanation. Thus, some level of familiarity of statistical mechanics beforehand would be recommended for students, particularly for non-physicists and non-chemists who are unlikely to have had such a course beforehand. On the other hand, this pace does allow a greater exploration of each topic.

The prose reads well and has an engaging style. Interspersed with the main material are a number of reflections, insights and alternative explanations that help to link together and reinforce ideas. Much use is made of footnotes to elaborate on particular aspects or state possible implications. A strength and significant part of the text is the extensive and varied listing of example problems given at the end of each chapter. The diverse, interesting and topical range of these problems reflects one of the book's main themes of the wide applicability of the statistical mechanics to many types of problems. A number of hints to the problems are suggested, although no answers are provided.

To summarise the content, the concepts first introduced by the author are probability, diffusion, density of states, temperature, pressure, chemical potential and ergodicity. This is followed by an extensive description of entropy and the need for other ensembles, each with their free energies. At this point, he summarises thermodynamics with its laws and goes through the examples of chemical equilibria and ideal gases. He then generalises to quantum mechanical statistics, followed by how perturbation theory or simulation may be used to understand the Ising model. More abstractly, a strategy is presented for how to characterise a system with order parameters chosen according to its symmetry, paying attention to any topological defects. The book finishes off with correlations and their relationship to spectroscopy, linear response theory and the fluctuation-dissipation theorem, abrupt phase transitions and continuous phase transitions.

This book will not appeal to everyone, but its original and thought-provoking style make it worthy of consideration for the right kind of course.

Textbook of Biochemistry with Clinical Correlations

Subject area
Biochemistry

Description
This book presents the biochemistry of mammalian cells, relates events at a cellular level to the subsequent physiological processes in the whole animal, and cites examples of human diseases derived from aberrant biochemical processes

Authors
Thomas M Devlin

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

Date/Edition
2005/6th Edition

ISBN
978-0-471-67808-3

Level
Undergraduate, research

Price
£38.50

Valdir Florêncio da Veiga Junior,
Rua Gal. Rodrigo Octávio Jordão Ramos,
3000 - Japiim,
Manaus - AM - Brazil, 69077000
October 2006

Summary Review

range: * poor to ***** good

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

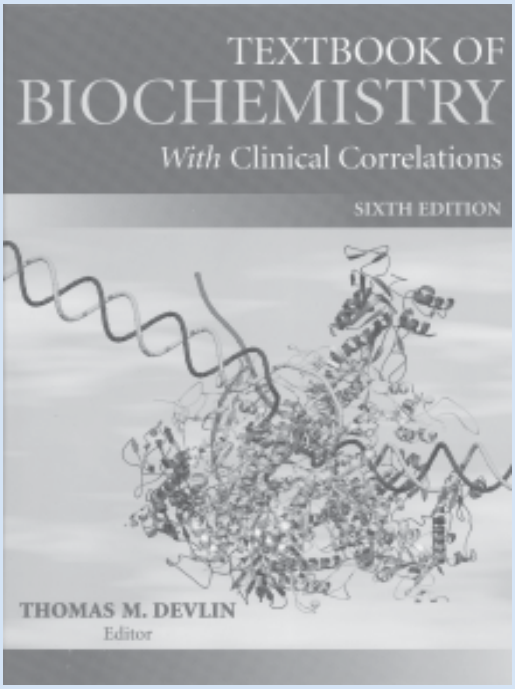
This new edition of the **Textbook of Biochemistry with Clinical Correlations** has the main objectives of the prevoius editions: “to present a clear, actual and precise discussion of the biochemistry of mammalian tissues and relate biochemical events at the molecular level to physiological process in the whole animal”. As the information in the biological sciences and the integration of disciplines have had a significant impact on the content of biochemistry courses, many topics were included, such as sections on the basal lamina protein complex and molecular motors. Every chapter was updated, with some additional information included and some material deleted. Two new chapters were added: ‘Cell Cycle, Programmed Cell Death’ and ‘Cancer; and ‘Fundamentals of Signal Transduction’.

This textbook continues to be one of the books that recognise biochemistry as one of the most important disciplines that permeate a lot of old and brand new disciplines, like cell biology, molecular biology, cell pharmacology, cell physiology and molecular pharmacology. It is relatively inexpensive if the student is interested to dive deeper into the human and clinical biochemistry.

The text is not basic and this is not a textbook intended for the general chemistry or biological sciences undergraduate students. The scope and depth of presentation in this book are designed for the graduate level or more particularly the professional school courses that teach biochemistry as one of the most important subjects, like biotechnology and biomedicine. In this way, the book does not set out to introduce every single type of biological molecule, its functions and characteristics, as a typical biochemistry book, but to show how they can be related to human health and disease. These characteristics of the biomolecules are assumed to be known but the most basic and common difficulties of the general biology students are very well recognised: the deficiency in organic chemistry and the interactions and forces that rule atom and molecule associations. An appendix bringing some essential and structural chemistry of lipids, amino acids and carbohydrates issues, like stereochemistry, types of reactions; and forces involved in macromolecular structures is added in an attempt to solve this problem. Unfortunately, an entire organic chemistry course would be necessary to do this but the appendix works as a quick review of basic biomolecules.

The book is divided into five parts, including appendix and glossary: ‘Structure of Macromolecules’; ‘Transmission of Information’; ’Functions of Proteins’; ‘Metabolic Pathways and their Control’; and ‘Physiological Process’. The last chapters are ‘Principles of Nutrition I and II’ on macronutrients and micronutrients respectively.

Textbook of Biochemistry with Clinical Correlations



From the publisher...

Textbook of Biochemistry With Clinical Correlations, 6th Edition

By Thomas M. Devlin

Thomas M. Devlin's Textbook of Biochemistry with Clinical Correlations presents the biochemistry of mammalian cells, relates events at a cellular level to the subsequent physiological processes in the whole animal, and cites examples of human diseases derived from aberrant biochemical processes. The organization and content are tied together to provide students with the complete picture of biochemistry and how it relates to humans. Loaded with new material and chapters and brimming with detailed, full-color illustrations that clearly explain associated concepts, this sixth edition is an indispensable tool for students and professionals in the medical or health sciences.

978-0-471-67808-3 1240pp 2005 £38.50

Written by more than thirty authors, the 28 chapters are filled with more than 1,200 clear and coloured illustrations, over 250 clinical correlations between biochemistry to clinical health and disease, several exercises with quick but well explained answers and a bibliography section that refers to the state-of-art of the knowledge at the subject, including open access journals and internet sites.

Devlin's textbook fits the needs of the general pharmacy and medicine students, especially those involved with clinical biochemistry, that seek a general human biochemistry book that is extensive and detailed at the right price.

The Challenge to Scholarship: rethinking learning, teaching and research

Subject area
General

Description
This text seeks to establish what it means to be a scholar and the value of scholarship

Authors
Gill Nicholls

Publishers/Suppliers
Routledge
(www.routledge.com)

Date/Edition
2005

ISBN
0-415-33532-9

Level
Teachers

Price
£75.00

Keith S Taber,
University of Cambridge Faculty of Education,
184 Hills Road,
Cambridge CB2 2PQ
October 2006

Summary Review

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

Gill Nicholls has written an interesting and thought-provoking book on what we mean by scholarship. On finishing the book I felt that the author had managed to raise my awareness of issues, and to suggest some important questions. I found the book engaging, and quite fascinating in places, but it was an uneasy read as well, for Nicholls managed to problematise for me a topic that had seemed fairly straightforward. This is certainly not a criticism: but leaves this reader to reflect upon my reactions to the book.

Perhaps I should start from my preconceptions as a reader before being offered an insight into some of the complexities and contested aspects of scholarship in the Academy. I had a simple, if largely tacit, notion of scholarship. Scholarship, surely, is what academics do to support their key functions of research and teaching. As academics we are charged with knowledge-creation (or construction of public knowledge), and knowledge dissemination (or facilitation of new personal knowledge among students and those who read our publications). Scholarship is - surely? - the private study we undertake to support those activities - to develop our own understanding of the areas where we teach, and where we write for publication, and where we undertake empirical research.

In reading Nicholls book I found my own understanding challenged in a number of ways. In historical terms, it is clear that my cosy view of scholarship being personal study supporting teaching and research is only one possible perspective, and reflects fairly recent notions of the roles and priorities of universities and scholars. In political terms, it is clear that 'scholarship', ie something academics are paid to spend part of their time undertaking, is likely to be a contentious issue with academics, universities and funders clearly having an interest in how this time is spent. In particular, as more academics find their universities organised as if hierarchical businesses rather than as colleges of scholars; and as in many universities time to support non-teaching activities seems harder to find; there is clearly the potential for both managers and lecturers to wish to impose their own definitions on, and demarcations around, what should or can be seen as scholarly activity.

This brings me to two of the key themes explored by Nicholls in her book. One central issue is the view that academics will not all share a view of what scholarship is, and that this is likely to at least in part have disciplinary elements: scholarship for the physicist or chemist may not match scholarship as understood by an art historian or nurse educator. Another key theme is that of the 'scholarship of teaching', a notion that has been commonly adopted in the UK (eg by the Higher Education Academy, representing academics) as elsewhere. Empirical work is reported showing that academics themselves do not seem to have adopted the term 'scholarship of teaching' and often have no idea what is meant.

Like most of the academics asked in Nicholls' research, this reader was somewhat at a loss to appreciate what exactly this 'scholarship of teaching' might be. My own simple notion of 'scholarship' assumed that learning more about an area of expertise would inform both teaching and research, making it difficult to see what could be meant by a form of academic 'scholarship' just for teaching. Only as I read further in the book

The Challenge to Scholarship: rethinking learning, teaching and research

did I make the distinction between 'scholarship for teaching' and 'scholarship of teaching'. The suggestion is that academics should not only learn more about their subject, but should also study the pedagogy of their subject to make them better teachers. This hardly seems a novel idea, as effective teaching clearly involves a knowledge of subject, of the students, and of pedagogy. Yet in my own professional work this is normally referred to as Pedagogic Content Knowledge (PCK) and teachers of science are said to need PCK as well as the content knowledge of the science itself. My failure to recognise what was meant by 'scholarship of teaching' was a good example of Nicholls' point about how it is unlikely that the Academy will readily share understandings about such issues across disciplinary boundaries.

I would also share concerns about the implications of such 'scholarship' becoming seen as a core part of the academic's work. This is not in any sense to suggest that academics-as-lecturers should not be developed and supported as teachers. If academics are expected to teach and research then they need to be properly prepared for both of these roles. However, we do not consider training in research techniques as 'scholarship for research', so 'scholarship for teaching' surely implies more than providing teacher education for lecturers. If this means continuing to read and reflect upon pedagogic literature (analogous to continued reading and reflection upon methodological literature to support research), then this is clearly important. However, I can see that it is a short step from this, to considering part of the role of the lecturer to be that of researching their own teaching practice. Again, I am hardly against this as an idea which is becoming common in school teaching (and there are many good examples in university chemistry and physics departments), but it has significant consequences.

If it becomes expected that all lecturers should be practitioner-researchers, supporting their reflection upon teaching practice with research, then this can be undertaken in two ways. Either this is seen as a relatively unproblematic activity facilitating evidence-based practice, and physical science lecturers squeeze in some research into their teaching as enthusiastic amateurs alongside their professional science research; or it is recognised that educational research is a specialised domain, with its own knowledge base and methodologies, and so lecturers spend time developing theoretical understanding to support this activity, train as educational researchers, and then plan and carry out rigorous research into teaching and learning in their courses. The costs here are as clear as the potential benefits. In some European countries it is quite usual for quality research in science and in science pedagogy to take place in the same departments. With a few exceptions, this has not been the tradition in most English universities. I am aware of one country where the government decided a few years back that lecturers in physics and chemistry departments should undertake pedagogic research. One result has been a great number of very poor quality studies being submitted to, and rejected by, education journals. These papers have been written by academics who presumably have professional training to undertake rigorous research in the physical sciences, but have limited appreciation of the demands of working in a very different discipline. This would not be a sensible direction to follow. Nicholls does well to raise some uncomfortable issues that need to be aired across the Academy.

The Chemistry of Polymers

Subject area
Polymer Chemistry

Description
An introductory text book on polymer chemistry, ideal for a broad introduction to the subject area

Authors
John W Nicholson

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

Date/Edition
2006/3rd Edition

ISBN
0-85404-684-4

Level
Undergraduate, research, teachers

Price
£28.95

Marie Walsh,
Department of Applied Science,
Limerick Institute of Technology,
Limerick,
ROI
October 2006

Summary Review

range: * poor to ***** good

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

This is the third edition of a popular introductory text on the chemistry of polymers. It comes eight years after the second edition, and its content reflects changes in our knowledge and understanding of polymers in that time. The original text was intended to inform new graduates and also educators who may not have had previous opportunity to study this increasingly important area of materials science or chemistry. However, the author acknowledges that it is now a reference text on many undergraduate courses and there is nothing in the style that suggests that it would be too difficult for undergraduate reading. Indeed the compact size and page count make it a more attractive and less challenging read than some of the other 'introductory texts' in the subject area.

The book comprises eleven chapters, which give an introduction to various topics and include updates from previous editions, as well as one completely new chapter on dendrimers. It begins by placing the historical development of the concept of macromolecules and outlining the structure and properties of nineteen different types of polymer. Structural formulae provide the illustration: this is not a colourful book and there are no photographs of polymers or polymers 'in action' but that is probably a good thing when describing more modern concepts for which the photography can date very easily. Where necessary throughout the book illustration is in simple black and white and in a size which doesn't detract or distract from the compact text.

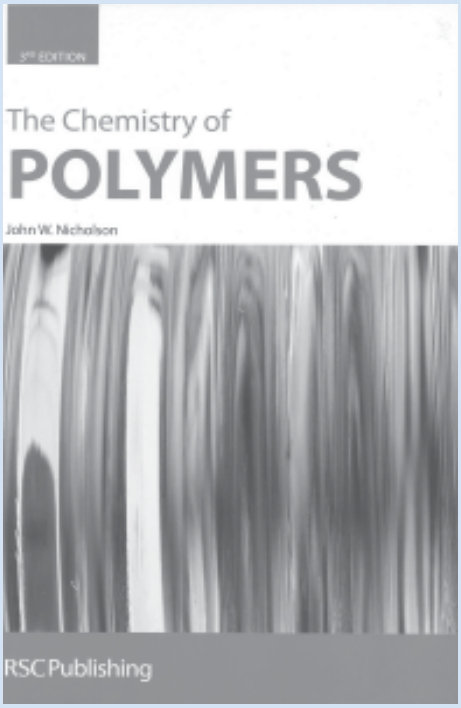
Polymer structures are looked at in more detail in subsequent chapters which introduce stereochemistry, crystallinity and thermal and mechanical properties, followed by descriptions of concepts like crosslinking and polymer solutions.

These chapters are preceded by one which looks at the formation of polymers through different polymerisation reactions and are followed by a brief survey of physical and mechanical properties. Chemical, physical and biological degradation of polymers are considered, but the author also introduces lithography and microlithography as positive exploitations of degradation.

There is a sense throughout that this text is intended to inspire the reader to want to find out more about the whole subject area. To this end some of the chapters finish with suggestions for further reading and there is a two page bibliography of recommended reading at the end of the book.

New material from previous editions has been introduced into the chapters on 'Polymers and the environment' and 'Special topics in polymer chemistry'. The latter includes uses in medicine, electrical conduction, liquid crystals, among other state-of-the-art concepts. One completely new chapter deals with the rapidly developing subject of dendrimers, including information on their characterisation and applications, again illustrating the author's endeavours to make this book as up-to-date as possible in the time between production and printing.

The Chemistry of Polymers



From the publisher...

The Chemistry of Polymers
Third Edition

By J W Nicholson, University of Greenwich, UK

Chemistry of Polymers, Third Edition, is a well established and highly readable introductory text book on polymer science, ideal for chemists requiring a broad introduction to the subject. Like its predecessors it has been written primarily from an applications point of view, emphasising practical applications and providing a comprehensive introduction on all aspects of polymer science including polymer synthesis, characterisation, reaction kinetics and materials science. Specialised topics such as polymer degradation, polymers and pollution and a variety of technological developments are also discussed in an informative and up-to-date manner.

0-85404-684-4 212pp 2006 £28.95

The Chemistry of Polymers is an informative introductory text, with an easy to read style, which achieves its objective of providing a current overview of this branch of materials science. One would imagine it fitting well into the third or fourth year of an undergraduate programme where the student would already have substantive knowledge of organic and physical chemistry in particular. The chapter on dendrimers includes a section on characterisation which assumes knowledge of a number of instrumental analytical techniques.

It is easy to see why the earlier editions of this book were widely appreciated, not just in reviews but also in sales and in translations into other languages. There can be few topics in polymer chemistry that it does not touch on - albeit briefly. It would definitely be a useful addition to any science library.

As the 'Special Topics' chapter says, "as with all branches of science, polymer chemistry is continually advancing" and it would be difficult to produce a textbook with absolutely all of the latest developments. However, this book provides a sound introduction to Polymer Chemistry and is a good starting point for studies of the materials which have made such a profound difference to modern society.

The Mathematics Companion: essential and advanced mathematics for scientists and engineers

Subject area
General Science

Description
A revision guide and study aid for undergraduate scientists and engineers

Authors
A C Fischer-Cripps

Publishers/Suppliers
Institute of Physics
(www.crcpress.com/default.asp)

Date/Edition
2005

ISBN
0-7503-1020-0

Level
Undergraduate

Price
£16.99

Gren Ireson,
Matthew Arnold Building,
Loughborough University,
Loughborough,
Leicestershire LE11 3TU
September 2006

Summary Review

range: * poor to ***** good

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

This, approximately A5, book aims to serve as both a revision guide and aid to learning for undergraduate students of science and engineering.

The text is split into two main sections: 'Mathematics Essentials' (83 pages) and 'Advanced Mathematics' (112 pages). The author will be well known to many readers via *The Physics Companion* (see Physical Sciences Educational Reviews, vol. 4 No. 2 page 29-30) and as such I was eager to review this text.

The 'Mathematical Essentials' section covers, to varying depths: trigonometry, geometry, functions, differentiation, integration, series, probability and matrices. Whilst one may argue about the 'essential' nature of the material included, or indeed that excluded, the coverage is neat and students will appreciate the one topic on a page approach, for example on page 25 – the 2nd derivative, which makes things easy to find.

The 'Advanced Mathematics' section covers, again to varying depths: differential equations, Laplace transformations, vector analysis, multiple integrals, Fourier Series, complex functions and numerical methods. Again students will find it easy to navigate the text and easy to follow examples.

The preface of the text states that "My own experience of learning mathematics was rather poor, mainly due to the enormous number of side issues, caveats, phrases such as 'clearly' and 'it can be shown' etc that seemed to get in the way of any enjoyment of the subject." Whilst the author does not use the terms 'clearly' or 'it can be shown' I find that this was implied especially in the 'Mathematics Essentials'. This, for me, makes the text more suitable for a revision guide since for a student new to the topic it is difficult to learn from and whilst this text is not intended as a replacement for a traditional text I fear that students will be confused rather than helped on occasions. The following examples may illustrate the point:

On page 7, vectors, having defined $|\mathbf{P}| = \sqrt{|\mathbf{P}_x|^2 + |\mathbf{P}_y|^2}$

tanè is given as:
tanè = $|\mathbf{R}_y|/|\mathbf{R}_x|$before $|\mathbf{R}|$is introduced.

On page 9, trigonometry, the sine and cosine rules are presented but the student is not shown where they come from. This is simple enough and would aid understanding.

On page 11, circle and ellipse, the standard equation for a circle with centre *C(h, k)* and radius *r* is given as:

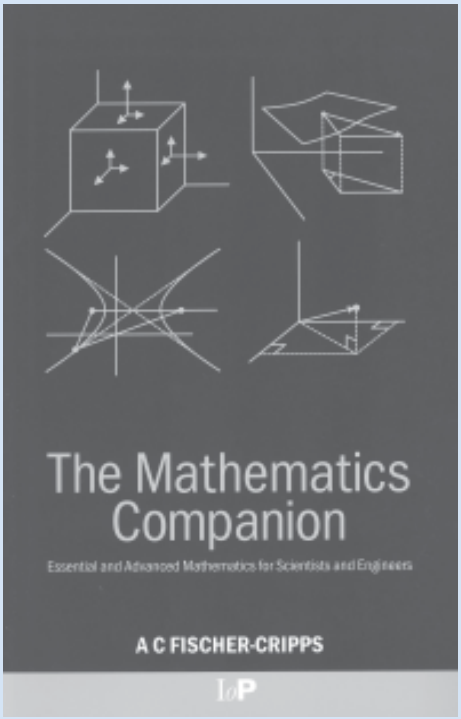
$(x-h)^2 + (y-k)^2 = r^2$

which is obvious enough but the next line states:

"Alternately, the general equation of a circle can be found by expanding the terms to obtain":

$x^2 + y^2 + ax + by + c = 0$

The Mathematics Companion: essential and advanced mathematics for scientists and engineers



From the publisher...

The Mathematics Companion: Mathematical Methods for Physicists and Engineers

By Anthony Craig Fischer-Cripps CSIRO (CTIP), New South Wales, Australia

Following the style of The Physics Companion and The Electronics Companion, this book is a revision aid and study guide for undergraduate students in physics and engineering. It consists of a series of one-page-per-topic descriptions of the key concepts covered in a typical first-year "mathematics for physics" course. The emphasis is placed on relating the mathematical principles being introduced to real-life physical problems. In common with the other companions, there is strong use of figures throughout to help in understanding of the concepts under consideration. The book will be an essential reference and revision guide, particularly for those students who do not have a strong background in mathematics when beginning their degree.

0-7503-1020-0 172pp 2005 £16.99

surely this is one of those 'it can be shown' situations that the authors aims to avoid.

Page 53, trigonometric substitutions, gives the substitution for expressions of the form $a^2 - x^2$, $a^2 + x^2$ *and* $x^2 - a^2$ again all standard fare to us but often not for the student reader. However the author then gives the differential *dè* only for $x = a\sin è$ and not for *acosè* or *atanè* which would complement the expressions given above. Again this seems to be contrary to the aim of the book.

In the 'Advanced Mathematics' section I found fewer issues since we can safely assume more background knowledge and worked examples are used to greater effect. However do look out for the missing –ve before the 8 in the bottom right corner of the matrix on page 100. Finally, and this may just be me, I also find it grating when 'data is' rather than 'data are' is written, as on page 185.

Not withstanding the comments above I would recommend to text, as a revision guide, to teachers and students alike where it would be a useful additional text for any undergraduate course in physical sciences or engineering. Indeed for a pre-university student studying mathematics and hoping to read science or engineering at university this text would prove a good investment since the majority of the Mathematics Essentials will be covered during their pre-university course, I fear I may have lost my copy to my daughter.

The Quantum in Chemistry

Subject area
Physical Chemistry

Description
This book explores the way in which quantum theory has become central to our understanding of the behaviour of atoms and molecules

Authors
Roger Grinter

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

Date/Edition
2005/1st Edition

ISBN
978-0-470-01318-2 (paperback)
978-0-470-01317-5 (hardback)

Level
Undergraduate, research

Price
£35.00 (paperback)
£90.00 (hardback)

Alan Hinchliffe,
School of Chemistry,
The University of Manchester,
Sackville Street,
Manchester M60 1QD
May 2006

Summary Review

range: * poor to ***** good

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

Roger Grinter writes in the Preface “Of the many factors that have influenced the development of chemistry in the second half of the 20th century, none has been more important than the inexorable diffusion across the traditional subject boundaries of concepts, which have their origins in theoretical physics. Students of chemistry and research scientists alike, not only in chemistry, are under continual pressure to assimilate and apply these ideas; quantum mechanics forms a central part of many of them. But the learning is hard, and although there are many excellent books they tend to be written by authors who are by nature theoreticians and whose approach differs from the experimentalist in many ways. I know, because I have been in this position all my working life.”

The author sees his book as a bridge between the two groups. In fact I was in just his position myself when as a beginning PhD student I was told to go away and calculate the coupling constants that I had been measuring in the newly developed field of ESR spectroscopy. I therefore started to read the text with sympathy and high expectations.

Chapters 1 through 4 are:
1. ‘The Role of Theory in Physical Sciences’
2. ‘From Classical to Quantum Mechanics’
3. ‘The Application of Quantum Mechanics’
4. ‘Angular Momentum’

It’s all been done (better) many times before. The present author has attempted to liven up the subject with a few distinctly unfunny cartoons. There is a sad lack of attention to detail; vector notation is sloppy, many Figures are incorrectly labelled (eg Figure B3.4.2 is labelled correctly with ÄE / J × 10^{-20} on the front cover but labelled incorrectly as ÄE (J × 10^{-20}) on page 67), and the general treatment of quantity calculus is confusing. I don’t believe that the Born interpretation applies only to eigenfunctions (p41), matrices are written in a curious way (without braces) and so on. The line diagrams have a distinctly bitmap-amateur look to them, especially where arrows are involved.

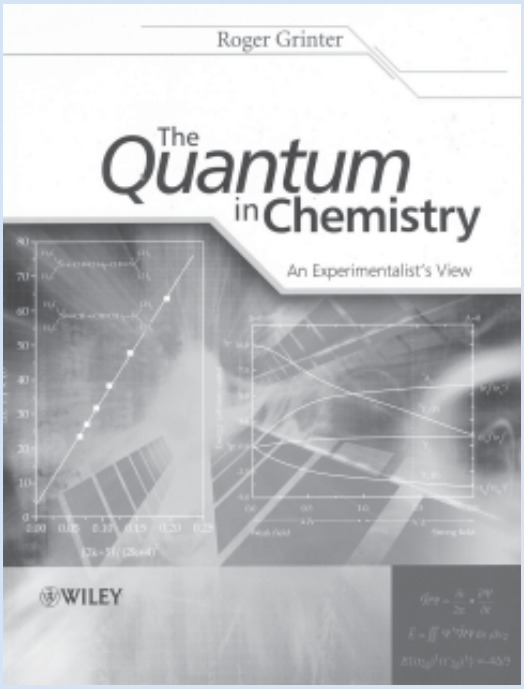
Chapters 5 and 6 are:
5. ‘The Structure and Spectroscopy of an Atom’
6. ‘The Covalent Chemical Bond’

It’s all very 1930s, and in my opinion this is a serious weakness of the book. There is VSEPR, hybridisation, the usual first-year MO treatment of diatomics, a paragraph on ‘The self-consistent field’ and a one-page section 6.18 on ‘Computational Developments’ together with a dated bibliography.

The meat of the book begins on p181, in my opinion.

Chapter 7 (‘Bonding, Spectroscopy and Magnetism in Transition Metal Complexes’) treats crystal field theory and a first year level introduction to ligand fields. Throughout the text, the ‘hard’ bits are presented in boxes and there are a number of Problems at the end of the Chapter. In an interesting twist, the answers to the problems are given on the Grinter family website.

The Quantum in Chemistry



From the publisher...

The Quantum in Chemistry: An Experimentalist's View

By Roger Grinter

This book explores the way in which quantum theory has become central to our understanding of the behaviour of atoms and molecules. It looks at the way in which this underlies so many of the experimental measurements we make, how we interpret those experiments and the language which we use to describe our results. It attempts to provide an account of the quantum theory and some of its applications to chemistry. This book is for researchers working on experimental aspects of chemistry and the allied sciences at all levels, from advanced undergraduates to experienced research project leaders, wishing to improve, by self-study or in small research-orientated groups, their understanding of the ways in which quantum mechanics can be applied to their problems. The book also aims to provide useful background material for teachers of quantum mechanics courses and their students.

978-0-470-01318-2 474pp 2005 £35.00

Chapter 8 ('Spectroscopy') attempts to set the scene for the remaining Chapters, and we meet the usual suspects; electromagnetic radiation, polarised light, selection rules, transition dipoles and so on. It's all breathless; electric and magnetic fields are plucked out of free space, passing mention is made of Maxwell and his famous equations, and so on. I was surprised that so little mention is made of group theory, which after all gives our basic understanding of which electronic transitions are allowed and which aren't.

Chapter 9 ('Nuclear Magnetic Resonance Spectroscopy') seems fine, I would have liked a little on ESR, ENDOR, and the myriad of related techniques.

In Chapter 10 ('Infrared Spectroscopy'), the author breaks his habit of a lifetime and acknowledges that it is indeed possible to calculate IR spectra by (unspecified) *Ab Initio* means.

Finally, Chapter 11 gives an elementary treatment of the electronic spectrum of benzene. The discussion isn't a patch on that given in John Murrell's definitive 1963 volume[1]

Chapter 12 is a collection of three Special Topics; 'The Hückel ð-electron model', 'Magnetism in chemistry' and finally 'The band theory of solids'. The book concludes with a set of Appendices which perpetuate a number of myths; for example:
'in atomic units, the Schrödinger equation for an electron moving in a potential V can be written:

$$\nabla^2\psi + 2\left(E - V\right)\psi = 0,$$

(In case you are wondering, the quantities in the equation are all *reduced* quantities; the physical quantity divided by the atomic unit. That's why so many of my colleagues have trouble with their *Gaussian/03* output).

Oh dear. You will have gathered that I'm a theoretician and not an experimentalist, but I really have serious doubts as to which of my experimental colleagues, spectroscopists or otherwise, would benefit from this book. I would argue that the most exciting and chemically important area where chemists come into contact with the quantum these days is in the field of molecular structure theory. The author has managed to ignore all the progress that has been made over the last 40 years; it's 2006 and we have moved on from the Hückel ð-electron model.

Reference

1. J N Murrell, *The Theory of the Electronic Spectra of Organic Molecules,* Methuen, London (1963)

The Rise of the Superconductors

Subject area
Superconductors, Physics

Description
An introductory text covering scientific principles and scope of superconductivity, the unique properties of superconductors, research, applications of superconductors and the commercial opportunities

Authors
P J Ford and G A Sunders

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

Date/Edition
2005

ISBN
0-7484-0772-3

Level
Undergraduate

Price
£30.99

Summary Review

range: * poor to ***** good

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

The last decade of the 19th to the first decade of the 20th century marked the transition from the classical to the modern era of physics. In a short space of time Röentgen discovered X-rays, Becquerel and the Curies discovered radioactivity and Thompson discovered the electron. On the theoretical front Planck introduced the notion of the quantised nature of energy and Einstein explained the photoelectric effect by supposing that light exists as quantised packets called photons. In the same period Einstein introduced special relativity to heal the rift between Maxwell's electromagnetic theory and Newton's mechanics. A less well-known piece of the revolutionary jigsaw was laid by Kamerlingh Onnes, a Dutchman at Leiden who in July 1908 liquefied helium for the first time.

The drive to ever lower temperatures can be traced back to the work of Humphrey Davy and his assistant Michael Faraday in 1810 working at the Royal Institution in England. Over the intervening century many well known names appear in the story such as Kelvin and Dewer, but so good was Onnes at this sort of work, that after 1908 everyone else withdrew from the field leaving Onnes and the Physics Laboratory at Leiden as the only centre for low temperature physics in the world. This monopoly lasted for around 15 years. In 1902 Lord Kelvin had suggested that while conductivity was known to increase with decreasing temperature, at very low temperatures conduction electrons in metals ought to attach themselves tightly to the latticework of atoms and hence conductivity ought to drop to zero. Onnes and his doctoral student Gilles Holst conducted a set of experiments to test Kelvin's ideas in 1911 using mercury as their working material. Conductivity increased as the mercury was cooled through liquid oxygen, liquid nitrogen and liquid hydrogen temperatures as predicated. However, at liquid helium temperatures the resistance of the sample appeared to become zero. Onnes attributed this unexpected result to an electrical short circuit in his apparatus. It was only after a laboratory assistant fell asleep while controlling the helium cryostat temperature, thus inadvertently allowing the sample temperature to gradually increase, that Onnes realised that there was no short circuit – the electrical resistance of the sample had disappeared. Onnes and Holst had stumbled on a brand new effect – superconductivity.

Ford and Saunders use the first three chapters of their book to tell the story from its beginning up to the present day in an informed and engaging style. They stop off along the way to discuss the interplay of physics discoveries and human affairs. Many authors of physics textbooks either play down or ignore the historical context of their subject matter but this book shows that, done properly, this approach brings the physics to life. The next four chapters discuss the physics of superconductivity from a phenomenological point of view, keeping the mathematical content fairly light. A brief digression into the basic concepts of quantum mechanics keeps the book self-contained. Chapters nine and ten focus on the ever increasing applications of the science of superconductivity. The final chapter briefly summarises the current state of play in push to produce an explanation of the origins of high temperature superconductivity.

Pitched somewhere between popular exposition and detailed textbook, this offering should appeal to anyone with an interest in the development of physics through the last century. It will be of particular interest to students who are taking a lecture course in the subject.

Gary Mathlin,
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University of Bath,
Bath BA2 7AY
October 2006

Undergraduate Instrumental Analysis

Subject area
Analytical Chemistry

Description
An undergraduate or reference text on instrumental analysis

Authors
James W Robinson, Eileen M Skelly Frame, George M Frame II

Publishers/Suppliers
Marcel Dekker
(www.crcpress.com/default.asp)

Date/Edition
2005/6th Edition

ISBN
0-8247-5359-3

Level
Undergraduate, research

Price
£44.99

Marie Walsh,
Department of Applied Science,
Limerick Institute of Technology,
Limerick,
ROI
October 2006

This sixth edition of a popular text has been completely rewritten, revised, and updated, illustrating the latest technologies and applications in spectroscopy, with greater focus on mass spectrometry, and chromatography.

Summary Review

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

It illustrates practices and methods specific to each major chemical analytical technique and also showcases innovations and trends currently impacting the field. Many of the chapters have been individually reviewed by teaching professors giving a sense of authority to the information they contain. There are descriptions of the fundamental principles underlying each technique with demonstrations of the instrumentation and hints for interpretation of results and spectra.

The text is some 1,000 pages in length and each chapter is given enough space to deliver an appropriate amount of information for a reference text. It is designed for students who have no background in analytical chemistry, calculus, physics, or physical chemistry and has a clarity of language and illustration which would be highly beneficial to development of understanding in the novice analyst. Wherever possible a diagram, photograph or illustration, structural formula, spectrum or table is used to illustrate each new topic or principle.

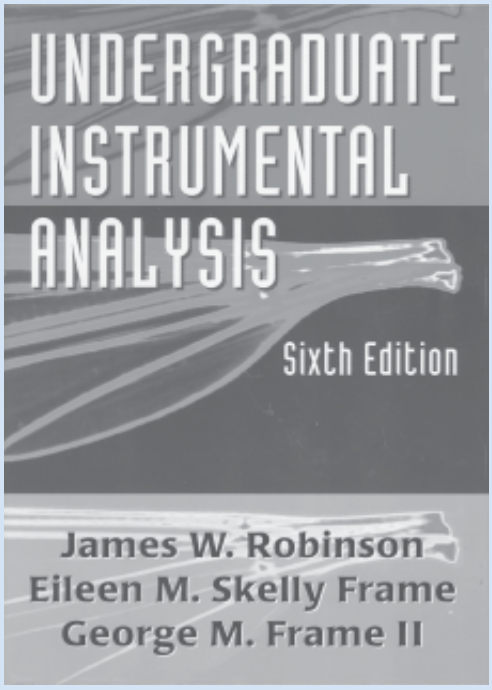
The chapters feature the following aspects of modern instrumentation:

- Concepts of Instrumental Analytical Chemistry
- Introduction to Spectroscopy
- Nuclear Magnetic Resonance Spectroscopy
- Infrared Spectroscopy
- Visible and Ultraviolet Molecular Spectroscopy
- Atomic Absorption Spectrometry
- Atomic Emission Spectroscopy
- X-Ray Spectroscopy
- Mass Spectrometry I: Principles and Instrumentation
- Mass Spectrometry II: Spectral Interpretation
- Principles of Chromatography
- Gas Chromatography
- Chromatography with Liquid Mobile Phases
- Surface Analysis
- Electroanalytical Chemistry
- Thermal Analysis

For each field of modern instrumentation there is consideration of the benefits, limitations, and applications. The introductory chapter surveys the different types of analysis and looks at sampling, sample handling and preparation. It also includes a summary of statistical terms, calculations and errors. Like all the other chapters it concludes with a comprehensive set of problems which act as a means of reviewing and recall for the information in the chapter. There are also questions to test the reader's ability to apply the information read and (hopefully) learned in different theoretical situations. This chapter gives enough information to inspire confidence in the inexperienced undergraduate that they will have ability to cope with learning about and using the different analytical techniques.

Continued on page 56

Undergraduate Instrumental Analysis



From the publisher...

Undergraduate Instrumental Analysis, Sixth Edition

By James W. Robinson Louisiana State University, Baton Rouge, USA
Eileen M. Skelly Frame Rensselaer Polytechnic Institute, Troy, New York, USA
George M. Frame II New York State Department of Health, Albany, USA

Completely rewritten, revised, and updated, this Sixth Edition reflects the latest technologies and applications in spectroscopy, mass spectrometry, and chromatography. It illustrates practices and methods specific to each major chemical analytical technique while showcasing innovations and trends currently impacting the field. Many of the chapters have been individually reviewed by teaching professors and include descriptions of the fundamental principles underlying each technique, demonstrations of the instrumentation, and new problem sets and suggested experiments appropriate to the topic.

0-8247-5359-3 1079pp 2004 £44.99

Continued from page 55

The text includes sections on the use of spreadsheets for performing calculations, 13C and 2D NMR spectral interpretation, magnetic resonance imaging, FT-NMR, SPME, instrumental design, the operation of GC and HPLC interfaces to mass spectrometers, and mass spectrometry applications using ICP-MS. It has expanded from previous editions with twice the amount of text, illustrations, and exercises on chromatographic separations and instrumentation.

Throughout the chapters there are a number of bibliographies, with web-links where they exist. In addition there are lists of spectral databases, which as the authors point out are not complete as many instrument manufacturers offer spectral databases as packages with the instruments. However, they are useful sources of additional information outside the manufacturer's packages. Spectral interpretation is described and illustrated thoroughly for each technique, and the problem sets include examples for further practice where possible. Students are encouraged to learn how to use resources from commercial instrument manufacturers to find solutions to particular separation or measurement problems.

There are also lists of suggested experiments for each technique. These are given in outline only, and a full procedure would have to be sourced for anyone with limited experience, but the instructor or more experienced student could use these as a point of reference for teaching or demonstrating purposes. The authors have produced a valuable text not only for undergraduates but also for practicing analysts who need an introduction to techniques with which they are not familiar. It is a very well produced book which would be a useful addition to any analyst's bookshelf or to undergraduate recommended texts. There is absolutely no doubt that it should be in every library used by undergraduate and graduate analytical scientists but it represents excellent value for money and would be a worthwhile investment for any student. If there were a category higher than 'Good' for each section in the review summary I would have no hesitation in placing it there: this really is an example of excellence in text book production.

Understanding Teaching Excellence in Higher Education: towards a critical approach

Subject area
General

Description
This book provides an examination of teaching excellence in higher education, identifying and examining interpretations of teaching excellence

Authors
Alan Skelton

Publishers/Suppliers
Routledge
(www.routledge.com)

Date/Edition
2005

ISBN
0-415-333328-8

Level
Teacher

Price
£24.99

Summary Review

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

This is a fluently written and very readable contribution to the field, excellently organised and thus suitable for a serious browse or thorough read. I recommend the latter for anyone who wishes to gain an overview of key issues, which are presented with a broad brush but with sufficient depth and supporting references for a fair understanding. Given the current pre-occupation with the book's theme, it will be a welcome resource for many different purposes. It presents a challenging treatment of the bases for awards to teachers, a sound view of professional development, recommendations for research into teaching excellence, and an interesting glance at the influence of the media.

Overall, the book argues for a critical approach to teaching excellence, in contrast with three other dominant approaches that it succinctly describes in Ch.2: the traditional, the performative and the (currently most fashionable) psychologised. (It is a pity this book was not in time to include the recent highly critical review of the last by Coffield et al[1]).

Skelton's 4 models of teaching excellence in higher education, each of which influences perceptions of teaching are:

1. Traditional	2. Performative	3. Psychologised	4. Critical
Impartially objective knowledge delivered by experts. pp.26-29	Knowledge and skills to be learned for economic advancement. pp.29-31	Attention to individual needs and learning styles directs the process. pp.31-32	Undermines epistemological authority and control. pp.32-37

[See "ideal-type understandings", p.24, and Table 2.1 p.35; Chapter 2.]

As the cover suggests, this work makes a good handbook for courses that address teaching and learning in further and higher education. As such, it also offers staff development officers some excellent material for developing critical seminars around general issues such as finding a balance between teaching and learning in the current political context, or specific themes connected with peer observation or promotion criteria. A non-linear perusal might well start with pages 137 - 140 of Chapter 9, 'Professional development and teaching excellence', where Skelton "articulates an understanding of professional development that puts *professionalism* at its centre" [Skelton's italics] p.137.

Many different interpretations of the term 'excellence' are covered, though I would have liked to see these linked to a similar deconstruction of 'quality' as in 'quality assurance'. And I would have wished for a stronger warning about the danger of putting teachers or teaching in a straightjacket. But I chiefly missed a clear analysis of some different terms scatted throughout the book, principally 'pedagogy', 'pedagogical assumptions', 'teaching', and 'practice'. Nevertheless, being heavily based on surveys of what teachers and learners think and believe, as well as on pithy explanations of current policies, the book rings broadly true to me.

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September 2006

Understanding Teaching Excellence in Higher Education: towards a critical approach

trans –disciplinary, inter-disciplinary and multi-disciplinary factors *locate the contexts of teaching & learning.* (Ch.6 -7, 10) These have a bearing upon an understanding of	
discourses of different disciplines *which place the discipline within the tree of knowledge*. (Ch.5) These affect, but have in fact been created within	- which, when used appropriately in context, take account of **trans –disciplinary, inter-disciplinary and multi-disciplinary factors**
subjects *that have specific needs and goals for teaching & learning.* (Ch.5) These affect decisions about	- thus leading to pedagogic discourses that relate closely to the actual discourse of the subject field in question, ie **discourses of different disciplines**
pedagogy *that deals with the how's and why's of teaching.* This affects	*that is normally sensitive in many respects to differences between* **subjects**
Teaching methods on the ground/in the classroom *which may be partly or wholly virtual.* These trigger generalisations that become codified as **pedagogy**	

Chart 1

Continued from page 57

My own interest in pedagogy, leads me to single out a section of Skelton's conclusions, regarding the "mismatch between official and ordinary teacher and student discourse on teaching excellence. [The former]… either ignores the human potential of teachers or seeks to minimize their limitations through the development of effective systems. In emphasising personal qualities and interpersonal skills, teachers and students appeared to be … restoring the teacher to the heart of the teaching and learning enterprise" [p.175]. Amen to that.

But in my view it is not sufficient to 'restore' the teacher merely as a facilitator of learning [as in the currently fashionable psychologised approach]. It is essential to understand pedagogy in order to appreciate what teachers do. This is a serious gap in all discourse about teaching excellence, and one which I have been attempting to fill in my training courses, particularly *Online Education & Training* at the Institute of Education, and in the resource materials currently being prepared for the Centre for Distance Education of the University of London. I plan to introduce Skelton's work into both of these. To give an indication of how I shall probably do this, I have roughly drafted Chart 1 to show dependencies and influences up and down the ladder as I see them (remembering that all concepts have porous edges). I would like to see institutional case studies, discussions and seminars focus on realities at the bottom, following my own model of pedagogy[2], and aiming then to plot the details of what occurs further up, drawing on ideas from Skelton. Read down the left and up the right. (Chapter and page references are to Skelton.)

References

1. Coffield, F. et al, *Learning styles and pedagogy in post-16 learning - a systematic and critical review*, Learning and Skills Research Centre, UK (2004)
2. Pincas, A., *The 3Ps elaborated for general pedagogic application* (2006) Personal Web page <www.ioe.ac.uk/english/Apincas.htm>

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