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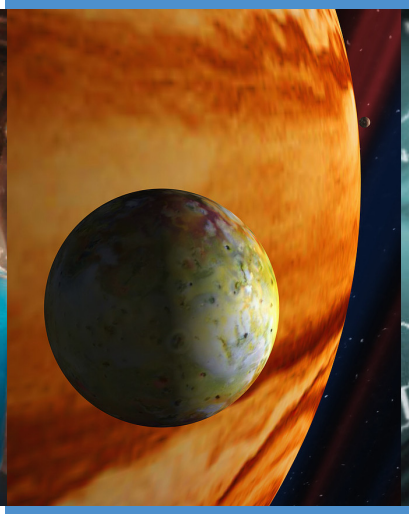
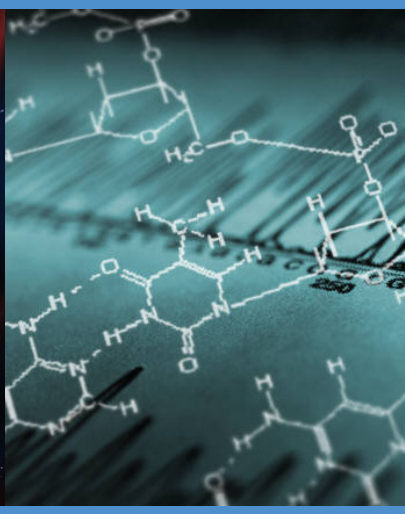

Reviews

A guide to publications in the Physical Sciences

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

Number 17
Volume 9 Issue 2

Reviews

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

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

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

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Editorial

This issue of *Reviews* continues our series of distinctive publications. This one should be easily recognised firstly as one from our 'stable' but also as our 'reviews' journal (but a separate issue to that previously distributed). Don't forget the additional contents page on the rear cover with resources listed by subject area rather than alphabetically.

Again we have a wealth of book reviews, 26 in total, ranging from molecules of murder, nanoscience and SI data, to fundamentals of physics and nuclear physics, plus working one-to-one with students and social networking. There should be a review of interest to all our community.

Roger Gladwin
Editor

In this issue...

Book reviews...

Asymmetric Synthesis – The Essentials

Subject area
Organic Chemistry

Description
This book is a comprehensive text covering key concepts and applications of asymmetric synthesis

Authors
M Christmann and S Bräse

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

Date/Edition
2007

ISBN
978-3-527-32093-6

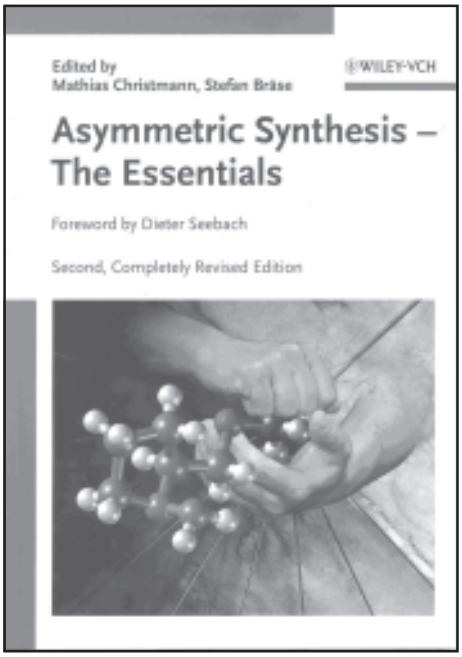
Level
Research, teachers

Price
£70.00

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

The title of this work suggests that it is a textbook, of importance perhaps to a beginning graduate or an advanced undergraduate, covering enough of the essential aspects of the subject to bring a novice up to a level of competency from which meaningful research is possible. Although it achieves the latter admirably, it is far from a textbook, at least in the conventional sense.

Although claiming to cover the essentials, it does not so much present asymmetric *reactivity* (and all of the associated concepts with which students need to become familiar) as asymmetric *synthesis*, in a series of short chapters typically 4-6 pages in length, often written by recognised research contributors to the field. This format, unique amongst similar books of this type, therefore provides concise updates and overviews of most the important developments in asymmetric synthesis, with as broad a range of subject coverage as possible. It is a format which will therefore be as useful to starting graduates looking to enter this field as to experienced practitioners and teachers seeking to keep their knowledge up to date in this rapidly developing field. The book comprises nearly 60 chapters, broadly grouped into three initial sections (chiral auxiliaries, metal-catalysed processes, bio- and organocatalysed processes) followed by two further applications-type sections, namely asymmetric reactions in total synthesis and asymmetric synthesis in industry. It therefore covers all of the well established as well as emerging methodologies, but with a strong emphasis on applications in synthesis, including those conducted at scale. However, the book is not comprehensive, and although there are omissions (for example, not all classes of chiral auxiliary are there nor are osmium-catalysed hydroxylations included), this in no way detracts from the book since the focus on synthesis means a comprehensive coverage of methodologies is not required and is in fact inappropriate. This book is easy to read – the short chapter format permits the reader to dip in when browsing permits – but also provides a fabulous background resource – being useful as a start point before entry into the detailed primary and secondary literature. The latter is assisted since each chapter has bibliography pointing to relevant references.



This is an excellent book, one which will serve a wide audience, finding use in the generation of ideas, as well as project design and execution.

Mark G Moloney
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October 2008

Chemical Structure and Reactivity: an integrated approach

Subject area
General Chemistry

Description
This book is an introductory text with an integrated approach to explaining the fundamentals of chemistry

Authors
J Keeler and P Wothers

Publishers/Suppliers
Oxford University Press
<www.oup.co.uk>

Date/Edition
2008

ISBN
978-0-19-928930-1

Level
Undergraduate

Price
£38.99

Mark G Moloney
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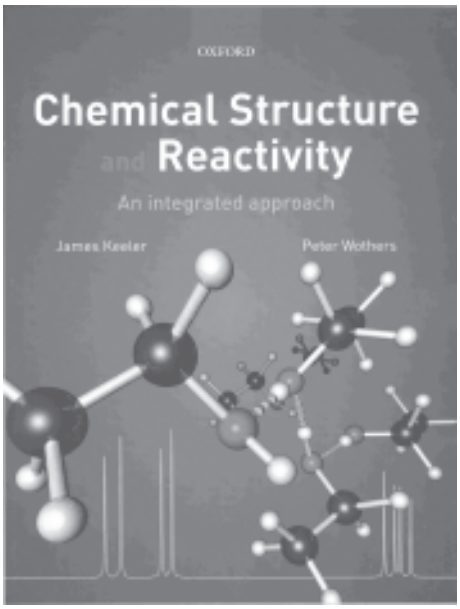
October 2008

Summary Review

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

There has been much made over the last decade of the need to integrate research function with university chemistry departments, but an analogous restructuring of the teaching function has been much slower coming. This book, from the same authors of the successful *Why chemical reactions happen* will act as an important catalyst for this outcome, since it is specifically designed for use as the primary text for a fully integrated first year chemistry course.

As might be expected, it begins with a detailed discussion of fundamental aspects of atomic orbital theory. This leads naturally into molecular orbital theory for both diatomic and polyatomic materials, and then to the bonding in solids. Chapters on introductory thermodynamics and trends in bonding then set the scene for one of the most important chapters in the book: a description of reactivity using orbitals, and its comparison to the widely known curly arrow formalism. This then allows a detailed discussion to be developed for the reactivity of organic compounds based on functional group reactivity, and the initial section of the book ends with a chapter on kinetics. By this stage in the book, all of the necessary fundamentals to understand and rationalise structure and reactivity of organic and inorganic molecules are in place. The remaining half of the book covers spectroscopy, further aspects of structural (isomerism) and reactivity (unsaturated systems) of organic compounds, main group and transition metal chemistry, as well as quantum mechanics, chemical thermodynamics and kinetics, and electrochemistry. The final chapter contains useful mathematical aspects necessary to gain the full benefit of the text.



This is a clearly written and beautifully presented text, which achieves what it sets out to do. It develops an explanation for structure and reactivity in chemistry as a whole based upon a molecular orbital description, coupled to detailed kinetic and thermodynamic and quantum mechanical descriptions of chemical phenomena. However, its use as a standard text in university first year courses is likely to require a significant revision of syllabus and order of delivery of teaching material, and this might prove to be a significant barrier to adoption, at least in the short term. In the longer term, though, it is likely to prove to be a major impetus for change in the introductory year of higher education chemistry courses.

Chemistry

Subject area
General Chemistry

Description
This text focuses on the core chemistry concepts typically taught in Australia and New Zealand

Authors
Allan Blackman, Steven Bottle, Seibert Schmid, Mauro Mocerino, Uta Wille

Publishers/Suppliers
John Wiley & Sons Australia Ltd <www.johnwiley.com.au>

Date/Edition
2007

ISBN
978-0-470-81086-6

Level
Undergraduate

Price
£38.99

Zia Khan
CA151,9/A, Muhammad Hussain Road
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October 2008

Summary Review

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

This book has been written for students in Australasia. The primary goal of this book is to present organic, inorganic and physical chemistry concepts in a manner that is appropriate for the majority of Australasian chemistry courses. In particular, the presentation of the content recognises that, in Australasia, organic chemistry is a major component of the typical first year curriculum and, accordingly, organic concepts are introduced early and integrated throughout the book. The book is divided into twenty six chapters, however these can further be divided into three groups; ie, most of Chapters 1 to 14 can be related to physical and inorganic chemistry, 15 to 24 to organic chemistry.

The first chapter, 'atom', describes the fundamental theories with nice photographic illustrations along with portraits of some great scientists. All experiments covered are described using attractive and colourful models. The second chapter describes the language of chemistry where systems of units, uncertainties and significant figures, chemical formulae, drawing structures along with nomenclature and related information are described. Then further details about naming of organic compounds along with attractive figures are given, based on IUPAC. Other chapters are related to chemical reactions and stoichiometry explained with the help of some basic knowledge of chemical equations, mole, empirical formulae and some basic calculations, atomic energy levels, nature of light (wave and particle) along with absorption and emission spectra, quantisation of energy, (energy level diagrams are described with the help of well drawn coloured figures and photographs of some line spectra). Furthermore, the Heisenberg uncertainty principle, quantum numbers, the Pauli exclusion principle, electron distribution and then periodic table and some related phenomena are explained.

In the next chapter, 'chemical bonding and molecular structure' are described, with the help of the hydrogen molecule, bond length and bond energy, ionic bond, Lewis structures, valence shell electron pair repulsion (VSEPR), valence bond theory and molecular orbital theories.

Chapters six and seven are about 'gases, liquids and solids', describing basic concepts like the ideal gas equation, molecular speeds, ideal gases properties, physical properties of real gases, the Van der Waal's equation etc. Then some properties of liquids such as surface tension, capillary action and viscosity, vapour pressure are considered, followed by some description of solids, phase changes, phase diagrams with some relevant examples. Next close-packed structures, crystal lattice and the unit cell are explained with very well drawn and colourful 3-D figures. Other important articles here are X-ray diffraction, diffraction patterns, Bragg's Law, and some useful illustrations.

In the chapter covering 'chemical thermodynamics', state functions, like Gibbs free energy, enthalpy, internal energy, entropy are discussed, followed by the three laws of thermodynamics, and thermochemistry.

Chapter Nine deals with 'chemical equilibria', describing the equilibrium constant, K_c, K_p, and their relationship etc. Other important topics here are the equilibrium constant expressions for heterogeneous systems, equilibrium and Gibbs free energy, the relationship between ΔG and K and thermodynamic equilibrium constants followed by Le Chatelier's

Chemistry

principle, the Van't Hoff equation and equilibrium calculations (with the help of nice illustrations).

Chapter Ten is about solutions and solubility, describing gaseous solutions, liquid solutions (gas-liquid solutions, liquid-liquid solutions, liquid-solid solutions), solubility product and qualitative properties of solutions with the help of figures and vivid illustrations, followed by the 'acids and bases' chapter, initially describing the Brønsted-Lowry equation, conjugate acid-base pairs, acid base reactions in water, strong and weak acids and bases, pH calculations, the molecular basis of acid strength, buffer solutions and acid base titrations, with the help of examples and figures.

The next chapter is about 'oxidation and reduction', where balancing the net ionic equations for redox reactions, Galvanic cells and reduction potentials are described with the help of many colourful laboratory photographs and sketches. After that the content covers other important topics such as thermodynamics of cells, electrochemical decomposition and batteries (lead storage battery, dry cell batteries, modern high performance batteries, nickel-metal hydride battery, lithium ion cells, fuel cells) in an excellent way showing detailed information.

'Coordination chemistry' is the next chapter where some important topics like metals in the periodic table, transition metals, ligands, transition metal complexes (chelate effect, inert and labile transition metal complexes, structures, isomerism) are described, followed by transition metal ions in biological systems, their isolation and purification plus applications of transition metals. Chapter Fourteen is about 'reaction kinetics', where the basic concepts of kinetics are described, followed by rate laws (first order, second order, zero order). After that collision theory, activation energy, Arrhenius equation, reaction mechanisms and catalysts (homogeneous catalysts, heterogeneous catalysts, enzyme kinetics) are described.

From chapter 15, mostly organic chemistry is discussed, starting with the basic concepts of organic compounds such as alkanes, alkenes and alkynes and their reactions. After that there is some description of aromatic compounds (such as structure of benzene, Kekulé's model of benzene, the valence bond model of benzene, the resonance model of benzene and the resonance energy of benzene), followed by chirality, stereoisomers, enantiomerism, naming stereocentres (the R, S system), molecules with more than one stereocentre, optical activity, chirality in the biological world, and synthesising chiral drugs. Other important chapters are about haloalkanes describing the nomenclature, synthesis, nucleophilic substitution (Sn1 and Sn2) and β elimination (E1 and E2), described with nice illustrations. Following this the text covers alcohols, amines and related compounds, describing their physical properties, reactions of alcohols, phenols, ethers, thiols, amines and their physical properties and reactions.

Chapter nineteen deals with 'spectroscopy'. After the basic concepts, some of the major spectroscopic techniques like, mass-spectrometry, IR, NMR spectroscopy are discussed along with basic theory, and applications to organic compounds in a simple and easy to follow way. There is also a helpful section covering the interpretation of IR spectra with many illustrations and proton and carbon 13 NMR spectra.

Other chapters are about aldehydes and ketones, describing nomenclature, physical properties, preparations (Friedel-Craft acylation, oxidation, ozonolysis of alkenes), reactions, keto-enol tautomerism, etc, then carbohydrates, initially describing monosaccharides, amino sugars, the cyclic structure of monosaccharides and conformational representations, followed by reactions of monosaccharides. Other important topics are disaccharides, oligosaccharides (sucrose, lactose, maltose) and polysaccharides (starch).

The next chapters, deal with 'carboxylic acids', 'amino acids' and 'proteins', describing chirality, protein derived amino acids and some common amino acids. After that acid-based properties of amino acids are described along with titrations, isoelectric point and electrophoresis. Other important topics are polypeptides and proteins, the primary structure of polypeptides and proteins, three dimensional shapes of polypeptides and proteins followed by chapter twenty four describing the chemistry of DNA (nucleosides and nucleotides, the structure of DNA, RNA, the genetic code and sequencing nucleic acids).

The next chapter is about 'polymers' explaining the architecture, polymer notation and nomenclature, formation of various polymers, silicon polymers and recycling plastics. The last chapter is about nuclear chemistry, describing nuclear stability, binding energy, gamma decay, positron emission, neutron emission, electron capture, nuclear equations etc. After that rates of radioactive decay along with GM counters are described followed by disintegration series, decay sequences, radiocarbon dating, synthesis of new elements and application of nuclear processes.

Overall this book provides as much help as possible for students due to its easy to follow style, excellent printing, detailed examples, coloured figures and camera photos, research links, exercises and problems. This is almost a self learning book but some continued help from teachers is required. However dividing the 26 chapters into separate sections, eg physical, organic and inorganic would have been a further plus point.

E-learning and Social Networking Handbook: resources for higher education

Subject area
Education

Description
A discussion of Web 2.0 tools for higher education

Authors
Robin Mason and Frank Rennie

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

Date/Edition
2008

ISBN
978-0-415-42607-7

Level
Teachers

Price
£22.99 (Paperback)

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September 2008

Mason Robin and Rennie Frank's, **E-learning and Social Networking Handbook: resources for higher education**, by Routledge is a 194 page text including references and a minimal index.

The book is linked to a blog for user comments and participation: <www.socialnetworking.wetpaint.com>

Summary Review

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

This is a carefully crafted book that lucidly fulfils its major stated goal of reviewing the key issues of social networking as an educational technique. It is about what to many is still the rather mysterious Web2, and comes to the conclusion that the tools Web2 encompasses are challenging us to work in a context of emergent learning design. I plan to use it as required reading in a new online course about Web2 in education.

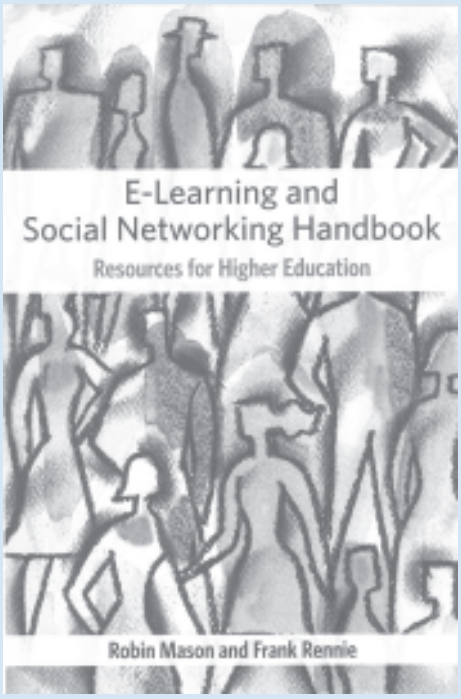
The central core of the book is its Chapter 4, 'The Tools in Practice' pp61-132, where 19 different instances are briefly described, evaluated, and linked to one case study and half a dozen helpful references (Unfortunately many are urls and there is no CD or website to use, so they have to be laboriously typed out). Each Web2 example is rather summarily dealt with in about 4 pages, but the writing is eminently clear and helpful. The following is the list of tools discussed:

> blogs, wikis, podcasts, e-portfolios, social, networking, social, bookmarking, photo, sharing, Second, Life, online, forums, video, messaging, e-books, instant, messaging, Skype, games, mashups, mobile, learning, RSS, feeds, YouTube, audiographics. (p61)

The general academic reader will, naturally, seek guidance on how to use these tools. However, though the book is called a 'Handbook', it does not function as a primer. The chapters surrounding 'The Tools in Practice' are very cogently related to theories of teaching and learning, but leave the reader to decide how to proceed with Web2, if at all. Thus, it is the weakness of this book - as of almost all writing about new technology - that it offers no bridging framework within which to bring together our still quite deeply entrenched traditional concepts of teaching and learning and the new opportunities at hand. Most of us find that talk about teaching transformation, 21st Century needs, millennial students, digital natives, and so forth, tells the non-expert user very little indeed.

It would not have been difficult to attest how the traditional mode of teaching is widely used at all levels, and how useful it is even in these changing times, as I have done <www.ioe.ac.uk/English/index1.htm>. In my in online training courses, experienced teachers are more responsive when encouraged to make links to their current practice, however traditional. Perhaps the authors plan such further development through their blog.

E-learning and Social Networking Handbook: resources for higher education



From the publisher...

e-Learning and Social Networking Handbook

By Robin Mason, Frank Rennie

Student engagement with digital learning resources and online social networking are strong forces in education today. How can these resources best be utilized by educators and course designers in higher education? This book aims to provide the reader with enough background information to appreciate the value of social networking, especially for distributed education. Through highlighting the most relevant, interesting, and challenging aspects of e-Learning the book provides practical advice for using social networking tools in course design.

978-0-415-42607-7 208pp 2008 £22.99

The book's major strength lies in its crystal clear delineation of contentious territory. When the authors deal with the implications of social networking for course design, they review briefly the importance of constructivism, connectionism, learner created content, and the decline of the teacher as omniscient expert, and many other now fairly familiar issues. There is a focus on the advantages and disadvantages of the internet rather than any attempt to promote a viewpoint.

If there is a predominant theme, then – though, for my liking it is not spelled out sufficiently (see especially pp17-22) - it is that we need to re-think the difference between 'content' (the *presentation* for learners of 'knowledge' or 'skills' in text or audiovisually) and 'knowledge' or 'skills' (the uptake by learners of new learning). The now old-style VLEs are based on a perceived need to package content for learners, following pre-set outcomes. By contrast, the new PLE's (Personalised Learning Environments) not mentioned in the book, but see <zope.cetis.ac.uk/members/ple> are learners' constructs with unpredictable outcomes.

We need to link these with networking, and this, in turn, with team-working. Then – even at the risk of taking an economic approach to education – we can ask whether the world we live in primarily needs people who contribute creatively to learner created knowledge and skills in a team. But in the formal, qualifications-lead HE, how shall we assess an individual team-member's contribution? This is the difficulty and it probably needs a significant degree of peer evaluation. Such is just one of the questions raised by this very interesting book.

Electrochemistry

Subject area
Physical Chemistry

Description
This book provides a concise introduction to the fundamental principles of modern electrochemistry, with an emphasis on applications in energy technology

Authors
Carl H Hamann, Andrew Hamnett, Wolf Vielstich

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

Date/Edition
2007/2nd edition

ISBN
978-3-527-31069-2

Level
Undergraduate, research

Price
£50.00

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School of Chemical Engineering and Technology
Harbin Institute of Technology
Harbin
Heilongjiang 150001
P R China
November 2008

This textbook is in its second English edition being completely revised and updated based on the fourth Germany edition written by Hamann and Vielstich. The first Germany and English edition were both published in 1998 with one of the authors, Hamnett, being the translator.

Summary Review

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

The major motivation for revising this textbook was to “offer signposts and the confidence that in an ever-widening groups of disciplines, the skills of the electrochemist will be urgently needed”. Therefore, both classical contents and modern developments of electrochemistry have been incorporated in this textbook to educate young modern electrochemists.

This 531 pages book, richly illustrated with 280 graphs, is divided into 10 chapters.

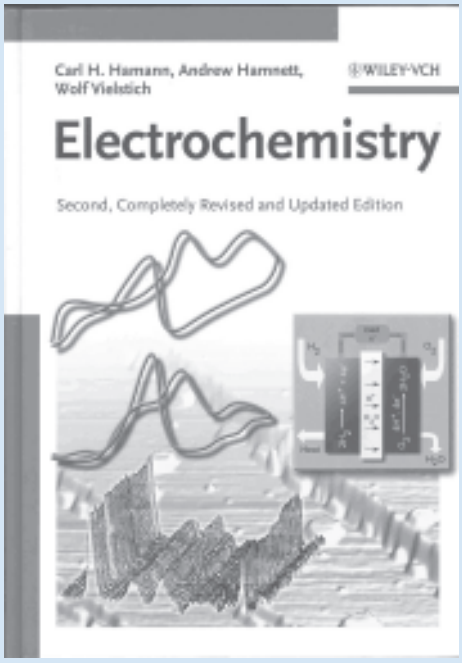
Chapter 1 (12 pages, 6 graphs) is on foundations, definitions and concepts.
Chapter 2 (63 pages, 23 graphs) is on electrical conductivity and interionic interactions.
Chapter 3 (78 pages, 35 graphs) is on electrode potentials and double-layer structure at phase boundaries.
Chapter 4 (93 pages, 50 graphs) is on electrical potentials and electrical current.
Chapter 5 (87 pages, 55 graphs) is on methods for the study of the electrode/electrolyte interface.

These five chapters are the physico-chemical core of the text. Particularly in Chapter 5, many new experimental techniques, besides classical methods, are introduced such as SPM, in situ IR, ESR, electrochemical MS, etc. It is interesting to note that three out of four cover images (SEIRAS curves, CV curves and one SPM topograph) are selected from Chapter 5.

Chapter 6 (41 pages, 24 graphs) is on eletrocatalysis and reaction mechanisms. Updated results on the mechanisms of electro-oxidation of methanol and CO are presented.
Chapter 7 (17 pages, 7 graphs) is on solid and molten-salt ionic conductors as electrolytes. Modern developments in membranes for cells are covered.
Chapter 8 (41 pages, 28 graphs) is on industrial electrochemical processes.
Chapter 9 (51 pages, 33 graphs) is on galvanic cells.
Chapter 10 (10 pages, 19 graphs) is on analytical applications.

The last three chapters, regarding the applications of electrochemistry, occupied about 20% of the whole book. Especially, the chapter on galvanic cells is very clearly written: readers are guided through many types of primary and secondary cells with carefully organised sections and well-illustrated graphs. The efforts of the authors should be appreciated.

Electrochemistry



From the publisher...

Electrochemistry, 2nd, Completely Revised and Updated Edition

By Carl H. Hamann, Andrew Hamnett, Wolf Vielstich

This second, completely updated edition of a classic textbook provides a concise introduction to the fundamental principles of modern electrochemistry, with an emphasis on applications in energy technology. The renowned and experienced scientist authors present the material in a didactically skilful and lucid manner.
They cover the physical-chemical fundamentals as well as such modern methods of investigation as spectroelectrochemistry and mass spectrometry, electrochemical analysis and production methods, as well as fuel cells and micro- and nanotechnology.
The result is a must-have for advanced chemistry students as well as those studying chemical engineering, materials science and physics.

978-3-527-31069-2 550pp 2007 £50.00

There are some suggestions for the book from the viewpoint of a researcher. First, the full title of journal publications could be given for the references listed at the end of each chapter. Second, for some figures such as Fig 6.6 to 6.10, no citations were given. The readers will not be sure whether these figures are unpublished results or not. Third, not enough details were provided in some figure captions, such as Fig 5.9 and Fig 5.10 (single crystalline or polycrystalline Pt samples?). Lastly, the quality of some figures was not very high.

Overall, this is a very solid and useful textbook. I highly recommend it to students and researchers.

Fundamentals of Physics

Subject area
General Physics

Description
This book is an introductory text for physics students with the option of an extended text

Authors
David Halliday, Robert Resnick, Jerl Walker

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

Date/Edition
2008/8th edition

ISBN
978-0-470-04472-8
978-0-471-75801-3 (Extended)

Level
Undergraduate

Price
£39.95
£40.95 (Extended)

Lynn Moran
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University of Liverpool
Liverpool L69 7ZE
October 2008

Summary Review

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

Fundamentals of Physics is designed as a core text book for year 1 physics students, composed of 37 chapters on Mechanics, E & M, Optics, and Thermodynamics with the customary titles. The extended edition contains a further 6 chapters (~200 pages) on Quantum Mechanics. The book has been described by students as bigger and heavier than the phone book, however it can now be purchased in two volumes or in 10 smaller sections. The new 8th edition contains only very minor changes from the previous edition, but approximately coincides with the re-launch of WileyPLUS, the publisher's online resource.

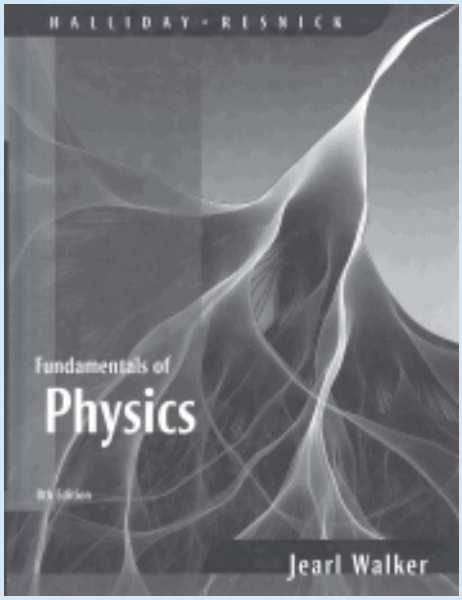
A puzzling situation, with an eye-catching picture and thought provoking question opens each chapter. This is then answered or explained in the chapter, highlighting an intriguing application of the topic. There are some fascinating examples, such as a supermassive blackhole at the centre of our galaxy or how to surf, which are useful as the theme for a lecture. This is followed by a paragraph introducing the topic and placing it in context. However students do not read the book in order, but rather dip into it to look up a particular item (often in a rush).

Chapters also feature so-called 'Checkpoints', which are questions (usually non-quantitative) on the application of concepts. These are designed to catch students' attention, and engage them with the material. The answers are provided, but at the back of the book, allowing the student the opportunity to think it through without the answer immediately in front of them. Sample problems are prevalent with diagrams and a discussion of 'key ideas' by which they mean the underlying concepts and how to set up a solution.

There are ~60 quantitative questions at the end of each chapter with numerical answers to odd-numbered ones available at the back of the book, but I would echo thoughts previously expressed in reviews of introductory text books, that ability to solve these end-of-chapter problems does necessarily lead to ability to apply physics concepts to real-world or even laboratory scenarios. Students are often daunted by the densely packed pages of questions, each several lines long. If they are stuck, they find it difficult to wade through the previous chapter and figure out what to do next, although publishers offer a potential solution in the form of the companion website.

This book (extended edition) has been the recommended text in my department for several years and, despite the integration of real-world examples from Jerl Walker's *Flying Circus of Physics*, students seldom engage with the text other than for the purposes of end of semester exam preparation. There is anecdotal evidence that students in year 2 use it as a reference when they begin new modules, and at that stage find it useful. It is in everyone's interest to encourage students to engage with the material regularly throughout the semester. The companion website offered by the publishers attempts to address this by providing a range of supplements such as a study guide (another review), solution manual (worked solutions to 15% of the material in the book), and 'Interactive LearningWare' (guides the student through problem solutions with some error-specific feedback). There is also a companion website for instructors offering prepared lecture slides (based on the entire book), a

Fundamentals of Physics



From the publisher...

Fundamentals of Physics, 8th Edition

By David Halliday

No other book on the market today can match the 30-year success of Halliday, Resnick and Walker's Fundamentals of Physics!
In a breezy, easy-to-understand style the book offers a solid understanding of fundamental physics concepts, and helps readers apply this conceptual understanding to quantitative problem solving. This book offers a unique combination of authoritative content and stimulating applications.
* Problem-solving tactics are provided to help the reader solve problems and avoid common errors.
* This new edition features several thousand end of chapter problems that were rewritten to streamline both the presentations and answers.
* Chapter Puzzlers open each chapter with an intriguing application or question that is explained or answered in the chapter.

978-0-470-04472-8 1136pp 2007 £39.95
978-0-471-75801-3 1328pp 2007 £40.95

manual (with answers to all questions), java applets of simulations, and questions suitable for tests, homework, and classroom response systems (clickers).

While repeated exposure to the material in a variety of contexts is very positive, the problem is there are so many bits and pieces, it is easy for the lecturer, let alone the fresher to get a distracted, if not completely lost. Another publisher offers the same quantity and variety of material, iteratively improved over the years, but in a format more suitable for both navigation and presentation to students, although the re-launch of WileyPLUS (interactive problems and simulations) shows some promise.

In summary, among the plethora of introductory physics texts crammed on to the shelves, I have found **Fundamentals of Physics** to be better than average due to its layout and the ample supply of real-world examples, but there are better texts available. The level of the book is neither basic enough to really help the less able student, nor challenging enough to push our more able. A view, to which I subscribe, is that if we could find a book to explain concepts introduced in year 1 in a manner accessible to all, any physics lecturer would be happy to expand on the material at the more challenging end of the scale. This is not that book, but it is a good, readable resource for year 1 students.

Introduction to Modern Thermodynamics

Subject area
Physics, Chemistry, Chemical Engineering

Description
This book covers a modern approach to thermodynamics written specifically for a first undergraduate course

Authors
Dilip Kondepudi

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

Date/Edition
2008

ISBN
978-0-470-01599-5

Level
Undergraduate, research

Price
£34.95 (Paperback)
£80.00 (Hardback)

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October 2008

Summary Review

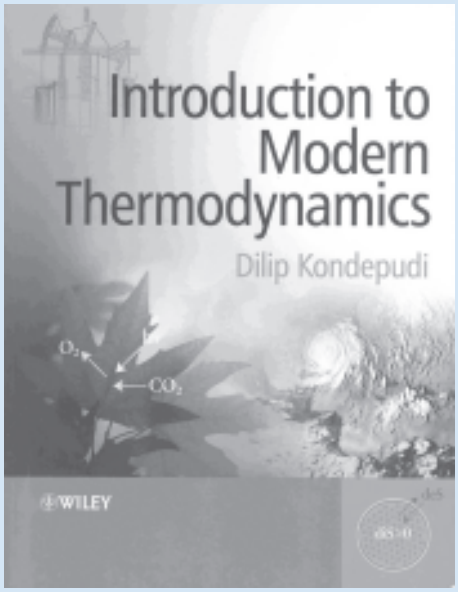
range: * poor to ***** good	
Academic content	*****
Usefulness to student	***
Usefulness to teacher	****
Meets objectives	****
Accuracy	*****

Here is an unusual textbook that seeks to synthesise equilibrium and non-equilibrium thermodynamics, topics that are commonly taught separately as thermodynamics and kinetics. As well as covering the standard thermodynamics material, it addresses in particular how thermodynamic properties change with time. This draws extensively on work of Onsager, Prigogine and De Donder and is the justification for the choice of the word *Modern* in the title. The author is not partisan to chemistry or physics, with topics including chemical and nuclear reactions, radiation and biological systems. It is intended to supplement a semester's course on thermodynamics. While some of the material is introductory and at an undergraduate level, its broad and ambitious scope and conciseness make it more suitable for advanced undergraduate or postgraduate courses.

The first five chapters introduce the main aspects of thermodynamics based around the kinetic theory of gases, the first and second laws, the chemical potential, free energy, and second-derivative quantities. The material is well-organised, if not slightly on the condensed side. Relevant historical background is given to put the content in context eg the Maxwell-Boltzmann distribution, the nature of heat, and Carnot's analysis of heat engines. Inset boxes summarise specific topics such as calorimetric methods, the three kinds of heat flow, and the concepts of extensivity and intensivity. Appendices at the end of chapters describe a diversity of related topics from standard mathematical integrals to the analysis of the wind-speed of a hurricane based on the Carnot cycle. Selections of *Mathematica* code are also given that allow one, for example, to plot the van der Waal's equation of state. Finally, example questions are listed, although worked answers are not provided. This pattern of organisation is repeated in later chapters. Interspersed between the standard thermodynamics material lie a number of ideas less commonly encountered that are required for examining time-dependent processes. The author defines the 'extent of reaction' and a variable called the 'affinity' which is the chemical potential of the reactants minus that of the products. Entropy production as a function of time is then expressed as the affinity times the rate of reaction divided by the temperature. Energy, being conserved, does not change with time. Equlibrium properties are recovered when the time derivatives tend to zero. A distinction is also made between entropy changes internally and entropy changes due to the exchange of energy and matter to and from the system.

Chapters 6-8 cover standard thermodynamic concepts: the entropy of mixing, real gases, equations of state, phase equilibria, ideal and non-ideal solutions, colligative properties, and electrolytes. Chapter 9, however introduces rates of reaction, first and second order reactions, equilibrium constants, detailed balance, the Arrhenius equation, collision theory, mechanisms, and the steady-state approximation. It is Chapter 10 that demonstrates the usefulness of non-equilibrium thermodynamics and shows how the time-dependence of entropy connects with, for example, Ohm's law, Fick's law and the Stokes-Einstein relation. Chapter 11 formalises this in terms of thermodynamic flows and forces, explores the concepts of spontaneous symmetry-breaking and the creation of

Introduction to Modern Thermodynamics



From the publisher...

Introduction to Modern Thermodynamics

By Dilip Kondepudi

This is the first modern approach to thermodynamics written specifically for a first undergraduate course. It covers the fundamental formalism with some attention given to its history; describes basic applications of the formalism and continues with a number of additional applications that instructors can use according to their particular degree program – these chapters cover thermal radiation, biological systems, nano systems, classical stability theory, and principles of statistical thermodynamics. A wide range of examples appear throughout the book from biological, engineering and atmospheric systems.

978-0-470-01599-5 516pp 2008 £34.95

order, and applies these ideas to the famous Brusselator and Belousov-Zhabotinsky oscillating chemical reactions. The next chapters, 12-16, go on to apply these ideas to radiation, biological systems, small systems, stability theory, and critical phenomena. The book concludes with an introductory chapter on statistical thermodynamics and partition functions.

Overall, this book is a refreshing presentation of thermodynamics beyond the traditional syllabi and is an appropriate starting point for those wishing to incorporate non-equilibrium aspects into their courses.

Introduction to Nanoscience

Subject area
Nanoscience

Description
Overview and general text for this specialised branch of multidisciplinary science

Authors
Gabor L Hornyak, Joydeep Dutta, Harry F Tibbals, Anil K Rao

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

Date/Edition
2008/1st edition

ISBN
978-1-4200-4805-6

Level
Research

Price
£39.99

Summary Review

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

The style of the book is weighty and extensive; the presentation is fluid but deals with in-depth coverage across the topics that comprise the field in a manner that is done nicely within fourteen chapters and 856 pages. The book is extremely easy reading for students with an affable line and the genial insertion of dilemmas and contemporary issues. It places the central position of physics, chemistry and biology neatly in the 'folder' that is nanoscience and nanotechnology. In terms of the ease of usage for the teacher, it is refreshing to see a textbook that is written from a biomedical perspective in an area customarily frequented by material scientists and physicists[1,2] and their customary dry writing style. The authors do a very good job at contextualising the field and the reading is made ever more pleasant by the use of magnificent figures of superlative clarity.

The societal impact and value of nanoscience is discussed rather tidily and succinctly and the reviewer was pleased to see it included; when it is customarily omitted. The section dealing with society and its perceptions of nanoscience deals with an invaluable background on ethics versus technical advances, intellectual property and patenting. There is an interesting aside when the book makes reference to the Osaka Bull Sculpture (p 80) that featured in the journal, *Nature* in 2001. However, in addition to nice images the book quite seriously and correctly deals with concerns of toxicology, environmental impact, sustainability and the unease among the public at large with this 'Frankenstein-ian' new science. The book doubles as supporting physics and physical chemistry courses and in this case it is a good investment for the price. The cost of the book at £40 is quite reasonable as a core text, particularly for courses where nanotechnology features strongly.

There are a number of similar books on the market[3], however, the book is particularly good at addressing materials covered piecemeal in many of these books and with unification of them under one cover. The book is a particularly good read in view of its appealing figures, explanatory text, diagrams and that the mathematics is kept at a 'need-to-know' level. The sections, all five of them, are clear and the thematisation used is particularly comfortable to encounter for students. Themes cover areas of, perspectives, nano-tools, physics, chemistry and finally, natural and biosciences. Prerequisite reading and knowledge needed by the reader is a sound pre-university level base in chemistry and physics. The text is written agreeably because the customary high level of mathematical description is kept to a bare minimum and concepts are allowed to be amplified in this way so the text is less daunting to many newcomers.

The book scales the subject matter from nano-crystals (quantum dots) to cell biology and talks about notions of the 'nano-world' both artificial or synthetic and natural. As with many books thoughtfully crafted by subject experts, significant attention is paid to problem sections throughout the text and this has always proved very popular with undergraduates. Sample questions to help students range from, "What is grey goo? Green goo?" to "What is a pi-acid ligand" and on to "Describe the structure of a cell membrane." The problems posed by the authors are masterfully both

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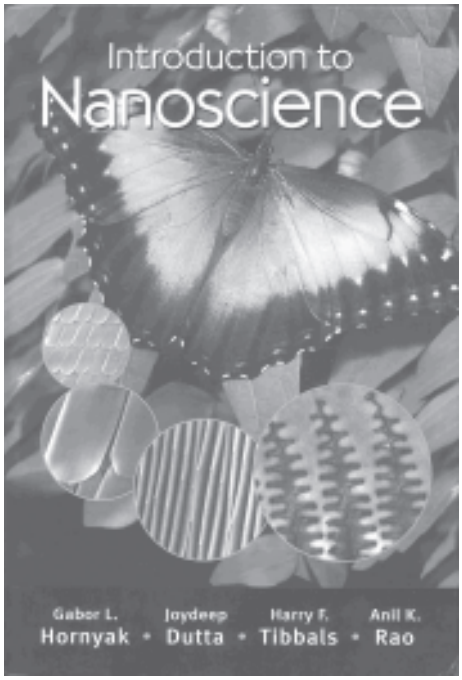
October 2008

Introduction to Nanoscience

fundamental and applied and involve both calculation and essay-type practice questions. Despite the specialised title there is enough subject matter and concept common ground to mean the textbook is always likely to be handy for core course teaching.

The title is specific to an application area of natural sciences consequently, there is little possibility of routine application of the book, for example as a chemistry textbook for a standard chemistry course. However, the range of topics endorsed by Gabor Hornyak et al mean its use for particular courses (covering diverse topics) is the expected path and then ultimately perhaps to application for routine teaching at graduate level. The book covers areas of analytical sciences, methodology, fabrication, gross and atomic-scale structure, thermodynamics, self-assemblies and natural materials. The analytical sections appear at first sight to be limited in terms of interfacial analysis (that are ubiquitously) applicable to the modern form of nanoscience and nanotechnology. These topics without detailed perusal appear to be manifested in terms of energy at the nanoscale (chapter 6), spectroscopy, the Brewster-Angle microscope (p113) and adsorption (chapter 12). On further reading it becomes clear that Gabor Hornyak's treatment of the subject matter means the material is present in entirety but inter-woven within various sections and thus located at the point of context rather than the subject matter that might be found in a particular order, in say a chemistry textbook. A very impressive chapter is the one dealing with the scanning tunnelling (probe) microscopy and the related atomic force methods. There is also excellent treatment of scanning electron microscopy and micrographs and at the same time it was interesting on a personal level to see the inclusion of the quartz crystal microbalance (quartz crystal resonant sensor) as a form of 'standard method' for interfacial study alongside the Langmuir-Blodgett methodologies.



The fabrication methodology section is well written and presents clear details of a range of methods on difficult topics in light of continual new discoveries and a rapidly evolving branch of scientific disclosure. Themes such as top-down and bottom-up (piece assembly), and supra-molecular assemblies are mentioned with appropriate weighting.

Supramolecular chemistry dealing with micelles, vesicles, natural colloids and single walled nano-tubes (SWNTs) and related Bucky balls and geometric systems is superbly written. The section on structure and crystallinity is dosed with liberal amounts of energetics, the theory of interfaces, liquids and theory on solids even at the atomic and molecular level (nanothermodynamics, p384); just as would be expected from a tutor. The book deals swiftly but cogently with concepts of the material continuum and the nano- (quantum) perspective and as might be expected discusses and explains the Schrödinger equation at comfortable depth for the newcomer. The text additionally deals with the notion of one-dimensional materials (quantum wires, p369) and nano-whiskers. Inclusion of Table 8.2 greatly impressed the reader since this represents an excellent attempt at minimalisation and 'de-clouding' of sometimes unnecessary and over zealous use of equations to suit the multi-disciplinary reader. This is also exemplified in the discussion and comparison of the nano- and macro-world.

A textbook covering nanoscience would be incomplete without a section on carbon-based nanostructures and the obvious contemporaneous inclusion of treatment on fullerenes, SWNTs and diamondoids is fully expected in a textbook of such superlative quality. The book then navigates through a difficult conceptual area of pi-interactions (p515), dative bonds (useful for biological and pharmaceutical scientists) and the hydrophobic effect (p533); that is critical to drug encapsulation[4] and vesicle or cell membrane function and binding or product stability. The book makes a great attempt to compare soft-matter with hard-matter (Table 11.3) and discusses supramolecular systems that find current applications, such as macrocycles (p565) and dendrimers (p572). These areas themselves are branches of nanoscience that are growing rapidly year-on-year.

Basic treatment of micelles and surfactants as a technological device is good but compounded further since the book also discusses strategies used as part of fabrication, such as those of Jean-Marie Lehn for supramolecular materials. The section on polymer types and synthesis (chapter 12.4) is needed and essential to nanotechnology but (unfortunately), in the eyes of the reviewer, too brief in such an extensive

Continued on page 16

Introduction to Nanoscience

Continued from page 15

survey of other themes. However, the reviewer was a little surprised to see little reference to nanomedicines or the drug applications of nanotechnology as this is a current area of huge economic and international regulatory interest. There is an occasional reference such as in Figure 12.39 to this subject matter and one must not be too critical as the authors do an excellent job in trying to squeeze a vast amount of information into such a student-friendly short textbook.

Chapter 13 deals with nanomaterials such as minerals and clays and then goes on to discuss natural biomaterials such as, exoskeletons and chitin. This was really appreciated by the reader by way of presenting a balanced portrait of nanoscience using biological and geological examples to prove that nanoscience is not just something invented in the late 20th century. This treatment also serves to send an important but subtle message to the reader. The notions of photonic crystals and photonic band gaps as applied to butterfly wing scales and the scansors-setae-spatulae of gecko's feet are two areas that have spawned interest in synthetic nanotechnology and the highlighting to the newcomer that some of the best ideas come from nature itself. Biomolecular nanoscience is reserved for the end of the book (chapter 14.2) and includes areas of cutting-edge pharmacological and biochemical research such as cell signalling, ion pumps and ion channels but then this area also refers indirectly to the earlier sections on self-assembled structures mentioned within the book.

There are no glaring errors in the book, in terms of accuracy and the content is excellent, as already mentioned. The sections on surfactants and micelles (11.1.4) and Langmuir-Blodgett films (12.1.1) were scrutinised very much by the reviewer, since these topics relate to the personal subject area of expertise and specialist knowledge. The final findings and overall conclusions were that the section was found to be flawless, succinct and of an ideal content for this general text.

Gabor Hornyak (GLH), Joydeep Dutta (JD), Harry Tibbals (HFT) and Anil Rao (AKR)'s book reflects the author group interests[5,6]. Those interests range from manufacturing through engineering to genetics (GLH), clinical and industrialised process testing and systems control (HFT), biophysics and electronics (JD) and endocrinology and systems biology (AKR) and are clearly alluded to in the book. This adds to the value of the text in light of the typical and rather customary positioning of these types of teaching texts. The intended area of potential use for this text is for those graduates embarking on colloid or material science study and research projects[3,4,6,7] and this of course ties up nicely with the backgrounds of the authors. This book would certainly be used by me personally, as a tutor and students for courses of biophysical, medical and biological sciences. Typical applied areas with these themes include pharmaceutical[8] and biochemical aspects[5] of nanotechnology and nanosciences. The text is primarily recommended for entry into the interdisciplinary field with direction towards undergraduate and postgraduate (eg MSc) specialisms[4,7].

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Learning to Solve Complex Scientific Problems

Subject area
Science Education

Description
This book offers the insights of cognitive scientists, engineers and science educators who explain methods for helping students solve the complexities of everyday, scientific problems

Authors
David H Johnson

Publishers/Suppliers
Routledge (Lawrence Erlbaum Associates) – Taylor & Francis <www.routledge.com>

Date/Edition
2007

ISBN
978-0-8058-5919-5

Level
Teachers, research

Price
£29.99

Summary Review

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

This book aims to provide educators in science technology, engineering and mathematics (STEM) disciplines with a background in recent developments in the theory and the application of complex problem solving. A number of different authors present a variety of theories and applications on the subject throughout the book. The book presents findings from a very active research area and as a consequence some of the chapters present work that is still in early stages. I found the work presented to be very interesting and I look forward to hearing about the progress of the various studies presented in this edition.

The book is divided into three sections each of which examines the problem from a different perspective. The opening section comprises a number of views on complex problem solving from the perspective of cognitive science. This section raises several interesting issues such as the use of computer-simulated scenarios in the study of complex problem solving, the role of working memory in problem solving, the factors which influence multitasking performance, the difficulties in designing representations of complex problems and an interpretation of team problem solving in terms of memetics. There are a range of interesting ideas in this section but as a relative newcomer to this area I found it a little difficult to fully grasp some of the concepts that were presented.

The second section of the book looks at scientific views of problem solving and focuses more on the application of complex problems in STEM Higher Education degree programmes. The issues raised in this section include the practicalities of moving students from simple to complex problem solving and the difficulties involved in this process, the role of information in collaborative problem solving including a consideration of the difficulties students have when presented with a quantity of information which they may have relating to the problem and the introduction of complex and contextualised problems to dynamics courses. The second section also considers the application of complex problem solving to multidisciplinary programmes including the application of problem solving in learning transfer between mathematics and physics, the introduction of an inventive problem solving methodology in the design stage of engineering projects and the use of complex problem solving in interdisciplinary teams. The final chapter of this section considers the issue of gender in STEM disciplines as a complex problem in its own right. I found the second section to be rather useful as it has provided me with a number of ideas which I would like to investigate implementing in my own teaching.

The short third section looks to the future, specifically at what questions remain to be answered. This section is enlightening as it shows the considerable opportunities for further research in the area.

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October 2008

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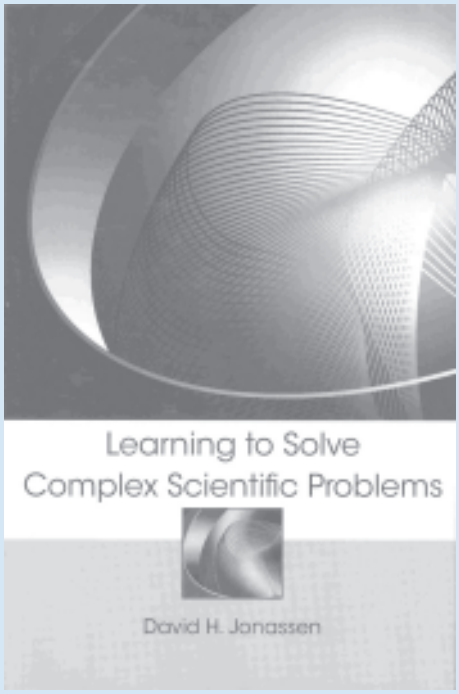
Learning to Solve Complex Scientific Problems



From the publisher...

Learning to Solve Complex Scientific Problems

Edited by David H Jonassen

Problem solving is implicit in the very nature of all science, and virtually all scientists are hired, retained, and rewarded for solving problems. Although the need for skilled problem solvers has never been greater, there is a growing disconnect between the need for problem solvers and the educational capacity to prepare them. Learning to Solve Complex Scientific Problems is an immensely useful read offering the insights of cognitive scientists, engineers and science educators who explain methods for helping students solve the complexities of everyday, scientific problems.

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Continued from page 17

After reading through this text my awareness of the issues surrounding the use of complex problem solving in STEM disciplines has improved. The book effectively presents some very significant concepts that anyone intending on introducing complex problems to their teaching would benefit from understanding. Educators may prefer to read this book by referring directly to the sections that are of most relevance to them rather than reading through the book, there are chapters that will appeal to educators with a wide range of interests.

As the move from simple to complex problem solving in STEM disciplines gains momentum it would benefit most instructors to read some of the points in this text so they can learn from the experiences and thoughts of those who have been involved in the development of these materials for a number of years.

Mass Spectrometry: principles and applications

Subject area
Physical Sciences

Description
This text provides students with a complete overview of the principles, theories and key applications of modern mass spectrometry

Authors
Edmond de Hoffmann and Vincent Stroobant

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

Date/Edition
2007/3rd edition

ISBN
978-0-470-003311-1

Level
Undergraduate, research, professionals

Price
£34.95 (Paperback)
£80.00 (Hardback)

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November 2008

Summary Review

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

The third edition of this popular Mass Spectrometry (MS) text is an adventurous primer for undergraduate students and professionals in the physical sciences. The author Edmond de Hoffmann is a lecturer at the Faculty of Science (Catholic University in Louvain, Belgium) and Vincent Stroobant is an Associate Investigator and member of the Tumour Immunology and Antigen Processing Group (Ludwig Institute for Cancer Research (LICR), Belgium). Both have published several research papers revolving around MS (biological analysis) which have been cited through the course of the text.

This in-depth, 489-page text offers nine chapters of comprehensive coverage of MS. It is an excellent source of qualitative information on MS for postgraduates and professionals in the fields of research. The chapters themselves are differing in length though the topic coverage is sufficient for lecturers and students to understand the basics of this technique. It also acts as a medium to allow professionals to research practical uses of MS. The text discusses the physical chemistry aspects of MS with an intention to provide the reader with a clear understanding of the instrument, and it does so, gracefully.

The text is well organised and begins with an introduction to the subject. The introductory chapter explores the concepts of ions, fragments and charged particles followed by a short history of MS. It details the work of some of the pioneers within the field including Goldstien dating back to 1886, through to the development of the orbitrap by Makarov in 1999. It also provides examples of the resolving power of MS and the feats the technique has risen to. The introductory chapter provides a basis for this gold standard yet complex technique in a very readable form, and sets the tone for the rest of the text.

The early chapters describe the core components of MS instrumentation including the differing ion sources, mass analysers and detectors. The topics are covered in detail, giving accounts of the basis of ionisation, pathways and theories of detection with the practical uses of the instrumentation. The detailed instrumentation is current and readily used within industry and related fields of research.

The text discusses the use of tandem MS and other methods of coupling. The data capturing capabilities - when used in conjunction with chromatography - have been given their due attention, although UPLC and Fast GC coupling have not been discussed. The instrumentation covered in early chapters provides a solid grounding to understanding modern day ion sources, mass analysers, and detection techniques. Subsequent chapters cover the more practical aspects of MS and its uses.

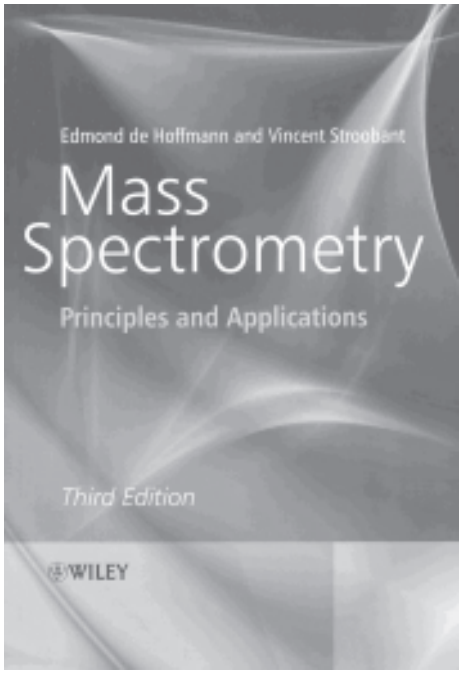
Continued on page 20

Mass Spectrometry: principles and applications

Continued from page 19

The particulars covered in chapter six titled 'Analytical Information' takes into account the procedures involved with structural interpretation in relation to unsaturations and rings, resolution, fragmentation, mass measurement and quantitative data. This chapter houses useful information for the reader and deciphers the spectral data which factors some of the key components in relation to spectral libraries, understanding the resolving power and limitations of instruments, parities, lost neutrals and so forth.

Chapter Seven begins with EI and fragmentation reactions and then delves into Quasi Equilibrium and the Rice-Ramsperger-Kassel-Marcus (RRKM) Theory, fragmentation reaction of ions and remote charge reaction. The final subsection of this chapter is on interpretation of spectral data, which includes examples to enhance the readers understanding of the topic. The chapter that follows is very interesting as it discusses the analysis of biomolecules, is up to date and includes metabolomics. Metabolomics is a relatively new field of 'omics' today and it is of particular interest to this reviewer. This section accommodates biological entities and includes proteins and peptides, oligonucleotides, oligosaccharides, lipids and metabolomics. The bulk of the information in this chapter is dominated by proteins and peptides with due attention given to other sections.



The text concludes with a chapter on exercises and answers thus enhancing the reader's understanding of the area by 'learning-by-doing'. It is particularly useful for students in the field though further reading would be required to thoroughly answer some of the questions. Although the answers provided are complete, readers may want to review other fields of analytics, eg IR spectroscopy.

This is a well versed and scripted applications text, organised with instructive diagrams, graphics and spectral data. The text provides a much needed visual perspective of modern day MS with its ever advancing nature. The illustrations are well documented and easy sighted with excellent readability. Beginners would find this book ideal in order to get to grips with the technique. Prior knowledge of physical chemistry is a *pre-requisite* to understanding this text. At times, beginners may find this text difficult although one will find its use in the plethora of references provided by the authors. The references provide an opportunity to delve deeper into understanding the technique even further. In our opinion, the exercises and answers provide an excellent information base especially in those areas not covered by similar texts.

The text is easy to follow and documented in a way that researcher's and student's alike would find practical. The writing style is straight-forward and the text's notable structure and impressive layout provides a good balance of descriptive and graphical information. The appendices are versatile providing a useful guide to the nomenclature used within the field and modern day acronyms. It also has a concisely presented group of data including isotopes in alphabetical and mass order, isotope abundances and thermochemical data useful to any budding physical chemist. It further includes a list of MS-related textbooks and internet resources. This text has been written with care and due consideration for students, yet it provides good depth for advanced users.

In our opinion, the text largely fulfils the aims set out in the preface and provides a good grounding in the field of MS. Hoffmann and Stroobant have successfully translated this book from French and integrated the latest advances within the field. This is a reasonably priced book and we would recommend it to university libraries, budding scientists within industry interested in the field, and advanced undergraduate and postgraduate students in the physical sciences.

Molecular Electronics: from principles to practice

Subject area
Chemistry

Description
This text provides an informed insight into molecular electronics by contrasting the prospects for molecular scale electronics with the continuing development of the inorganic semiconductor industry

Authors
Michael C Petty

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

Date/Edition
2007/1st edition

ISBN
978-0-470-01308-3

Level
Undergraduate

Price
£39.95

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University of Liverpool
Liverpool L69 7ZD
October 2008

Summary Review

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

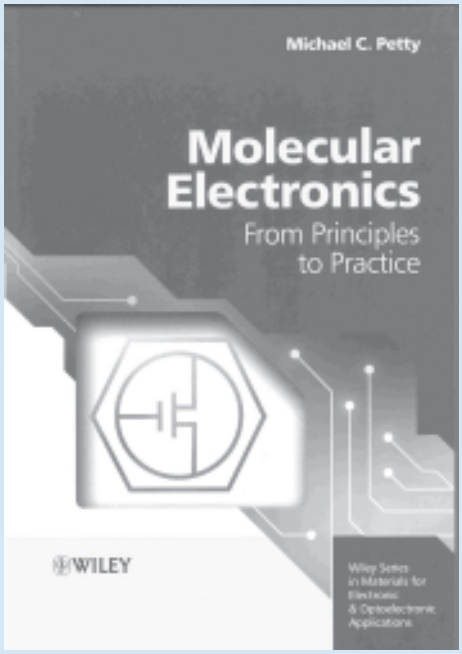
The use of organic molecules and materials in electronics technology has a long history. For example, sophisticated photoactive materials play important roles as resists in the fabrication of silicon chips, and liquid crystals are a key ingredient of display devices (LCDs). The discovery of semiconducting and conducting polymers, however, opened up entirely new possibilities, and the subject now often referred to as 'organic electronics' or sometimes (somewhat confusingly) as 'molecular electronics' began to develop in its own right. The development of organic light-emitting diode (OLEDs) into display devices is reaching commercial fulfilment. As with the earlier LCDs, OLED development is necessarily a multidisciplinary endeavour, involving synthetic and materials chemistry, polymer chemistry and physics, device physics and electronics, circuit design, packaging etc. Yet at present, textbooks designed for advanced undergraduate use, or for postgraduate students embarking on research in this field, are rare. James Tour wrote a very chemistry-focused book, *Molecular Electronics: Commercial Insights, Chemistry, Devices, Architecture and Programming* that basically reviewed his own work and those of his collaborators, back in 2003. A multi-author work edited by Sergey Lyshevski, *Nano and Molecular Electronics*, part of a series on Nano- and Microscience, Engineering, Technology, and Medicines and published by CRC, is also available, but I have not yet seen this, so I cannot make comparisons. I believe other titles are in the pipeline.

Mike Petty's book **Molecular Electronics: from principles to practice** forms part of a series published by Wiley on materials for electronic and optoelectronic applications. Clearly, 'molecular electronics' in the title includes both devices that use the collective materials properties of organic systems, and those that exploit the properties of individual molecules. The book is aimed at final-year science or engineering undergraduates, and is designed to be accessible to a wide readership. This is addressed by opening the book with a series of introductory chapters, covering materials' foundations, concepts in electrical conductivity, optical phenomena and electrochemical phenomena. These occupy roughly the first half of the book. Next, the reader is introduced to spectroscopic and other characterisation tools used in electronics, thin film processing and device fabrication. The coverage chosen is clearly all-encompassing, for the remaining chapters then deal with liquid crystals and devices made from them, plastic electronics, chemical sensors, molecular-scale electronics, and even bioelectronics.

For a single-author work, the book is highly ambitious, and the author is to be congratulated for his courage in undertaking the task of trying to explain everything from bonding and isomerism in alkanes, through space-charge limited currents, to the Fresnel equations! The specifically 'molecular' aspects are mainly put into a wider subject context, because they are discussed alongside more traditional electronics technology. For instance, in the thin film processing chapter, we learn the basics of chemical vapour deposition and electrodeposition alongside molecular beam epitaxy, ink-jet printing and Langmuir-Blodgett methods.

Continued on page 22

Molecular Electronics: from principles to practice



From the publisher...

Molecular Electronics: From Principles to Practice

By Michael C. Petty

This consistent and comprehensive text is unique in providing an informed insight into molecular electronics by contrasting the prospects for molecular scale electronics with the continuing development of the inorganic semiconductor industry. Providing a wealth of information on the subject from background material to possible applications, Molecular Electronics contains all the need to know information in one easily accessible place. Speculation about future developments has also been included to give the whole picture of this increasingly popular and important topic.

978-0-470-01308-3 544pp 2007 £39.95

Continued from page 21

This book would make a useful foundation textbook for a MSc-level course on organic or molecular electronics, and it would make a good reference book for a more specialist MSc or a shorter option-type course in the undergraduate curriculum. I will certainly use it in this way for an option course I give to final-year MChem students.

Since the book is in some respects a personal perspective, the balance of coverage given to different topics sometimes seems odd. For example, the topic of 'plastic electronics' merits about the same number of pages as sensors and actuators, yet arguably, most of the scientific and technological breakthroughs that made organic electronics a subject in its own right have come in the former area, while 'organic' versions of the latter are still largely curiosities.

Perhaps unsurprisingly given the extremely wide subject coverage, a few minor errors creep into the text in places. For example, there is an error in the structure of the liquid crystal molecule in Fig 8.21, and I am not sure that representing the structure of silicon as planar (Fig 2.40) is a good idea, even if the emphasis in this picture is on the surface atoms. I got the impression that better proof-reading would have been useful in places (one small example: 4,4'– and 2,2'– not 4,49– and 2,29– on P349).

Nevertheless, the book is a very useful contribution to pedagogy in this rapidly–evolving area, and I hope the author recoups some financial reward for his efforts.

Molecules of Murder

Subject area
Forensic Science, Toxicology, Criminology

Description
This text explains how forensic chemists have developed ways to detect minute traces of dangerous substances, and explain why some of these poisons are now being researched as possible life-savers

Authors
John Emsley

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

Date/Edition
2008

ISBN
978-0-85404-965-3

Level
Undergraduate

Price
£14.95

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

Style
This book is a must read for students of forensic science. The chapters are written in a popular science style but nevertheless contain enough information of a scientific nature to warrant the book being considered a science textbook. The writing style makes the book both informative and entertaining, what might be described as a 'good read'.

From the perspective of a forensic science textbook **Molecules of Murder** is the right balance between a book on toxicology and an analysis of the use of poisons in crime.

The book contains comprehensive descriptions of the type of poisons commonly used in homicides. Poisoning as a method of homicide goes back to time immemorial and the author, where relevant describes the development of poisons and their use as weapons in many cases by referring to infamous poisonings in history. This is a very effective composition style and makes for easy understanding of the use of poisons in topical, case study type setting.

The case study analysis makes the book useful in other disciplines apart from a pure science and this would be a very good text for use in criminology or other social science based courses. Similarly the good descriptions of forensic criminal investigations would make the text very useful in police training courses. There are some very useful insights into criminal motives and reasoning behind using poison as a murder weapon especially in political murders.

The book has a very good glossary making it a useful reference source. The recommended further reading gives a comprehensive list of references also of great assistance to any student studying forensic science, the law of evidence or criminology.

Requirements
In order to fully appreciate the book the reader will need a reasonable understanding of biology, physiology and chemistry but no more than would be expected of an undergraduate student. The book is in the style of popular science rather than toxicology textbook and while it deals with a reasonably high degree of technical detail it is done in that style rather than in the style of a textbook or scientific journal. As well as the scientific and technical prerequisite knowledge some understanding of criminal history would be of help as would some historical knowledge of medicine.

Accuracy
The book is accurate in its technical detail and contains no errors. Some may disagree as to the culprits in the Litvinenko case (not however this reviewer) but to all intents and purposes the book is free of any obvious errors.

Barry Turner
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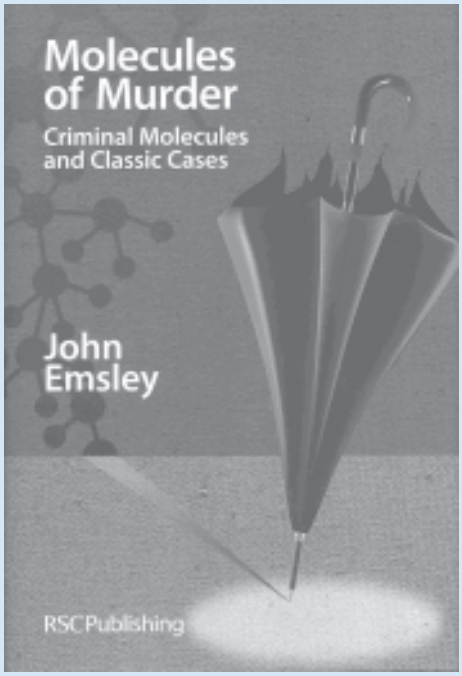
University of Lincoln
Lincoln LN6 7TS
September 2008

Continued on page 24

Molecules of Murder



From the publisher...

Molecules of Murder
Criminal Molecules and Classic Cases
By John Emsley

Molecules of Murder is about infamous murderers and famous victims; about people like Harold Shipman, Alexander Litvinenko, Adelaide Bartlett, and Georgi Markov. Few books on poisons analyse these crimes from the viewpoint of the poison itself, doing so throws a new light on how the murders or attempted murders were carried out and ultimately how the perpetrators were uncovered and brought to justice.

Molecules of Murder will explain how forensic chemists have developed cunning ways to detect minute traces of dangerous substances, and explain why some of these poisons, which appear so life-threatening, are now being researched as possible life-savers.

978-0-85404-965-3 276pp 2008 £14.95

Continued from page 23

I agree entirely with the two reviewers on the back cover of the book. Professor Steven Ley of Cambridge is right in his assessment that the book brings chemistry and true crime together in a fascinating read and Dr Michael Utidjan's comments concerning meticulous research and elegant explanations describe this book very well.

Comparison

Molecules of Murder reminds me of the popular forensic entomology true crime book *Maggots, Murder and Men: Memories and Reflections of a Forensic Entomologist* by the late Zakaria Erzinclioglu BS PhD FRES. Both books bring together the scientific and technical disciplines of forensic science and criminological analysis. Both books should be on the reading list of forensic science courses as well as being in the popular science sections of all good bookshops.

Nuclear and Particle Physics: an introduction

Subject area
Physics

Description
An introductory text covering both Nuclear and Particle Physics for students new to these topics at undergraduate level

Authors
B R Martin

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

Date/Edition
2006

ISBN
978-0-470-02532-1

Level
Undergraduate

Price
£32.50

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

The text sets out to offer a first course in nuclear and particle physics at undergraduate level. The author, rightly in my view, points to the fact that nuclear and particle physics are often taught together as a first course and hence this text does have a market.

The text starts with basic concepts covering symmetry and conservation, Feynman diagrams, exchange particles, cross-section and decay rates. This first chapter would also be suitable background material to those teaching the material at A-level in English schools.

The following three chapters explore nuclear and particle phenomenologies and experimental methods. This gives the reader a solid introduction to binding energy, nuclear instability, leptons, quarks, hadrons, accelerators and detectors. Indeed the first four chapters taken together set out all the groundwork for further study in a logical and readable way.

These phenomenologies are used to develop, over the next three chapters, an understanding of the strong interaction, electroweak interaction and models and theories of nuclear physics. Within these chapters the reader is taken through, amongst other topics, quantum chromodynamics, W and Z bosons, CP violation, alpha decay, beta decay and gamma emission all at a level appropriate to the intended audience and with the mathematical demands skilfully managed.

Chapter eight, of the nine in the text, makes good use of the preceding ones by looking at applications of nuclear physics. Here again the content is well managed and appears to be on a sound pedagogical footing. Given that the applications include stellar fusion, fusion reactors, radiation therapy and MRI it is likely that everyone will find something of interest.

The final chapter addresses outstanding questions and future prospects. This includes unification, supersymmetry, nuclear medicine, nuclear waste and, of course, the Higgs boson.

The author, in his preface, states that the reader should have taken a first course in quantum physics and that a few lectures in relativitistic kinematics would be useful. However the text is also well supported with two appendices which address some issues in both quantum mechanics and relativistic kinematics. A third appendix covers Rutherford scattering in both classical and quantum mechanics.

Chapters one to eight are also supported with appropriate problem sets for which, in the final appendix, full solutions are given. This completes a readable and pedagogically sound text which meets its intended objectives.

Gren Ireson
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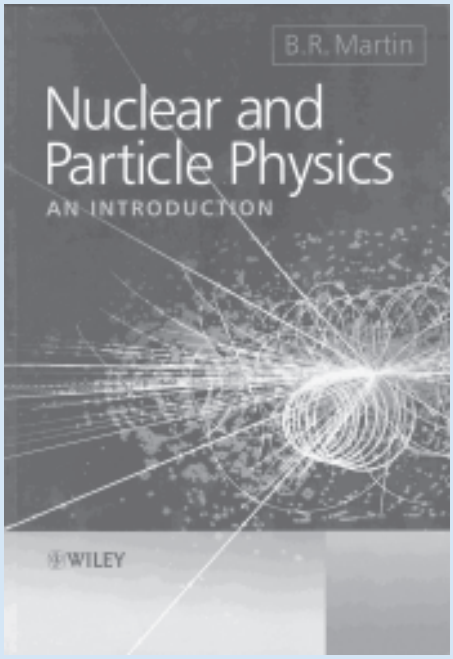
October 2008

Continued on page 26

Nuclear and Particle Physics: an introduction



From the publisher...

Nuclear and Particle Physics: An Introduction

By Brian Martin

Nuclear and Particle Physics is an accessible, balanced introduction to the subject and provides a readable and up-to-date overview of both the theoretical and experimental aspects of nuclear and particle physics. The emphasis is on the phenomenological approach to understanding experimental phenomena.

Chapters are supplemented by an extensive set of problems with full solutions.
Includes Appendices on some topics in quantum mechanics and relativistic kinematics.
An invaluable text for all physics and astronomy students.

978-0-470-02532-1 428pp 2006 £32.50

Continued from page 25

However, all is not how it seems. Given that the text was originally published in 2006 and reprinted with corrections in 2007, the review version is a 2008 reprint, too many errors still exist. The author does provide corrections via, <www.hep.ucl.ac.uk/~brm/npbook> including over twenty five corrections to solutions to problems. Whilst many of these are minor we are all aware of the impact this can have on a student during directed self study.

Whilst thinking of the student I would also take issue with the referencing system used in the text. The author explains at the beginning of the book that references with be referred to in the form Ab95, where Ab is the start of the first authors surname and 1995 the year of publication. If we wish to develop best practice and have our students reference appropriately why not, for example, simply use the Harvard system or a numerical system as per *Journal of Physics G: Nuclear and Particle Physics*?

Given these two gripes I would still suggest that this is a text that would be good for both lecturer and student, provided the lecturer addresses referencing and ensures the learner visits the website.

Nuts and Bolts of Chemical Education Research

Subject area
Chemistry Education and Research

Description
A collection of papers from an American Chemical Society symposium (ACS Symposium Series; 976)

Authors
Diane M Bunce and Renee S Cole (editors and introducing authors)

Publishers/Suppliers
Oxford University Press <www.oup.co.uk>

Date/Edition
2008

ISBN
978-0-8412-6951-4

Level
Research, teachers

Price
£85.00

Summary Review

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

The ACS Symposium Series was first published in 1974 and this is just one of some 435 titles in the Series, the overall aim of which is to provide a mechanism for publishing symposia quickly in book form. The volumes contain only original research papers and original review papers. Each paper is peer-reviewed before final proofs of the book are prepared for publishing. A review panel of thirteen academics from the US and Canada is listed for **Nuts and Bolts of Chemical Education Research**.

As is standard for the Series, there is an introductory chapter which sets the context of the rest of the volumes. Two distinguished chemistry professors, Diane M Bunce of Catholic University of America (CUA) and Renée S Cole of the University of Central Missouri, are the introducing authors and editors of the volume. At the outset they state their objective as being to provide an overview of the field of chemical education research for various interested groups, particularly other chemical education researchers, chemical researchers, chemistry teachers, and funding agencies. They claim that chemical education research is "often misunderstood within the field of chemistry", but that it can add significantly to the knowledge of how we teach and the impact upon learners of chemistry. They include a 'road map' of the themes in the following thirteen chapters, which is based around eight questions:

How do I find out if my students are learning?
How is chemical education research different than just evaluating what goes on in the classroom?
How do I come up with questions to investigate?
How do I get funding for chemical education research?
How do I include an education component in a chemistry grant?
How do I investigate the research questions once I have them?
How can I revise my research manuscript to make it acceptable for publication?
What is expected of me as a chemical educator by the chemistry community?

This serves to make the volume accessible for very specific investigations, eg where to get funds, but it also gives an idea of the usefulness of the book for the different interest groups at which it is aimed. Each question is partially answered by particular chapters.

Overall this is not a light-hearted book and it doesn't give any easy fixes to chemistry educators looking for ways of revising and enhancing their curricula. One cannot help feeling that it would be of most use for beginning researchers and that they would be the target audience who would derive most benefit from the volume. Each chapter has a list of references (as many as 80 in one case) which give a comprehensive flavour of what is in the literature on this relatively young area of educational research. Some of the chapters include figures and charts which is a relief, in some cases, from the turgid text of what are effectively literature reviews of topics.

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ROI
October 2008

Continued on page 28

Nuts and Bolts of Chemical Education Research

Continued from page 27

In Chapter 2, Richard N Zare, defends the usefulness of chemical education research and argues against the quotation from George Bernard Shaw, and the corollary proposed by Laurence Peter,
"He who can does, He who cannot teaches"……..."He who cannot teach, teaches teachers".

This is a thoughtful chapter, in which Zare lists 20 questions which he would like to see addressed by chemical education researchers. If only the rest of the volume had been dedicated to answering these questions it might have been more appealing and practically useful to the working chemistry educator! His advocacy of reflective practice and encouragement of adventurous spirit in trying new methods is inspirational.

The third chapter 'Funding Chemical Education Research' may give some universal guidelines but is more relevant to researchers based in the US or in collaboration with researchers with access to US-based funding.

The questioning theme continues in chapter 4, 'Constructing Good and Researchable Questions', where editor Diane M Bunce guides the intending researcher stepwise to identifying a problem and developing a researchable question to be investigated. The BIG question here has five parts: Is the question worth asking? Is it feasible? Who will be studied? How will it be investigated? What is the potential 'take home' message (result) of the investigation?

In chapter 5, Michael R Abraham justifies the 'Importance of a Theoretical Framework for Research', describing how chemical education research theory can be derived from psychology, sociology, philosophy, as well as chemistry itself. This chapter gives a very useful summary of different theories of education and learning. The importance of the theoretical framework is underlined in the next chapter, which looks at ways in which student understanding of a chemical concept has been enhanced by testing different methods to encourage visualisation. 'The Particulate Nature of Matter: An Example of How Theory-Based Research Can Impact the Field' reviews ways in which educators have promoted understanding of this most fundamental concept in chemistry and physics. Looking at the success of interventions in making mental models for one topic accessible provides a framework for tackling other abstract ideas.

The following chapters get down to the nuts and bolts of research approaches, considering topics like, 'Qualitative Research Designs in Chemistry Education Research', 'Using Inferential Statistics To Answer Quantitative Chemical Research Questions', and then 'Mixed Methods Designs in Chemical Education Research', which describes studies in which researchers use both qualitative and quantitative methods in the same study to balance the strengths and weaknesses of each methodology, claiming that this approach results in more valid and interpretable outcomes.

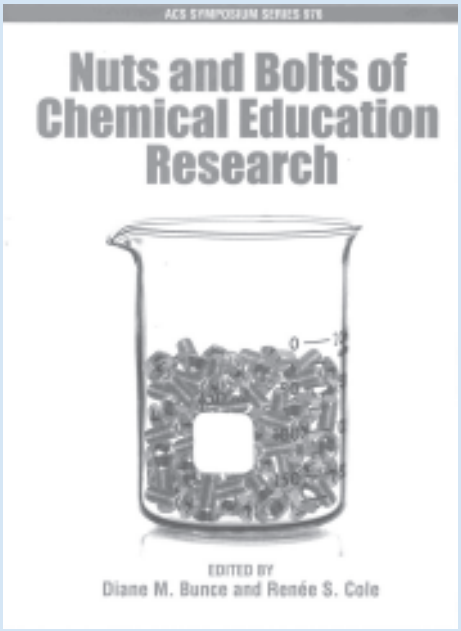
The toolkit analogy continues in the next two chapters, which contain useful ideas for the researcher who has the questions which are driving the research and now wants a framework for the investigation of these questions.

'Designing Tests and Surveys for Chemical Education Research' explains how to design and evaluate surveys and tests by using pencil and paper techniques, including item wordings; use of figures; selection scales; and text layout; and by using the Rasch psychometric model to guide the initial development of instruments, evaluate data-set quality, communicate research results, and conduct longitudinal studies. The model is especially useful in psychometrics, the field concerned with the theory and technique of psychological and educational measurement, and can be used for analysing data from assessments to measure things such as attitudes and personality traits.

'Drawing Meaningful Conclusions from Education Experiments' describes how to avoid pitfalls in producing meaningful conclusions to the research, including confusing cause with effect, overgeneralisation, anecdotal evidence, failure to control for differences in student population, mistaking self-reported learning for actual improvements, and disturbing the test population by the investigation itself.

In Chapter 12, the focus shifts to assessment of student learning and offers guidance to instructors on setting assessment goals, development of guiding questions, use of appropriate methods, and collection and analysis of data. This chapter includes tabulations of a number of instruments and approaches that have been used in chemistry instruction and they have 65 references to both the

Nuts and Bolts of Chemical Education Research



From the publisher...

Nuts and Bolts of Chemical Education Research

By Diane M Bunce and Renee S Cole

Nuts and Bolts of Chemical Education Research is book that would be useful for the chemist who is writing the educational outreach or evaluation component of a grant or planning his own chemical education research project. This book brings to the surface the key elements that are common to both.

978-0-8412-6951-4 248pp 2008 £85.00

literature and to other sources of assessment ideas and tools. The authors exhort the instructor to look for guidance from the research and not to go it alone. This is a theme that is expanded in Chapter 13, which encourages collaboration and briefly describes how chemistry departments can highlight and use chemical education researchers in collaborative projects involving departmental colleagues, faculty from other departments or universities, members of the community, or K-12 school districts. It concludes that all stakeholders benefit, and the collaboration impacts both science and educational research.

The volume ends with a paper on 'Building a Fruitful Relationship between the Chemistry and Chemical Education Communities within a Department of Chemistry', which echoes the theme of collaboration of the earlier chapters but ends by emphasising the importance of communication among chemical education researchers, chemists and other scientists, and any other interested parties.

This is a useful book for anyone interested in how the research process works in any scientific education discipline. It is not a long book but also not an easy book to read for long periods of time and the overall sense of the book can be difficult to grasp on first perusal. It is designed in some elements for the American chemical education community and certain parts may not seem relevant to a European audience, but there is still food for thought, and even action in curriculum design and delivery, in many of the chapters. Chemists involved in education should approach their work as thoroughly as they would any area of chemical research and can only benefit from considering ideas from the education research community.

Physics

Subject area
General Physics

Description
This book helps readers understand the relationships among Physics concepts. Real world Physics applications are presented, to show how Physics principles are in our lives. Highlighted Problem Solving Insights sections explain each calculation in detail, guiding readers through the quantitative process. The 'Concepts at a Glance' charts provide a visual representation of the conceptual development of Physics principles

Authors
John D Cutnell and Kenneth W Johnson

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

Date/Edition
2007/7th international edition

ISBN
978-0-471-66315-7

Level
Undergraduate

Price
£39.95

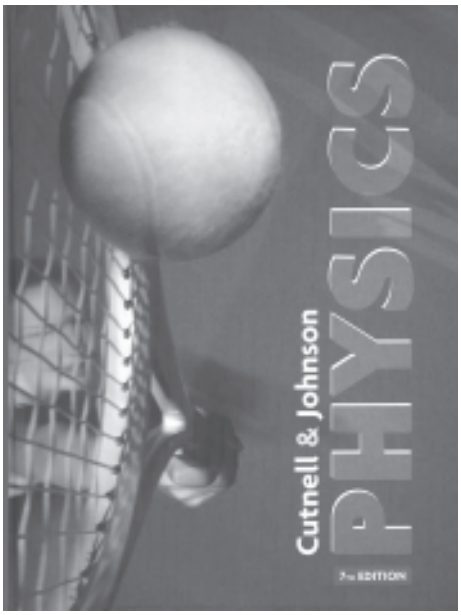
Guadalupe Muñoz
Calle de las Delicias
35 4 B - 28045
Madrid
Spain
October 2008

The concepts are split into several chapters according to the following sequence:
1. Mechanics.
2. Thermal Physics.
3. Wave motion.
4. Electricity and Magnetism.
5. Light and Optics.
6. Modern Physics.

Summary Review

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

The text is clear and concise. The explanations are presented with examples of real life that help students to understand the underlined concepts. It provides students with excellent diagrams and tables. The main authors' objectives are the conceptual understanding, the reasoning, and to show the relevance in every day life of what has been learnt. To achieve these goals, they organise the information in several sections for every chapter. For the conceptual understanding, we have 'Check your understanding', 'Self-Assessment Test' (online), 'Concept simulations' (online), 'Concepts and calculations', 'Conceptual Examples' and 'Concepts-at-a-glance'. For the reasoning, the sections are: 'Analyzing multiple-concepts problems', 'Go' (homework online), 'Interactive learning ware' (online), 'Interactive solutions' (online), 'Explicit reasoning steps' and 'Reasoning strategies'. Finally, to show the relevance, the section is called 'The Physics of…' for many examples.



In addition, students can buy *Physics, Student Solutions Manual*, 7th Edition, and *Physics, Student Study Guide,* 7th Edition as fine supplements. The student solutions manual contains answers to 'selected' problems (roughly 21% per chapter). Also, solved problems and other supplementary material can be found at <www.wiley.com/college/cutnell> for both, teachers and students for free.

One of the new features of this edition is the AMP Examples (Analyzing Multi-Concept Problems). These unique example problems show students how to combine different physics concepts algebraically to solve more difficult problems. AMP examples visually map-out why the different algebraic steps are needed and how to do the steps.

In summary, text and examples are given to ease the understanding, avoiding complicated and obscured descriptions.

Physics of Functional Materials

Subject area
Materials Science

Description
Introductory work with wide coverage of structure and properties of materials

Authors
Hasse Fredriksson and Ulla Åkerlind

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

Date/Edition
2008

ISBN
978-0-470-51758-1 (Paperback)
978-0-470-51757-4 (Hardback)

Level
Undergraduate, research

Price
£50 (Paperback)
£125 (Hardback)

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

Summary Review

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

The only significant problem with this book is its title: a comprehensive coverage of the **Physics of Functional Materials** should include a wider range of materials' responses to stimuli. One looks in vain for piezoelectrics and nonlinear optical materials, or for other classes of functionality such as materials for gas sensors: nor is there coverage of phenomena with significant technological application such as superconductivity and magnetoresistance (either on its own or in its giant or colossal incarnations). A better idea of the book's contents is gained from the explanation in the preface that it was originally intended to provide deeper insights into the material covered in the authors' previous work, *Materials Processing during Casting*, in which aim it is fairly successful.

About one third of the book is concerned with the basic structural and electronic properties of solids. It starts with arrangements at the atomic level, including aspects of real materials such as polycrystallinity, defects and dislocations, and the structures of alloys and melts. The quantum mechanical background is covered next, and gives the necessary information about atomic and molecular wavefunctions and the quantum mechanical nature of vibrations, rotations and transitions. This is further developed in the third chapter in the context of solids, leading to band structure and a discussion of lattice vibrations.

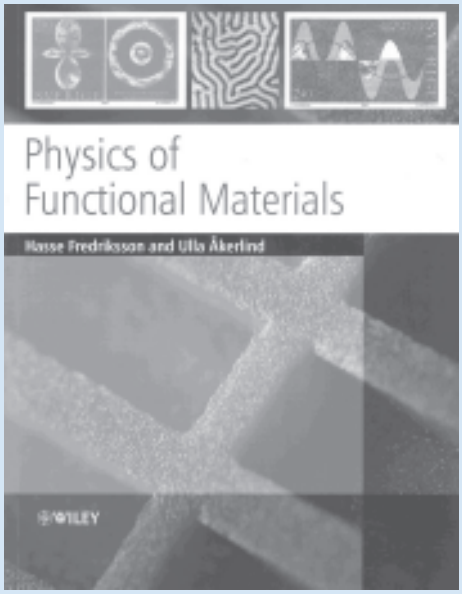
Chapter 4 seems somewhat out of place, being as it is a review of the kinetic theory of gases and a short discussion of plasmas. Its treatment of diffusion provides, perhaps, some useful background to the following chapter on transformation kinetics and diffusion in solids. Here thermodynamics is introduced, leading to the concepts of phase equilibrium. The kinetics of gas-phase reactions bring in activation energies, which are then applied in solid-state processes.

With the background established, there follows one chapter on mechanical, thermal and magnetic properties and one on the transport and optical properties. These cover a lot of material at a rather rapid pace, and space is found for topics which are often not found in books of this kind, such as double refraction. Finally, the properties of liquids and melts are described: most of this chapter would have sat more comfortably earlier in the book, as it comes as an anticlimax after the build-up to and discussion of the functional aspects of solids.

The 480 wide-format (215mm by 280mm) pages are clearly laid out and extensively illustrated. Most of the figures are reproduced from other sources, and even at the rather small size at which many of them are presented some appear as noisy as a fifth-generation photocopy. Each chapter finishes with a summary and extensive sets of exercises: it would have been useful to highlight the summaries more clearly – a simple boxed outline, for example. The level of accuracy is good.

Continued on page 32

Physics of Functional Materials



From the publisher...

Physics of Functional Materials

By Hasse Fredriksson, Ulla Åkerlind

Written by academics with more than 30 years experience teaching physics and material science, this book will act as a one-stop reference on functional materials. Offering a complete coverage of functional materials, this unique book deals with all three states of the material, providing an insightful overview of this subject not before seen in other texts.

Includes solved examples, a number of exercises and answers to the exercises.
Aims to promote understanding of the subject as a basis for higher studies.
The use of mathematically complicated quantum mechanical equations will be minimized to aid understanding.

978-0-470-51758-1 488pp 2008 £50.00

Continued from page 31

The text is relatively free of typographical errors, though inevitably one or two have crept through: something has gone wrong with a power and a subscript in the definition of the Debye frequency in equation 6.65, and the first law of thermodynamics is stated on page 220 as $Q=U+W$ and on page 276 as $Q=U+A$. In the section on magnetism, where units always cause problems, a factor of μ_0 is missing from the expression for diamagnetic susceptibility.

There is a great deal of useful information here, but I can see it being of more use as a supplementary text, or as a source of class exercises, than as the primary resource for a materials science course.

Practical Organic Synthesis: a student's guide

Subject area
Organic Chemistry

Description
This book is a concise guide to good laboratory practice in the organic chemistry laboratory with hints and tips on successful organic synthesis

Authors
R Keese, M P Brändle, and T P Toube

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

Date/Edition
2006

ISBN
978-0-470-02966-4

Level
Undergraduate

Price
£25.95

Mark G Moloney
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University of Oxford
Mansfield Rd
Oxford OX1 3TA
October 2008

Summary Review

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

A high level of competence in practical experimentation and laboratory work is at the heart of organic chemistry; certainly a thorough understanding of the practicalities of organic synthesis is a highly sought after commodity by potential employers. It is perhaps surprising, then, that so little emphasis is placed on this aspect of university education at least when compared to the teaching of what might be called the theory. There are many excellent texts aimed at presenting organic chemistry to a range of audiences, but far fewer for experimental aspects; this book by Keese, Brändle, and Toube seeks to fill this gap, providing an introduction to the mysteries of practical organic synthesis suitable for undergraduates attending this first laboratory course in organic chemistry. Not surprisingly, the book begins with first aid and safety relevant to an organic chemistry laboratory, but pleasingly covers this topic with sufficient detail to make a student aware of what is needed, but without undue emphasis on what might go wrong! The emphasis is on responsible behaviour, rather than an overly bureaucratic approach in which adherence to rules and regulations is the only goal.

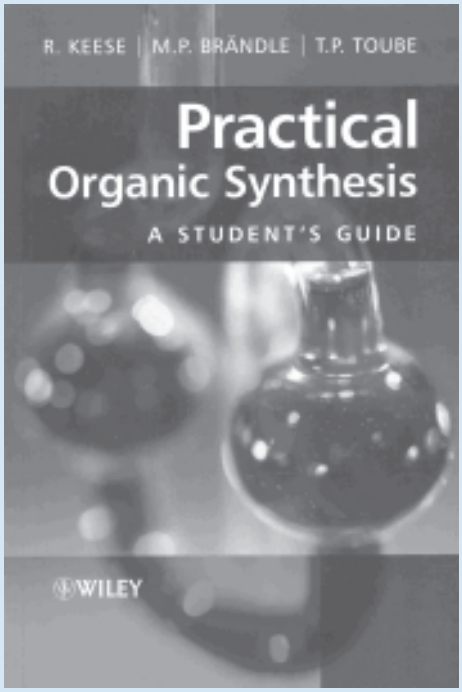
The book then covers, in a series of chapters, key operations for which any undergraduate would be expected to be competent at the end of the laboratory course: these include crystallisation, distillation, chromatography, plus extraction and isolation. The chapters compile lots of relevant information, familiar to any experienced practitioner, but which is often dispersed across a large number of sources and difficult for the beginner to find. These chapters include enough theory relevant to a given technique to help the reader understand the practical application, eg in the chapter on distillation, a short discussion of both the Clausius-Clapeyron equation and Raoult's Law sets the scene for their practical consequences. Structure determination using spectroscopic methods is the next chapter; this is not an in-depth analysis of all of the techniques (IR, UV, NMR, MS) but rather attempts to show the sort of information which can be extracted from each of them, and how in combination they can be used to build up a structure. One worked example is covered in full detail to show how this can be done.

The book then moves to the area of what might be called 'bookkeeping': searching the chemical literature, keeping a lab notebook, and writing reports. The first of these covers electronic databases (*Beilstein*, *Gmelin*, *SciFinder Scholar*, *Web of Science*) and their use in some detail, but also has a section at the end on hardcopy sources; this ordering reflects the relative importance most practitioners place on electronic versus hardcopy source material. Many of us would hardly dream of walking over to the library these days and our students most likely think the same!

The remaining chapters include hints for laboratory procedures for the synthesis of a wide variety of materials, such as the handling of air sensitive materials, or the conduct of reactions at low temperatures. This is information well known to existing practitioners, but of critical importance to those learning, and not so easy to find! A further chapter covers chemical disposal, the purification and drying of solvents, and a glossary of *R* and *S* phrases, as used in EU Poison Regulations.

Continued on page 34

Practical Organic Synthesis: a student's guide



From the publisher...

Practical Organic Synthesis: A Student's Guide

By Reinhart Keese, Martin P. Brändle, Trevor P. Toube

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. Topics covered include:
safety in the laboratory, environmentally responsible handling of chemicals and solvents, crystallisation, distillation, chromatographic methods, extraction and work-up, structure determination by spectroscopic methods, searching the chemical literature, laboratory notebooks, writing a report, hints on the synthesis of organic compounds, disposal and destruction of dangerous materials, drying and purifying solvents

978-0-470-02966-4 208pp 2006 £25.95

Continued from page 33

All of the chapters have thorough bibliographies, and reflect the ethos of the book as a whole, which is not to be comprehensive, but to point students to the many excellent compilations of data which already exist.

This is only a short book, and is by no means a comprehensive practical reference, but is what it sets out to be, and that is an excellent introduction. It is the sort of guidebook which would readily find use in organic laboratory courses.

Reactions and Syntheses in the Organic Chemistry Laboratory

Subject area
Organic Chemistry

Description
This book presents a broad spectrum of modern synthetic methods including full and carefully checked experimental procedures

Authors
Lutz F Tietze, Theophil Eicher, Ulf Diederichsen, Andreas Speicher

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

Date/Edition
2007/3rd edition

ISBN
978-3-527-31223-8

Level
Undergraduate, research, teachers, professionals

Price
£55.00

Summary Review

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

Anyone involved in advanced organic chemistry will welcome this textbook, particularly if their involvement extends to experimental laboratory work. Research groups associated with three of the authors participated in preparation of the experimental sections of the syntheses presented in this book, which is intended for advanced level students and beyond. For each synthesis considered reliable practical procedures are provided, and links are made to synthesis of selected compounds of relevance in biology, pharmacology and medicine.

The original edition of the text was published in German in 1981, with a second edition in 1991. The text has been translated into various languages including Japanese, Russian, Chinese, Korean, and, in 1989, English. As with many translated texts, the language can be a little bit quirky, but that doesn't reduce the overall readability and extreme usefulness of this text. This latest edition is up to date with new preparative procedures and advances in areas like transition metal catalysis, organocatalysis and domino reactions. The authors reckon that more than seventy per cent of the contents of the last edition have been replaced by more recent and more relevant experimental examples, and the remaining syntheses from that edition have been reviewed and updated.

Reactions and Syntheses assumes that its readers have acquired more than elementary knowledge of organic chemistry theory and laboratory techniques. Therefore, although it starts with two pages of abbreviations and symbols, it does *not* include information on safety, first aid, practical procedures for elementary level, instrumentation and standard apparatus, or isolation and purification of compounds. Neither has it elementary information on the formation or transformation of basic functional groups. The authors have alluded to this information being available in other textbooks, but the two to which they specifically refer are in German.

This book is divided into four broad chapters, each with several sub-chapters:
1. C-C Bond Formation
2. Oxidation and reduction
3. Heterocyclic compounds
4. Selected natural products.

Chapters 1, 3 and 4 are longest, with chapter 2 relatively short. The longer chapters have an introductory section which specifies the different procedures and syntheses which they contain. Throughout the chapters there are extensive references to literature on the particular compounds.

The general structure of each sub-chapter is the same. We are given:
- Name of target molecule.
- The molecule's structural formula.
- Topics for which this synthesis is relevant.
- General information about the target molecule, retrosynthesis and planning the actual synthesis, with reaction equations and mechanisms where possible.

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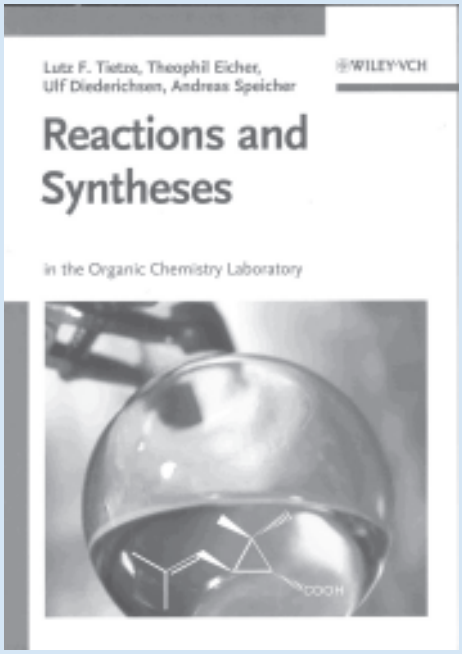
Limerick Institute of Technology
Moylish
Limerick
ROI
October 2008

Continued on page 36

Reactions and Syntheses in the Organic Chemistry Laboratory



From the publisher...

Reactions and Syntheses: In the Organic Chemistry Laboratory

By Lutz F. Tietze, Theophil Eicher, Ulf Diederichsen, Andreas Speicher

Presenting a broad spectrum of modern total synthesis of natural products, pharmaceuticals, heterocycles, C-C bonding and biochemical reactions, this practical textbook readily guides readers to the necessary information. A list of keywords in each chapter and numerous tables summarize the contents, resulting in an excellent overview.
Written with graduates in organic chemistry in mind, this is equally valuable for students and lecturers in chemistry, organic chemists, as well as lab technicians and chemists in industry.

978-3-527-31223-8 598pp 2007 £55.00

Continued from page 35

- The steps of the synthesis are outlined in detail, again with mechanisms and equations. The number of steps performed and the yields are summarised.
- Many additional notes about purification and characteristics of the substrates, including toxicity and safety remarks, are included.
- Characterisation of the product by spectral data is given.
- In some cases, the preparation of derivatives together with their instrumental and chemical analysis is given.
- Each synthesis ends with the list of references cited in each section. These include the primary literature on the synthesis, its steps and topics, articles, reviews and textbooks.

For example, Sub-chapter 1.5 looks at reactions of alkenes via carbenium ions. The first molecule described, over six and a half pages, is Piperine. A list of six topics to which it is relevant is given, including synthesis of natural products, acetal formation by the orthoester method, Lewis acid-induced C-C bond formation by addition of an acetal to an enol ether, acid-catalysed ROH elimination, Knoevenagel condensation and transformation of a carboxylic acid into a carboxylic acid amide.

The detail which follows regarding the piperine synthesis would form a solid basis for an undergraduate project, as would many of the syntheses throughout the book. The clear experimental instructions conclude with the information that the "product crystallizes in well-shaped yellowish needles, which are collected by suction filtration, washed with cyclohexane, and dried; 11.0g (95%), mp 130-132°C, TLC (SiO_2;Et_2O:R_f = 0.40)". One can imagine the feeling of satisfaction in achieving a comparable yield and characterisation!

The chapter on selected natural products emphasises the relevance of industrial organic synthesis in the preparation of substances with important physiological and pharmacological properties, for use in the production of medicinal products, agrochemicals, fragrances and flavourings, etc. Again, as in the rest of the book, there is a wealth of material which could be used in project work for advanced undergraduates.

I thoroughly recommend this textbook for any of its target audience. It should be in every library with collections relevant to students, academics and industrialists with an interest in advanced organic synthesis, and on the personal bookshelves of each of its intended readers as well. It would be an invaluable aid to anyone devising an advanced course in organic synthesis and characterisation.

Science Learning, Science Teaching

Subject area
Science Education

Description
A comprehensive and critical guide for aspiring, new and experienced science teachers

Authors
Jerry Wellington and Gren Ireson

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

Date/Edition
2008

ISBN
978-0-415-43393-8

Level
Teachers

Price
£21.99

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

Science Learning, Science Teaching is an excellent book which brings together the scholarship and practices of modern science teaching and is written with new standards for initial teacher training in mind. It's stated aim is to help teachers to improve and enrich their practice and it is peppered with excellent suggestions, tested in the classroom and rooted soundly in educational theory. The first chapter sets the scene, entitled the 'Art and Craft of Science Teaching' and is full of practical advice not only on the logistics of presenting science but more importantly our use of language, the art of explaining, the use of practical work, concept mapping and perhaps the most important of all generating and maintaining motivation and enthusiasm for science.

Each chapter of the 347 pages is a summary, with helpful examples, of the problems encountered by science teachers every day of their professional lives, the major themes from the literature on the subject and potential approaches and solutions. Each chapter has a useful summary at the end and some excellent references to important work covering the subject area. There is also a fascinating chapter by John Scaife entitled 'Focus on Learning in Science'. He discusses the importance of learning theory and how teaching leads to learning if it is to be successful. There are also chapters on the use of practical work in science and a separate chapter on using investigations. These are very interesting and help one to understand the historical success of the Nuffield approach and its modern incarnations, if I may be permitted to grossly over-simplify, such as Salters' chemistry. A critical, often overlooked area is the use of language in science, to which another chapter is devoted and there is another on numeracy, a subject which has received far more focus but is nevertheless a valuable summary.

The book divides into three themes:
A Science Teaching, the Science Curriculum and the Nature of Science
B Practical Approaches to Science Learning and Science Teaching
C Enriching Science Learning and Teaching

This is the best, and most readable, summary of science learning and teaching I have encountered: I would recommend it to all aspiring and practising teachers. I would also commend it to fellow academics who teach undergraduate science. Having recently begun, for the first time in a long career teaching undergraduate chemistry and environmental science, to teach PGCE science students, I found this to be an invaluable insight. The world has changed much since I taught secondary science for a short time, 25 years ago. It is useful to reflect upon the problems of communicating science and many of themes of this book relate strongly to university science teaching too. The first words of the preface are "there is no substitute for teaching experience and classroom observation" and I think most of us would agree with that wholeheartedly. However, reading this wonderful volume whilst engaging in the above will make the experience all the more valuable and rewarding.

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October 2008

SI Chemical Data

Subject area
General Chemistry

Description
This data book is supplementary text aimed mainly at chemistry undergraduate students and their tutors. The data is selected to be useful for students and teachers involved in tutorial exercises and in practical classes. The extensive listings of chemical hazard information make this text useful for anyone involved in the planning and running of practical classes

Authors
Gordon Aylward and Tristan Findlay

Publishers/Suppliers
John Wiley & Sons Australia Ltd
<www.johnwiley.com.au>

Date/Edition
2008/6th edition

ISBN
978-0-470-81638-7

Level
Undergraduate

Price
£20.99

Colin Kennedy
5 Putsham Mead
Kilve
Bridgwater
Somerset TA1 1DZ
September 2008

Summary Review

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

This text is primarily intended as a teaching and learning aid for undergraduate chemistry courses. It is particularly useful in the design and running of practical classes and as a data set for problem solving in tutorial sessions etc. It would also be useful for similar reasons in sixth form work. The extensive and clearly presented chemical hazard information, easily accessed from the tables of properties, recommends the book to those concerned with the safety aspects of practical classes. Risk and hazard information is further interpreted and expanded in the 46 page appendix. Whilst the authors stress that the book should not replace the safety guidance from official sources, nevertheless it does bring together much information in an easily digestible form.

The tables of data are clear and easily read. A useful aid to the eye in the broader tables is the inclusion of the compound name or formula on both sides of a two page spread. There is usually a short, clear, introduction defining and explaining the terms in the table. Table numbers refer one to a source data list and footnotes give additional information.

It is impossible here to check all the numerical accuracy in the tables but as this is the sixth edition it is likely that errors will be minimal.

The contents, together with any comments, are given below. Except where otherwise stated, the properties of substances are those at 25°C.

1. International system (SI) of units, base and derived.
2. Fundamental constants: from 'CODATA Internationally Recommended Values of the Fundamental Physical Constants, 2006'.
3. Common conversion factors to non-SI units.
4. Properties of the elements included are atomic number, relative atomic mass, density, melting and boiling points, specific heat capacity, thermal conductivity, electrical conductivity, structure, metallic, covalent and ionic radii, and naturally occurring isotopes.
5. Properties of ionic compounds (78 pages), includes formula, hazard code (links to footnotes and appendices), structure, relative molecular mass, colour, melting and boiling points (sublimation or decomposition noted where it occurs), solubility in water (or other behaviour), state, standard enthalpies and Gibbs free energies of formation, standard entropy, standard molar heat capacity, molar enthalpies of fusion and sublimation, and electric dipole (gas phase).
6A. Properties of organic compounds arranged by functional group. This includes hazard (see 5 above), formula, relative molecular mass, density, melting and boiling point, flash point, refractive index, electric dipole (gas phase), standard enthalpies and free energies of formation, standard entropy in the gas phase, standard molar heat capacity, molar enthalpy of vaporisation, molar enthalpy of sublimation, standard molar enthalpy of combustion and acid dissociation constants.
6B. Properties of naturally occurring amino acids. The range of properties is as in Table 6A, plus water solubility and isoelectric pH. Perhaps a useful addition would have been specific optical rotation data. It is not clear whether the pK_a values quoted here and in Table 6A are those appropriate to zero ionic strength (as in Table 20A). If not I think that the applicable ionic strength should be indicated.

SI Chemical Data

7. Some well selected and clearly drawn crystal structures are shown.
8. Shapes of molecules and ions: examples of simple inorganic species are given and illustrated.
9. Average bond lengths for a useful range of single and multiple bonds are given.
10. Bond dissociation enthalpies for a several chemical species in the gas state are tabulated.
11. Average bond enthalpies.
12. Electronegativities of the elements (Pauling scale). The Table heading gives a general description of the relation of these to bond energies, but a defining equation might be helpful here.
13. Enthalpies of melting, vaporisation and atomisation of the elements. A useful introduction to the Table is given. $\Delta_{fus}H$ and $\Delta_{vap}H$ are given at the melting and boiling points respectively. $\Delta_{vap}H$ is also given at 25 °C.
14. Successive ionisation enthalpies of the elements. These are given as ΔH_{298}/MJ mol^{-1}, and a conversion factor to electronvolts is given. The data is quite extensive, with values for elements up to Americium (Z=95). From hydrogen to calcium all possible ionisation enthalpies are shown.
15. Periodic trends in first ionisation enthalpies.
16. Electron affinities.
17. Lattice enthalpies of ionic crystals.
18. Enthalpies of neutralisation.
19. Solubility products. The concept is clearly explained but some further notes on the likely further species existing in solution would be helpful, eg, $Fe(OH)^+$. Also the ionic strength status of the solutions is not defined.

20A. Stability constants of complex ions.
20B. Cumulative stability constants.
21. Standard electrode potentials and redox equilibria in aqueous solution.
22. Dissociation constants of acids and hydrated metal ions. This is a useful selection but the ionic strength of the solutions is not indicated.
23. Common acid-base indicators. The usual properties are tabulated.
24. The ionic properties of water, in terms of electrical conductivity and ionic product are given over a range of temperatures.
25. Molar conductivities of aqueous solutions. Values for a selection of electrolytes are given at concentrations of 0.001M, 0.01M, 0.1M and 1.0M.
26. A useful selection of ionic molar conductivities at infinite dilution is tabulated.
27. The solubility of various gases in water is given over a temperature range from 0°C to 80°C.
28. Ebullioscopic and cryscopic constants for 10 solvents.
29. Critical temperatures, pressures, densities and molar volumes, plus triple point temperatures and pressures are listed for a good range of substances.
30. Vapour pressure and density of water and mercury are tabulated over a temperature range from -10°C to 374.2°C.
31. The densities for a range of solutes in water are listed.
32. Characteristic absorption frequencies (in cm^{-1}).
33. A useful selection of ^{1}H and ^{13}C NMR chemical shifts is given in ppm with tetramethylsilane as reference.
34. Electronic configurations of the elements.
35. Greek alphabet.
36. Numerical prefixes.

In summary, the moderate cost, the ease of use and the extent and clarity of the data recommend this text both to chemistry students, as source material for projects and tutorial exercises, and, to tutors concerned with the planning and safe running of practical classes.

Spectacular Chemical Experiments

Subject area
General Chemistry

Description
This book demonstrates over 80 enjoyable, impressive and sometimes almost unbelievable chemical experiments for the classroom, lecture hall or home

Authors
Herbert W Roesky

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

Date/Edition
2007

ISBN
978-3-527-31865-0

Level
Teachers

Price
£22.50

Summary Review

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

This excellent book by Herbert Roesky is a follow on from his *Chemical Curiosities* (VCH, 1996) and the demonstrations in it appear to be more aimed at a general student or school audience, compared to some of the advanced concepts in the earlier book which make for good undergraduate practical experiments. There does not seem to be much overlap between the two books, and the 80 or so demonstrations that Herbert Roesky describes in the new book cover a very wide range of examples, and are drawn from his extensive experience of giving chemical demonstration lectures both in his native Germany, as well internationally.

Although the author states in the preface the experiments are not presented in any systematic order, they are loosely divided up into seven sections or cycles (water; the colour blue; the colour red; colloids, sols, and gels; fascinating experiments by self-organisation; chemical varieties; the art gallery of chemistry) which gives some structure to the book. In keeping with the earlier book, there is an introductory anecdote or poem for each of the demonstrations. The majority of these are Germanic in origin, and a few seem to have lost their impact either in language or cultural translation. There then follows detailed descriptions of both the apparatus and chemicals required, together with safety information. The experimental procedure is described very carefully, with appropriate additional warnings to follow the instructions exactly as given in safety critical ones. The underlying chemistry behind each of the demonstrations is discussed in sufficient detail for both the demonstrator, and also for them to pass onto the audience. Finally, information is given as to how to dispose of the residues. All of this information is laid out very well, and although I have not yet checked any of the demonstrations myself, the instructions seem to be very clear. It is claimed in the preface that they have all been optimised for this book. In a significant number of cases colour photographs are included to show either how the apparatus is assembled, and/or the demonstration in action. These are very welcome, it is just a slight shame that they are not present for all but the most trivial demonstrations.

I thoroughly enjoyed reading this excellent book and would heartily recommend it for either personal or library purchase as it will be a very good additional resource to *Chemical Curiosities* (VCH, 1996) and *Classic Chemical Demonstrations* (RSC, 1996) for undergraduate, schools and general chemistry demonstrations. Some of them are suitable for large auditoria, but a fair number need the use of fume cupboards/hoods which limits their scope slightly. Whilst many of the demonstrations are familiar to those of us who do chemical demonstration lectures and sessions it is always helpful to see demonstrations presented in a different context, with different emphases or variations. As well as containing its fair share of ‘flashes and bangs’ there are also a good selection of more thoughtful and insightful demonstrations. I certainly intend to make use some of them in the near future.

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October 2008

Structure and Reactivity in Organic Chemistry

Subject area
Organic Chemistry

Description
The text comprises a short overview of the way chemists understand chemical structure (and how that understanding is essential in developing a good knowledge of chemical reactivity and mechanism) plus a mechanistic classification of modern organic chemistry

Authors
Mark G Moloney

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

Date/Edition
2008/1st edition

ISBN
978-1-4051-1451-6

Level
Undergraduate, research

Price
£29.99

Summary Review

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

In the preface, Mark Moloney states that this book is aimed at undergraduates meeting this material for the first time and graduates wishing to refresh their knowledge or coming to this subject area from a related scientific discipline. Writing a book for a cohort with this spread of experience is a tall order but, if it can be achieved, it needs someone like Mark Moloney who has taught the whole spread of organic chemistry in his college tutorials at Oxford. Indeed, when I look at the contents list, I recognise a structure and subject choice not very dissimilar to the tutorials I used to teach across the first three years of the Oxford chemistry course during my days in that city of dreaming spires.

Continuing in the preface Moloney states that his aim has been to highlight the mechanistic rules to demonstrate the high degree of order in chemical processes. With this philosophy and the audience in mind, the book opens with chapters discussing the fundamentals of organic chemistry - bonding, structure and reactivity. These chapters cover the basic toolkit necessary to be able to appreciate organic chemistry and the contents will make up the introductory part of any first year specialist organic chemistry course. Subsequent chapters on reactive intermediates and acidity-basicity would likewise be found in most if not all second year courses. However, although the chapters deal with the basics of the subject, the material goes far further allowing those who so wish to look at these areas at a more profound level. A good example of this is in the chapter on reactivity when Moloney breaks off from a discussion of the effect of temperature on reaction rates to emphasise the difference between kinetic and thermodynamic stability - a distinction lost on so many undergraduates it seems.

The remaining chapters feature reaction classes with the first five covering nucleophilic substitution, addition, elimination, aromatic electrophilic substitution and addition-elimination processes. Once again, this covers first year material but the chapters go much further with a wealth of useful illustrative examples and data tables. The last part of the book has themes on radical reactions, organometallic reactions and pericyclic reactions; these more advanced topics again being treated in a clear manner with lots of examples. Again the material is treated at several levels and so, for instance, in the chapter on sequential addition-elimination processes, not only are condensations at carbonyl groups covered but metathesis is also discussed within this context.

Moloney's writing style is concise but lucid and one has the feeling that his words have been honed over his years of dealing with awkward questions from bright tutees. The only point about the book that jarred with me - and I stress this is just a matter of taste - were the diagrams. These do not stick to a consistent bond length but seem to have been shrunk or enlarged to fit the available space. Consequently, some appear too small for clarity (particularly in the chapter on pericyclic reactions); whereas others appear large and clumsy. There are frequent cases of bonds and atom labels overlapping, lines that don't quite match up and enormous charge signs. It is such a pity that a minor presentational oversight mars what is otherwise an extremely well thought out and well presented book that achieves the author's stated aims and deserves to be on any practising organic chemist's shelf - if not open at the bench or on the desk.

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University of Reading
Whiteknights
Reading RG6 6AD
September 2008

Surface Science: Foundations of Catalysis and Nanoscience

Subject area
Physical Chemistry

Description
This edition of this book has been fully revised and updated to reflect all the latest developments in the field and now includes an extensive discussion about nanoparticle growth and the quantum confinement effects in nanoscale systems

Authors
Kurt W Kolasinski

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

Date/Edition
2008/2nd Edition

ISBN
978-0-470-03308-1

Level
Undergraduate, research

Price
£39.95

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

The first edition of Kurt W. Kolasinski's book **Surface Science: Foundations of Catalysis and Nanoscience** was an almost immediate success and has been described as a 'classic of its time'. It bridged the gap between primer-type textbooks that just cover what is absolutely necessary for an advanced undergraduate course in surface science and those heavy textbooks targeting mainly the research community, which are suited only for the most ambitious undergraduate students. The second, fully revised edition is substantially enlarged with two completely new chapters and new worked examples throughout the book, which increased its volume by more than 150 pages to 486 in total.

The author worked previously in the group of G Ertl, who was awarded last year's Nobel prize in Chemistry for his work in surface science. Kolasinski's current research is in the field of laser-induced surface phenomena and the growth of nanostrcutures on surfaces. Throughout the book he uses examples from his own and Ertl's work in order to illustrate the concepts that he is describing. The book aims at undergraduate students in Chemistry, Physics, Chemical Engineering and Materials Science taking advanced courses in surface science, as well as researchers and professionals, who want an 'up-to-date review of the subject'. It is divided into 8 chapters, each about 50 pages long with a summary of important concepts, suggestions for further reading, plenty of exercises and references.

Chapter 1, 'Bulk and Surface Structure', is a general introduction into the arrangement of atoms, the electronic structure and vibrational modes of clean surfaces. This chapter and the exercises require a relatively high level of previous knowledge of band structures and crystallography, which cannot be expected from all students of the target readership, however more fundamental textbooks are listed in the 'Further Reading' section, which provide this information.

Chapter 2, 'Experimental Probes and Techniques', explains all main experimental techniques used in surface science, molecular beams, scanning probe microscopy, low-energy electron diffraction, photoelectron and Auger-electron spectroscopy, and surface-sensitive vibrational spectroscopies in detail. The chapter goes well beyond a qualitative description of these methods and includes exact mathematical descriptions where possible, thus providing a very useful reference.

Chapters 3 and 4 'Chemisorption, Physisorption and Dynamics' and 'Thermodynamics and Kinetics of Adsorption and Desorption', are a real pleasure to read. They contain well balanced explanations of the concepts describing chemical bonds at surfaces, which are discussed using a number of classic examples, such as molecular CO adsorption (Blyholder model) and dissociative adsorption of hydrogen, and provide a thorough treatment of surface thermodynamics and kinetics.

Georg Held
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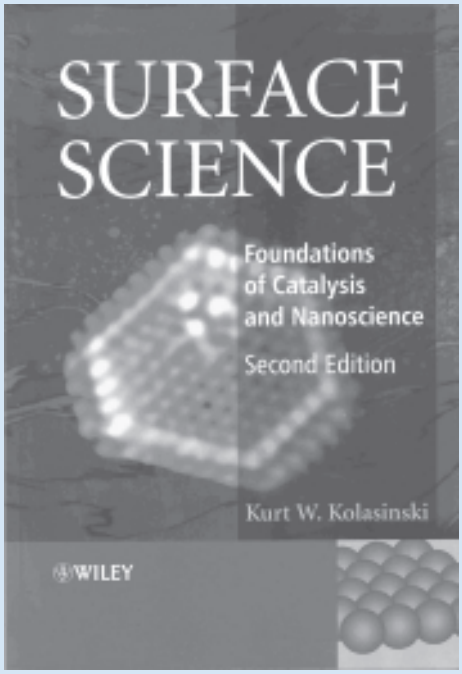
October 2008

Surface Science: Foundations of Catalysis and Nanoscience



From the publisher...

Surface Science: Foundations of Catalysis and Nanoscience, 2nd Edition

By Kurt W. Kolasinski

Surface chemistry is an essential and developing area of physical chemistry and one that has become increasingly interdisciplinary. The Second Edition of Surface Science: Foundations of Catalysis and Nanoscience has been fully revised and updated to reflect all the latest developments in the field and now includes an extensive discussion about nanoparticle growth and the quantum confinement effects in nanoscale systems. Two new chapters have been added and discuss The Liquid/Solid Interface and Non-Thermal Reactions, and Photon and Electron Stimulated Chemistry and Atom Manipulation. There are now many more worked examples included throughout to help students develop their problem-solving skills.

978-0-470-03308-1 500pp 2008 £39.95

Chapter 5, 'Liquid Interfaces', is one of the two new chapters in the second edition and was added to cover also the material in this area that would normally be included in an undergraduate surface science course. It discusses the Young-Laplace equation, Kelvin equation, Gibbs isotherm, Langmuir-Blodgett films, etc, to sufficient detail, however, not at the same depth as the previous chapters.

Chapter 6, 'Heterogeneous Catalysis', returns to the in-depth style of the first four chapters and applies the thermodynamic and kinetic concepts developed there to heterogeneous catalysis in general. Some of the most important catalytic reactions, such as the Haber or Fischer-Tropsch processes, are used to illustrate the discussion.

The first half of chapter 7, 'Growth and Epitaxy' describes the thermodynamics and kinetics of growth processes in general discussing the standard growth modes, interface strain, nucleation theory and different ways of growing layers on surfaces. The second half of the chapter deals with some very interesting applications in nanotechnology.

The last chapter, 'Laser and Nonthermal Chemistry: Photon and Electron Stimulated Chemistry and Atom Manipulation', is a compilation of 'other interesting stuff' in surface science that did not quite fit into one of the previous chapters. Examples discussed here include photo-stimulated surface processes, photovoltaics, electrochemistry, and manipulation of atoms using scanning tunnelling microscopes.

In addition to the usual lists of constants, abbreviations and symbols, the appendix also contains a very useful compilation of formulae, which do, however, lack a proper description of symbols (these have to be looked up in another list).

In my opinion the second edition is not always benefiting from the added material and is losing its focus at times. A more rigorous labelling of sections as 'essential' or 'advanced topic' would be helpful. Other points on the negative side are the large number of typing errors and the poor quality of some of the figures.

Nevertheless, this book should be compulsory reading for every postgraduate student starting to do research in surface science and is probably the best book on the market for undergraduate students, who want to learn more about this subject than what can be covered in a normal lecture course.

Symmetry and Structure: readable group theory for chemists

Subject area
Inorganic Chemistry

Description
This book turns the complex and potentially difficult subject of group theory into an accessible and readable account of this core area of chemistry

Authors
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Publishers/Suppliers
John Wiley & Sons, Inc
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Undergraduate

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October 2008

Summary Review

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

An enjoyable read on group theory might sound unlikely, but this book manages to achieve this. For those brought up on drier texts which dwelt on matrices or abstract groups the different approach of this book is very attractive. The style is refreshing and the author conveys his enthusiasm and interest in the subject. It is clear that the author has thought long and hard about how to convey the concepts necessary to understand the subject and he does an admirable job.

The material presented is at a level accessible to undergraduates and the first eleven chapters cover the topics that would generally be expected for an undergraduate course on the chemical applications of group theory to bonding and spectroscopy. The remainder of the book which includes the treatment of electron spin and then moves on to crystallography and spectroscopy in the solid state moves beyond what most undergraduates might need. However, the final chapters will certainly be of interest to brighter undergraduates, graduate students and their teachers.

This is the third edition of this book and it is much more than a minor revision. In each edition not only have extra topics been included, in this case double groups, but major changes have been made to the text to increase its pedagogical value. In this edition nodal patterns have been included as a method of visualising irreducible representations. I found this approach particularly instructive and helpful. This method obviates the need to introduce matrices to obtain characters and the matrix approach is consigned to the appendices. If students are happy with matrix operations they should read this book anyway as a route to a better and clearer understanding than the dry application of matrix algebra.

The layout is good and the inclusion of problems in highlighted boxes at appropriate parts in the text a useful teaching method, which enables the reader to check their understanding as they work through the material. The subject is developed in a clear way and the author normally explains concepts in more than one way, which both aids and reinforces understanding. Throughout the text the author is careful to explain how the symmetry/group theory is related to different ‘pictures’ for example molecular orbital vs hybrid orbitals. He is always careful to simplify but not mislead. The figures are, apart from Fig 8.39, which is too small, clear and of an appropriate size. There are a few typographical errors for example in Table 1.1 in which the second occurrence of $N(CH_3)_3$ should be $P(CH_3)_3$; plus a number of errors, especially and most surprisingly in Chapter 2 where page references in the summary have not been properly included. In fig 5.12 the symmetry labels of the first two combinations of atomic orbitals are the wrong way round.

This is not the way I learnt group theory, but I rather wish it had been. I recommend this book to both students and lecturers. With its idiosyncratic appeal it might not appeal to all, but many will love it.

The Investigation of Organic Reactions and their Mechanisms

Subject area
Physical Organic and Mechanistic Chemistry

Description
This book is intended as a guide for the trained chemist who needs to characterise an organic chemical reaction and investigate its mechanism, but who is not an expert in physical organic chemistry

Authors
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Publishers/Suppliers
Blackwell Publishing – Wiley <eu.wiley.com/WileyCDA>

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Level
Undergraduate, research

Price
£99.50

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October 2008

Summary Review

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

This book is to help chemists who do not have a strong background in physical/ mechanistic organic chemistry, but who want to characterise an organic chemical reaction and investigate its mechanism. They may be in the chemical or pharmaceutical manufacturing industry and need reaction data to help identify reaction conditions for an improved yield or shorter reaction time, or to devise safer reaction conditions. Another potential user could be a synthetic chemist who wants to investigate the mechanism of a newly discovered reaction in order (say), to optimise reaction conditions and avoid troublesome side reactions. The book is divided into twelve chapters written by various authors.

Chapter 1 provides an introduction to various topics such as, product analysis, reaction intermediates, isotopic labelling, kinetics, electrochemical and calorimetric methods, radical intermediates, catalysed reactions etc. Chapter 2 deals with the investigation of reaction mechanisms by product studies, describing product structure and yield, product stabilities, kinetic and thermodynamic control, stereochemical considerations and isotopic labelling. After that mechanistic evidence from variations in reaction conditions, problems and opportunities arising from unsuccessful experiments or unexpected results, kinetic evidence from monitoring reactions, sampling and analyses for kinetics and case studies etc are described.

Chapter 3 is about the experimental methods for investigating kinetics. Here reaction rate, rate law, rate constant, reversible reactions, equilibrium and equilibrium constants with some important thermodynamical equations, are described. Furthermore, reaction mechanisms, elementary step and rate limiting step, transition structure, and transition state are described followed by the differential method, method of integration (along with useful plots, figures and tables). After that the text covers the isolation method, physical variables, then some description about the monitoring method, and about some experimental methods such as spectrometric methods, conventional and slow reactions, fast reactions, very fast and ultra-fast reactions, conductimetry, polarimetry, potentiometry, dilatometry, pressure measurements and chromatographic methods. Chapter 4 provides the relationship between mechanism and rate law, deducing the rate law from a postulated mechanism such as single step unidirectional reactions, consecutive unimolecular first order reactions, reversible unimolecular first order reactions, parallel unimolecular first order reactions with useful equations and plots. After that complex reaction schemes and approximations, eg the steady state approximation (SSA), the pre-equilibrium approximation, the rate determining step approximation etc are explained. Then there are some case studies.

Chapter 5 explains the reaction kinetics in multiphase systems. The important topics in this chapter are mass transfer coupled to chemical reaction, phase transfer catalyses (PTC), system complexity and information requirements. After that there are some experimental methods such as the stirred reactor for the study of reactive dispersions with a liquid continuous phase, techniques providing control of hydrodynamics and use of atomic force microscopy (AFM).

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The Investigation of Organic Reactions and their Mechanisms

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The next chapter is about electrochemical methods, explaining organic electrochemistry and its relationship with chemistry of radical ions in neutral radicals. Furthermore, some experimental considerations such as two electrodes and three electrodes, electrochemical cells, cells for electro-analytical studies, electrodes for electro-analytical studies, the solvent-supporting electrolyte system and the electronic instrumentation, supported by useful structural diagrams. Other important topics are electrochemical double layer and the charging current, mass transport and current, the kinetics and mechanisms of follow up reactions, the response curves for common electro analytical methods (potential step experiments, potential sweep experiments, potential sweep experiments with ultra-microelectrodes), supported by many useful plots and figures.

Chapter 7 deals with the computational chemistry and the elucidation of mechanisms, providing information about use of various computer programs, for calculating potential energy surfaces, reaction coordinates and transition structures, absolute and relative energies with the help of energy diagrams. There is further description here about molecular mechanics, wave function theory, semi-empirical methods, Hartree-Fock theory, electron-correlation methods, density functional theory. Also, there is additional description about basis sets and validation, followed by some case studies. Chapter 8 is about calorimetric methods, describing initially the use of calorimetry and IR spectroscopy, fundamentals of reaction calorimetry, types of calorimeters (heat-flow calorimeters, power-compensation calorimeters, heat-balance calorimeters, pelpier calorimeters). Then there is further description about steady state isothermal heat-flow balance of a general type of reaction calorimeter with the help of various useful equations. The next article is about infrared and IR-ATR (attenuated total reflection) spectroscopy, followed by experimental methods for isothermal calorimetric and infrared reaction data, calorimetric device used in combination with IR-ATR spectroscopy.

Chapter 9 deals with the detection and characterisation of intermediates in chemical reactions, starting with potential energy surfaces and profiles, then moving from molecular potential energy to rates of reaction. After that there is reaction classification, consequences of uncoupled bonding changes plus evidence and tests for the existence of intermediates, supported by various useful equations and data. Chapter 10 is about the investigation of reactions involving radical intermediates, starting with basic concepts, followed by radical addition to alkenes, chain and non-chain reactions, nitroxides, nitroxide-trapping experiments, alkoxyamine dissociation rate constant, the persistent radical effect (PRE) and nitroxide-mediated living-controlled radical polymerisation (NMP), supported by many useful chemical equations and plots. The next important topic is radical clock reactions, homolytic aromatic substitution and redox reactions. Chapter eleven deals with the investigation of catalysis by acids, bases, other small molecules and enzymes. Speeding up the rate of chemical reaction by catalysis gives an economic advantage in industrial chemical processes, In this chapter, the important topics are experimental demonstration, reaction flux and third order terms, Brønsted equations, kinetic ambiguity, explained with experimental data and useful plots and figures. After that is covered, mechanisms of catalysis by proton transfer, explained for example with the help of stepwise proton transfer (trapping), stabilisation of intermediates by proton transfer, push-pull and bifunctional acid base catalysis using many chemical equations. Nucleophilic and electrophilic catalysis is the next article, describing detection of intermediates, nonlinear free energy relationships and transient intermediates followed by enzyme catalysis.

The last chapter is about catalysis by organometallic compounds, describing the basic concepts, the challenges inherent in the investigation, techniques used for the study of organometallic catalysis plus choice of examples, etc. After that use of the classical heteronuclear NMR method has been described, then phosphorus and proton NMR investigation of the Rh-catalysed asymmetric phenylation of cyclohexenone and summary and key outcomes with the help of a detailed reaction mechanisms. Furthermore, kinetic and isotopic labelling studies using classical techniques are described to study intermediates indirectly, supported by Pd-catalysed cyclo-isomerisation of dienes. Atom accounting through isotopic labelling, observation of pro-catalyst activation processes by NMR spectroscopy, are also described. After that product distribution analysis and kinetics determined by classical and advanced NMR techniques are described with some examples and then early mechanistic proposals for the alkene metathesis reaction along with some useful equations. Lastly, some more important articles like disproving the pair wise mechanism for metathesis and mechanistic investigation of contemporary metathesis catalysts, NMR studies of ligand exchange are described.

Overall this book is very useful for many organic and physical chemists in several research projects involving reaction mechanisms. There are excellent experimental and theoretical methods for almost all mechanistic studies. Scientists from other fields, like life sciences, agricultural sciences, applied, medicinal and industrial sciences can also use this book as handy reference book.

Working One-to-One with Students: supervising, coaching, mentoring and personal tutoring

Subject area
Education

Description
This book is intended as a practical guide to improving one-to-one teaching, covering a wide range of teaching contexts; including mentoring students and staff, supervising dissertations and how to approach informal meetings outside of lectures

Authors
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£70.00 (Hardback)

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October 2008

Summary Review

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

The book **Working One-to-One with Students: supervising, coaching, mentoring and personal tutoring** is written for Higher Education academics, teaching assistants, and research students. The book is part of the series Key Guides for Effective Teaching in Higher Education. It is more specifically aimed at new lecturers, although experienced teachers may find resources useful for their reflection on their practice. The authors have tried to make use of examples inspired from and interesting to various disciplines and universities across the UK.

The book starts with a nice introduction describing in some details the background in HE, why the teaching practices in HE have and must continue to evolve (basically because of the increase of students in HE), and how working one-to-one with students fits in this picture. It is not a question of debating whether or not it is the best way of teaching, but rather to see how to best use this way of working.

The first chapter introduces the skills and the role of coaching, mentoring, supervising, and tutoring. It draws interesting parallels with these practices in other sectors. It concludes with the key skills throughout these roles and by introducing the various learning styles that students may (or may not) use. These are surface learning (obviously to be discouraged), deep learning, and strategic learning.

The following four chapters present in more details the necessary skills, the techniques that can be used, the best approaches, and several additional resources in the form of books, journals, or web sites, regarding coaching, tutoring, mentoring, and the supervision of undergraduates for dissertation or research projects. The chapter on coaching skills is particularly interesting. It is well written, and examples of coaching session plans to follow and advice for good practice are given. The reader can then reflect on these to improve his own methods. In these chapters, the reader can find a great amount of discussion to put each of these activities in a wider context (eg the situation in the UK HE system, or the needs of employers). The text remains accessible to all and makes no use of jargon. In some chapters, activities are suggested to engage the reader and provoke deeper thinking on some issues. I would have liked to see these suggested activities more widely used throughout the entire book.

It is important to keep in mind that students might encounter various problems (health, finances), or that the one-to-one sessions might not function as planned (students refusing to engage, or being unhappy with the one-to-one relationship). Ways to prevent the occurrence of some problems and to solve them when they occur are suggested. The characteristics and the personality of the student are obviously essential to take into account when working in a one-to-one setting. Therefore, the next two chapters are devoted to dealing with diversity, focusing first on the different kinds of learners in relation to learning approaches and styles, and then on student with disabilities.

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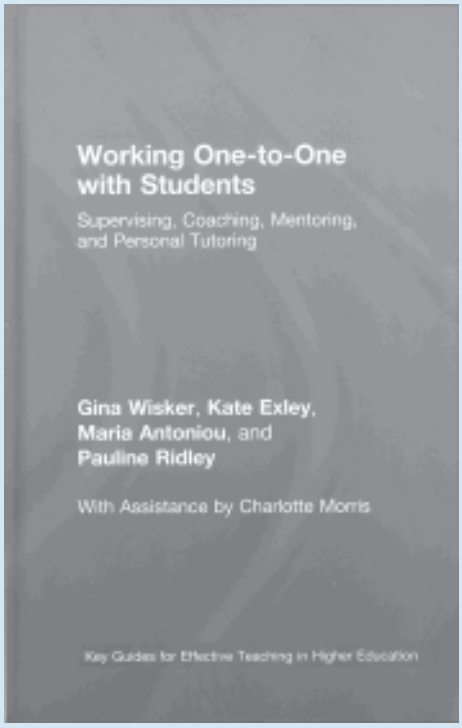
Working One-to-One with Students: supervising, coaching, mentoring and personal tutoring



From the publisher...

Working One-to-One with Students Supervising, Coaching, Mentoring, and Personal Tutoring

By Gina Wisker, Kate Exley, Maria Antoniou, Pauline Ridley

Working One-to-One with Students is written for Higher Education academics, adjuncts, teaching assistants and research students who are looking for guidance inside and outside the classroom. This book is a jargon-free, practical guide to improving one-to-one teaching, covering a wide range of teaching contexts, including mentoring students and staff, supervising dissertations and how to approach informal meetings outside of lectures.

Written in an engaging, accessible style and grounded in experience, this book offers a combination of practical advice backed by relevant learning theory.

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Continued from page 47

The recent evolution of Higher Education in the UK means that there are more and more cases where one deals with students at a distance. A chapter discusses the best use of different modes of contact such as emails, conference calls, instant messaging, virtual social networks, etc.

The last two chapters of the book are devoted to postgraduate supervisions in Social Sciences, Arts and Humanities, and in Sciences, Engineering, and Medicine. They contain both general and discipline-specific information. I would advise the reader to look at both chapters. One may find useful advice in one chapter which would have benefited to be repeated in the other chapter.

The book is written in a clear style. However I found that the meanings of some acronyms were sometimes missing, or were explained a few pages after their introduction. I was also confused at times by the use of 'we', or 'some of us', where I wonder if this refers to the authors, or those of the readers who are actually concerned with one-to-one teaching. I would suggest that the general coherence of the book could be improved by ensuring that 1) activities for the reader are offered throughout the book rather than in a few chapters only; 2) the use of words such as 'I' or 'my' is avoided and that words such as 'we' or 'our' are preferred. I think this would make the entire book even more convincing if we could feel that the four authors are speaking with one voice.

That said, I believe that even someone with no a priori interest in one-to-one teaching will find this book interesting. The description of the processes involved in a teaching/learning relationship between two individuals is particularly interesting.

Overall, I found this book extremely useful to reflect on my practice of one-to-one supervision, as well as on small group (less than 5-6 students) teaching. I am convinced that this book will bring useful insights in working one-to-one with students to all new lecturers, and also to more experienced academics who wish to step back and reflect on their practice.

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

Reviewed in this issue...

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