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Reviewed in this issue:
28 books

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Physical Sciences Educational Reviews

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

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Editorial

This issue is another 50-plus page edition with 28 books reviewed (including 2 consecutive editions of the well-known CRC Handbook of Chemistry and Physics). There is a good spread of physical sciences topics and some more general educational areas covered.

We are still keen to receive your views on all of our publications, please let us know if you would like to see changes.

Thank you again to all our reviewers, both in the UK and overseas. If you would like to review a resource or would like to see a resource (book, web site, software package) reviewed, please let us know.

Roger Gladwin
Editor

In this issue...

Book reviews...

A brief introduction to classical, statistical, and quantum mechanics

Subject area
Quantum Physics, Mathematics

Description
This book provides a rapid overview of the basic methods and concepts in mechanics for students in applied mathematics or related fields

Authors
Oliver Buhler

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

Date/Edition
2006

ISBN
978-0-8218-4232-4

Level
Undergraduate, research

Price
£18.25

Summary Review

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

This book is based on the lecture notes for a one semester graduate class in mechanics given in 2006 and 2007 to 1st year PhD students and advanced undergraduates at the Courant Institute of Mathematical Science in USA. The idea was to present an introduction to the methods of classical, statistical and quantum mechanics to the PhD students who may be at the beginning of their research in applied mathematics, mathematical physics and similar fields. The author has claimed no previous knowledge of physics.

The book is divided into four chapters, 'Classical Mechanics of discrete systems', 'Wave Mechanics', 'Statistical Mechanics' and 'Quantum Mechanics'. The 1st chapter introduces the elements of Newtonian Mechanics and it has been described that the word 'classical' means that there are no quantum effects and 'discrete' means that we are considering systems that consist of a finite number of elementary particles. The basic Newton equation, like F=ma has been described. Then the author has introduced the concept of Newton's apple, as a mass point with mass m and vertical point z(t) at time t. Here 'z' is a Cartesian coordinate pointing upward. After that energy conservation has been described along with phase space and Newton's vector law. There are also some contour diagrams and useful footnotes. After that some introduction to pendulum and virial theorem has been described, followed by use of the Hamiltonian as a differential equation and generic structure of one-degree-of-freedom of the system.

In the next article, calculations of variation have been described. It is stated that mechanics can be understood from the point of view of Newton's law. This is further supported by some useful mathematical expressions under the headings extremals, Shortest Path, Multiple Functional Symmetries and conservation laws. Action principle is the next article, which describes Newton's apple and rephrases its fate as a variational problem. Furthermore this is supported by coordinate invariance of the action principle, central force field orbits (where a very heavy mass sitting at the origin of a three dimensional Cartesian coordinate system has been suggested along with very light particles orbiting it); easy to follow mathematical steps have been fully explained. Then systems with constraints and Lagrange multipliers are discussed.

The next article deals with the Legendre transformation, where a smooth real valued function f(x) has been considered and then the Legendre transformation has been applied giving suitable mathematical steps. The next section deals with canonical equations, where the Legendre transformation has been applied to the action principle. This is a general mathematical technique and applied to any feasible variational problem, whether mechanical in origin or not. This is further supported by the Hamiltonian function, based on its application with some mathematical steps. The canonical action principle has further been explained, along with examples in canonical form, generic systems with quadratic kinetic energy etc.

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November 2007

A brief introduction to classical, statistical, and quantum mechanics

The rotating frames of reference is the next interesting topic which concerns coordinate transformations that depend upon time; such transformations do affect the form of action principle. It is further supported by useful mathematical expressions. The next articles in this chapter are remarks on integral systems, symmetries and phase space geometry (phase space flow, Liouville's Theorem, Adiabatic invariance). Another important topic is the Hamiltonian-Jacobi Theory, where the action integral from a new point of view has been reconsidered, that focuses on the value of the action extremal. Furthermore this article is supported by action on a function of coordinates, and the Hamiltonian-Jacobi Equation (HJE) using suitable mathematical steps. This is further followed by trajectories from HJE, parameterised curves etc. Furthermore Fermat's Principle has been defined with the help of isoenergetic variations, geodesics in configuration space, geodesics for Newton's apple and Fermat principle and the Hamiltonian-Jacobi equation.

Chapter 2 deals with wave mechanics. The opposite extremes of discrete particle mechanics is continuum mechanics, in which point masses are replaced by smooth distribution of matter described by continuous densities for masses, momentum etc. The first article in this chapter is from discrete particle to continuous fields, followed by continuous dynamics. In this stretched string section, kinematics of transversal motion has been described along with mass and energy densities, orthogonal function expansion, continuous action principle and some useful mathematical steps. Furthermore energy conservation and virial theorem have been explained. In the canonical equations there is sufficient explanation with the help of the Hamiltonian densities and the Hamiltonian function and derivatives.

In the next section the two dimensional wave equation has been explained using some knowledge of propagating plane waves and standing waves etc. The next article is about the geometric wave theory, where Eikonal and Transport equations, classical wave particle duality and Ocean Acoustic Tomography have been discussed. The dispersive wavetrain is followed by scaling of a model problem, slowly varying wavetrains, HJE for the wave phase, leading-order wavetrain amplitude etc. Then there are some examples of wavetrains, like Sea Swells, shoaling wave on a beach which have been described well. Lastly Fermat's Principle for dispersive wave has been discussed.

The next chapter deals with statistical mechanics. According to the author it has two broad applications, ie, statistical behaviour of a single system observed for a very long time (eg, motion of a solar system over a few million years) and secondly statistical behaviour of a system object to imperfectly known initial conditions (eg, average motion of air molecule in a large room). Time and phase averaging has been introduced, followed by some suggested results from Ergodic Theory, and furthermore some description of microcanonical statistical mechanics. Then the concept of finite discrete phase space has been introduced. The important and rather interesting topic is Magnetic Switches. In the simplest example this is given by an assembly of N-switches, each of which can be in precisely two states, namely 'off= -1' or 'on=+1'. Then microcanonical entropy and couple system have been explained with suitable expressions, followed by maximum entropy and statistical temperature (hot and cold) in statistical mechanics etc. Furthermore statistical mechanics have been explained with the help of Energy reservoirs, canonical formalism, expansion and continuous phase space etc. Then there are some good examples of canonical mechanics, like particle in a box, Newton's apple above a table, linear harmonic oscillator, the lazy oscillator and multiple independent oscillators.

Free energy of macro states is the next article, followed by the maximum entropy principle, which is again divided into further sub-categories, like Gibbs-Shannon information entropy, recovering the macrocanonical and canonical distributions, relative entropy etc. The next important article is the variational approximation method followed by Bogoljubov's inequality, approximation of the lazy oscillator and first-order correction. An important application of the variational methods is systems with many interacting parts and this has been explained in the mean field theory with the help of Ising model, N-body problems etc. Far transition, numerical methods (like a random walk in phase space) has been explained.

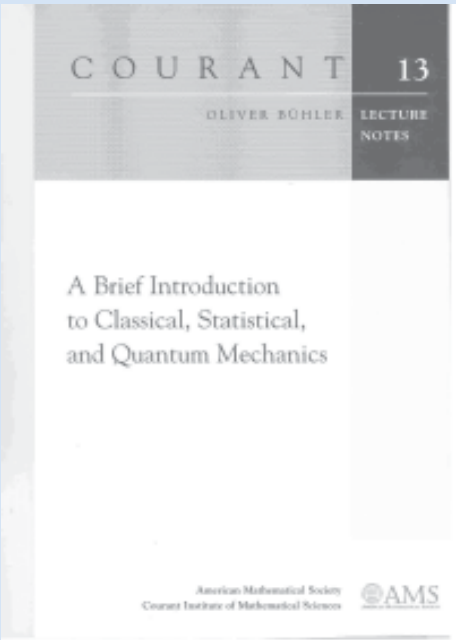
Chapter 4 deals with quantum mechanics. There are two main reasons described why quantum mechanics is very different from classical mechanics;

1. The classical deterministic evaluation is replaced by a certain kind of random, probabilities evolution.
2. There is a new phenomenon of quantum interference, which is an interference between events that from a classical view are mutually exclusive alternatives.

The chapter starts with Planck's quantised energy spectrum and fundamentals of quantum states (amplitude and state vector, linear state algebra etc). After that operators and observables have been discussed by considering a single switch in a certain quantum state. Other important topics are uncertainty principle, amplitude evolution, and expansion in energy Eigenstates, path amplitude and quantum interference and approximation path amplitude. The author has then described the particle on a lattice using suitable mathematical steps. The Schrödinger wave equation is used in the continuous state space. Another interesting article is Schrödinger's apple, where one can remove the cell wall and allow the particle to roam. There is no

Continued on page 4

A brief introduction to classical, statistical, and quantum mechanics



From the publisher...

A Brief Introduction to Classical, Statistical, and Quantum Mechanics

By Oliver Buhler

This book provides a rapid overview of the basic methods and concepts in mechanics for beginning Ph.D. students and advanced undergraduates in applied mathematics or related fields. It is based on a graduate course given in 2006-07 at the Courant Institute of Mathematical Sciences. Among other topics, the book introduces Newton's law, action principles, Hamilton-Jacobi theory, geometric wave theory, analytical and numerical statistical mechanics, discrete and continuous quantum mechanics, and quantum path-integral methods.

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Continued from page 3

complete freedom because of potential V(x), eg, V=max etc. Furthermore the quantum linear harmonic oscillator has been explained with suitable mathematical steps.

Evolution of expectation and conservation laws have been explained with the help of useful subheadings, like Ehrenfest relations etc. The path integral approach to quantum mechanics has been covered, followed by approximation short time propagators, classical limits of path integrals and the action principle with constraints. Quantum statistical mechanics has been expressed with the help of canonical mechanics of discrete system, black body radiation, density matrices and pure and mixed quantum states. Last but not least a differential equation for canonical density matrices is explained with the help of continuous state space and some other relevant articles.

Overall this book is not only useful for PhD students of mathematics, physics, chemical physics but also for other similar fields etc. Although the book is self explained and the student can use it as a standalone book, sometimes professional help is necessary. Some more examples and figures would have enhanced the standard of this book.

A Practical guide to Supramolecular Chemistry

Subject area
Supramolecular Chemistry

Description
An introductory manual of practical experiments for students studying or conducting research projects in supramolecular chemistry

Authors
Peter J Cragg

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

Date/Edition
2005

ISBN
978-0-470-86654-2

Level
Undergraduate, research

Price
£34.95

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November 2007

Summary Review

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

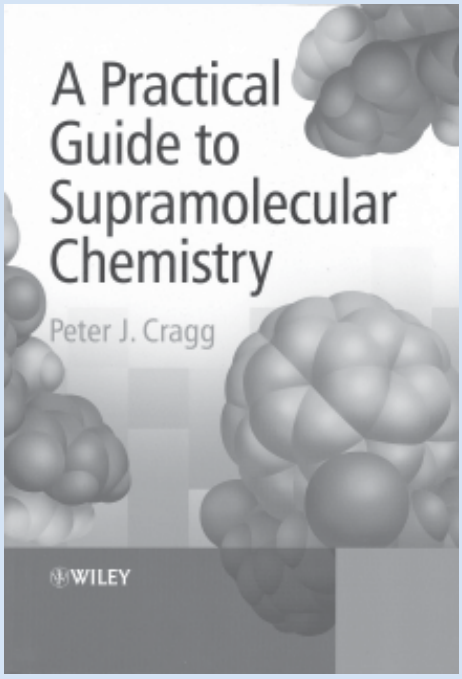
For a field of chemistry as diverse, rich and actively researched as supramolecular chemistry, it should perhaps come as a surprise that there are still relatively few student-level books on the subject. Taking supramolecular chemistry into the laboratory, Peter Cragg's book is aimed primarily at advanced students and researchers who are new to the area, although even experienced supramolecular chemists are likely to find something interesting and useful to their work. The book is divided into five chapters, each sub-divided into sections exploring a particular theme in supramolecular chemistry, supported with real tried-and-tested practical experiments. Each section is comprehensively referenced to original literature, encouraging further reading.

The first three chapters concentrate on the major classes of molecules commonly found in supramolecular chemistry, from classics such as crown ethers and calixarenes through to more exotic species such as rotaxanes. Each section opens with several pages of background information which is insightful, informative and enjoyable, highlighting why the molecules in question are significant in supramolecular chemistry. The text is supported with reaction schemes and 'ball-and-stick' computer-models of structures, the latter of which are too often not particularly insightful or useful. Many of the sections could instead benefit from more chemical structures of the molecules described, as in places the text is challenging to follow for someone unfamiliar with the field. The practical experiments cover the synthesis of a wide range of supramolecular synthons and their derivatives, and the synthetic procedures are very clear, simple and robust, requiring no specialised equipment. I'd have no hesitation in using them in my own research or basing undergraduate practical experiments around them. Yields, melting points, proton NMR and IR data are given for most compounds, although a minor criticism is the absence of some TLC solvent systems and associated Rf values.

The investigation of supramolecular interactions is not overlooked in the fourth chapter, which begins with a concise section describing the application of X-ray crystallography in the study of supramolecular assemblies. A welcome inclusion here is a brief discussion on the practicalities of growing quality crystals. The following sections describe how binding stoichiometries and association constants can be measured-experiments which can seem daunting and frustrating to those not versed in the ways of supramolecular chemistry, and it is pleasing to see all the common methods concisely described here. Given the importance of these measurements in supramolecular chemistry the book would have benefited from more experimental examples. As UV spectrometers are often very accessible instruments in undergraduate teaching labs, examples of experiments describing the measurement of association constants by UV spectroscopy would have been very welcome; opportunities then arise to more easily take supramolecular chemistry into the physical chemistry teaching lab. The final section on the application of computational chemistry to the analysis of supramolecular problems gives a good overview of the field, describing the basic principles and applications of each computational method. The reader is also taken by the hand through some good examples applying computational chemistry to real

Continued on page 6

A Practical guide to Supramolecular Chemistry



From the publisher...

A Practical Guide to Supramolecular Chemistry

By Peter Cragg

A Practical Guide to Supramolecular Chemistry is an introductory manual of practical experiments for chemists with little or no prior experience of supramolecular chemistry. Syntheses are clearly presented to facilitate the preparation of acyclic and macrocyclic compounds frequently encountered in supramolecular chemistry using straightforward experimental procedures.
Many of the compounds can be used to illustrate classic supramolecular phenomena, for which clear directions are given, or may be developed further as part of the reader's own research. The book also describes techniques commonly used in the analysis of supramolecular behaviour, including computational methods, with many detailed examples.

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Continued from page 5

supramolecular problems. The book could have benefited from some guidance on which software packages are best suited to each computational approach.

The final chapter about supramolecular phenomena is a brief tour around some other exciting areas of supramolecular chemistry, and again is enjoyable and informative with lots of references for further in-depth reading. The appendices cover some thoughts on designing integrated undergraduate projects and some important safety information. The book is also supported by a supplementary website, but at the time of writing, these pages appeared to be down.

In summary, this well-written book is an excellent addition to the collection of any supramolecular chemist, and will also be of great use to research students conducting PhD or final year undergraduate project work. Those looking for ways to bring supramolecular-based experiments into the undergraduate teaching lab will also draw inspiration from the book, as will anyone involved in developing lecture courses in supramolecular chemistry.

An Introduction to Free Radical Chemistry

Subject area
Organic Chemistry

Description
An introduction to the subject of free radical chemistry from an organic chemistry viewpoint

Authors
Andrew F Parsons

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

Date/Edition
2000/1st edition

ISBN
978-0-632-05292-9

Level
Undergraduate, research

Price
£31.50

Summary Review

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

An Introduction to Free Radical Chemistry by Andrew F Parsons seeks to provide a concise introduction to the subject suitable for use by advanced undergraduates or postgraduates in the fields of chemistry and biochemistry.

Many years ago, I was an undergraduate in chemistry and then a postgraduate working with free radicals in the context of organo-fluorine chemistry. I always found free radical chemistry rather exciting but sometimes infuriating; exciting as these highly reactive species could achieve synthetic results that were not easily carried out any other way and infuriating because the high reactivity often lead to a mixture of products (typically a brown sticky mess) from which the extraction of the desired one was problematic!

This is a fairly concise book, being about 230 pages but also quite thorough, covering all the topics with a useful level of detail. The eleven chapters cover the topic as follows.

Chapter 1 provides a brief history of the term ‘radical’ and development of free radical chemistry, examines what free radicals are and why they are important both in naturally occurring and commercial contexts. The chapter, as do the subsequent ones, concludes with a useful list of further reading material from both books and journals.

Chapter 2 is titled ‘The Basics’ and covers the fundamental information that a chemist needs to ‘understand’ free radicals. This chapter looks at detection and observation, the very important technique of electron spin resonance spectroscopy; the use of 1H nmr in chemically induced dynamic nuclear polarisation (CIDNP); the shapes of radicals and various electronic, energetic, molecular orbital and stability considerations.

Chapter 3 looks in detail at ‘Radical Initiation’ and therefore the different methods such as thermolysis, photolysis, radiolysis, sonolysis (using ultrasound), and electron transfer (for example one-electron redox reactions of non-radical anions and cations).

Chapter 4 considers radical reactions in more detail considering propagation, addition reactions, fragmentation reactions, rearrangements and termination steps. It also looks at reactivity and selectivity, energetic considerations, endothermic and exothermic reactions, entropy, steric and stereoelectronic effects.

Chapter 5 explores the range of synthetic possibilities using free radicals, contrasts radicals with ions and considers synthetically important factors such as chemoselectivity, regioselectivity and stereoselectivity. The chapter then goes on to look at chain reactions and non-chain reactions, on the way highlighting a variety of important reagents. Clear reaction schemes and mechanisms are given where relevant, as in the rest of the book.

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October 2007

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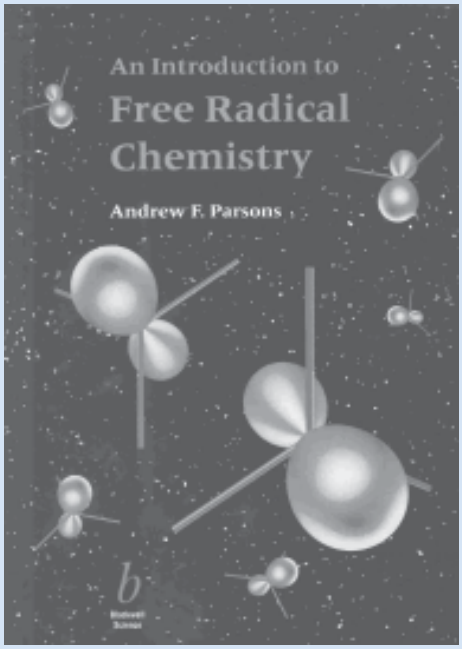
An Introduction to Free Radical Chemistry



From the publisher...

An Introduction to Free Radical Chemistry

By Parsons, Andrew

The past twenty years have seen an explosion of interest in free radicals as their pivotal role in both chemistry and biology has come to light. From their beneficial role in the manufacture of plastics to their detrimental effects on the Earth's ozone layer, radical reactions impact significantly on our daily lives. "An Introduction to Free Radical Chemistry" provides a concise introduction to free radical chemistry from an organic chemistry perspective, highlighting the importance of radical, radical anion and radical cation reactions in synthesis. The book provides a step-wise introduction to the subject, taking the student from the basic principles of radical reactions through to their applications in industry and their role in biological and environmental processes.

978-0-632-05292-9 238pp 2000 £31.50

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Chapter 6 focuses on functional group transformations; in particular: halogenation and dehalogenation, oxygenation and deoxygenation, decarboxylation, carbonylation, cyanation and nitrosation. This chapter contains some very interesting chemistry, well explained, and includes several well known examples such as the Hunsdiecker and Sandmeyer reactions.

Chapter 7 looks at intramolecular cyclisation reactions and includes some very pleasing and interesting transformations which highlight how effective free radical synthetic solutions can be.

Chapter 8 is concerned with intermolecular reactions using free radicals both in general and in the context of synthetic chemistry. The difficulties that may be encountered as a consequence of competing reactions is highlighted and some interesting and industrially important examples are presented.

Chapter 9 looks at radical translocation reactions, in other words the migration of a radical within a molecule, considering chemical and photolytic examples.

Chapters 10 and 11 focus on radical anions and radical cations respectively.

Following chapter 11 is a section of questions allowing readers to determine whether they have understood well enough to make use of their new knowledge of free radical chemistry and outline answers are provided in the following section.

Next is a more general ‘Further Reading’ list of some important text books on the subject and finally a reasonably comprehensive index.

Overall this textbook is well written using clear technical language, the illustrations are very clearly presented. No errors were noted. When considering the wide variety of applications of free radical chemistry the examples selected are invariably excellent choices to highlight the usefulness of free radicals and the interesting ways in which they may be used to achieve a variety of different molecular transformations. The questions and their answers have been placed in a separate section as is appropriate for a book aimed at this level of advanced undergraduate or postgraduate study. Any chemistry student at the intended level should find this a very enjoyable introduction to the subject and lecturers should find it worthy of recommendation to their students and researchers requiring an introduction to this interesting area of chemistry.

An Introduction to Pollution Science

Subject area
Environmental Sciences

Description
The book covers topics including pollution in the atmosphere, the world's waters and soil and land contamination

Authors
R R Harrison (Editor)

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

Date/Edition
2006

ISBN
0-85404-829-4

Level
Undergraduate

Price
£24.95

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October 2007

Summary Review

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

Undergraduate science courses that have no components impinging on environmental impacts must surely now be the exception rather than the rule. As well as the obvious 'environmental' topics, issues such as the development of 'Green Chemistry' or alternative energy generation techniques are now relatively mainstream. The Royal Society of Chemistry has recognised the importance of these issues and has published a number of books on the topic over the years. This is one of the latest in this series and is aimed at the general environmental science undergraduate market and as a companion book to the more focused *The Chemistry of the Environment* by the same publishers.

On opening this book I was instantly reminded of the saying about not judging a book by its cover. I have nothing against the cover. However the production standards inside are best described as erratic. The quality of the paper is such that an irritating level of bleed through of text from adjacent pages is evident yet there is no obvious excuse that the paper is recycled (which it probably should be in this case but as far as I can see isn't). The quality of the diagrams ranges from OK to downright poor. Colour is used in a peculiarly erratic way; in some cases (eg Plate 4a) colour distinctions are almost indecipherable. Indeed the use of the term plates is a misnomer in that the paper quality remains unchanged. Plate 2 contains lettering that I was unable to read even with the help of a 10x hand lens. In one flow diagram (Ch3 Fig1) there is an unexplained and seemingly arbitrary red border to one box in a box diagram which is otherwise simply black on white. The reproduction of greyscale pictures (which would have been much better in colour) is also poor (eg Ch3 Fig.3) and at least one example of what is effectively a GIS plot appears to be hand drawn – and this in a section on how to present data!

All this is unfortunate and certainly detracts from the impression given to a bookshop browser who is just flicking over the pages. But do the contents make up for it? I think that answer is only up to a point. For a text like this to be coherent, and therefore accessible and useful, it must have a consistent editorial vision and I feel that this is not really the case here.

To take one early example the section on units in Chapter 1 wrestles with the differing usage of mass per unit volume but ignores the molar scale entirely. How, for example is a hapless undergraduate reader expected to deal with data in a single table (Ch5 Table 1) of eight lines of data that includes six different unit scales namely $ng.m^{-3}$, $pmol\ dm^{-3}$, $mg\ kg^{-1}$, ppb, $mg\ m^{-3}$ and ppm. Another editorial oddity is that most substantive chapters have a questions section at the end but not chapters 2 and 3. Why not?

The main chapters of the book deal with the 'Atmosphere', 'World's Waters', 'Soils and Land Contamination', 'Investigating the Environment', 'Ecological and Health Effects of Chemical Pollution' and 'Environmental Management'. In each case, as would be expected, the emphasis is on pollution. The atmospheric section deals with both gaseous and particulate contaminants and provides reasonable though not error-free coverage.

Continued on page 10

An Introduction to Pollution Science

Continued from page 9

Figure 6 incorrectly quotes the title from the source material and an anagram of 'aldehydes' appears a few pages later. There are some case studies inserted within the text which vary from a quite detailed account of ozone depletion in Antarctica to a much shorter account of air pollution problems in Los Angeles. Free radical reactions are mentioned though again there are inconsistencies in the way that these are described in the text (eg OH) and in the equations (eg $OH^{\bullet}$) such that a reader unfamiliar with the nomenclature might wonder if these referred to different entities.

The water chapter is subtitled 'A Chemical Contaminant Perspective' which is accurate but would be even more so if it was qualified as an Organic Chemical Perspective. Of ~44 pages on the subject only 21 lines relate to inorganic chemicals using the heading 'Heavy' metals (which is in my view an outmoded and unhelpful descriptor) and excludes issues of genuine international concern such as arsenic contamination of groundwaters. Aside from this, the chapter is generally informative though a bit list-heavy.

The 'Soils and Land Contamination' chapter opens with a basic description of the nature of soils and soil types. This melds into a too brief discussion of adsorption properties and adsorption coefficients. There is a worked example using the Karickhoff equation that doesn't actually give the equation. Nor are parameters such as K_{OW} and K_{OC} actually defined. The rest of this section moves through threat assessment, regeneration, some structures on site assessment and analysis in a rather uneven style which doesn't to my mind have a consistent view of the likely audience.

This inconsistency is also noticeable in the following chapter on 'Investigating the Environment' where some useful basic advice is combined with more abstruse topics. I feel that a sentence such as "This 'aggregated dead-zone' model is thus a combination of the continuously stirred tank reactor and a factor to account for the advection component of dispersion." is unlikely to stir the intended readership similarly. The use of case studies in this chapter is useful though, in the case of the radon example, let down by a diagram of appalling quality.

I was more enthused by the chapter on 'Ecological and Health Effects of Chemical Pollution'. This seemed to me to provide an account of the subject area that was reasonably consistent in anticipated audience understanding whilst being clear and informative. Even so, some Figures from the primary literature don't fit easily into the text because some of the terms included are not explained or put into context.

The final chapter on 'Environmental Management' is arguably not the 'pollution science' of the book title but the decision to include it is clearly correct. An appreciation of the management and legislative frameworks of pollution issues is both useful and is helpfully constructed here.

So overall this is a book for which the term 'curate's egg' could have been coined. I hope that my consistent irritation with the production standards has not rubbed off too much on my views of the content. Ultimately though, I think that the multi-author approach to this topic has not really been successful. A single author could have provided a more consistent style and standard of both text and illustrations. So whilst there is undoubtedly some useful material here I would need to be persuaded that this was the most useful text to be recommended to the general environmental sciences reader.

Analysis of Drug Impurities

Subject area
Analytical Chemistry

Description
This book provides a source of reference on the techniques available for accurate identification and quantification of drug impurities, and it brings together all the relevant disciplines within one volume for the first time

Authors
Richard J Smith and Michael L Webb (Eds)

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

Date/Edition
2007/1st edition

ISBN
978-1-4051-3358-6

Level
Undergraduate, research

Price
£99.50

Analysis of Drug Impurities is one of a series of Analytical Chemistry texts (series editors Alan J Handley and John M Chalmers) which sets out to provide an accessible source of information for both practitioners and students of Analytical Chemistry. Each volume in the series aims to be an accessible source of information on general principles, instrumentation, methodology and applications.

Summary Review

range: * poor to ***** good

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

This volume sets out to help analytical chemists understand the challenges and techniques related to the accurate identification and quantification of impurities in drug products. Its veracity is enhanced by the fact that the contributors are working in multinational pharmaceutical companies or with the US Food and Drug Administration (FDA): this information extends from the teaching laboratory into what is state-of-the-art in this heavily regulated industry. There are several references to the International Conference on Harmonisation (ICH) guidelines for the pharmaceutical industry and it would be useful for the reader to have familiarity with or access to the guidelines.

The book comprises eight chapters, beginning with an overview of organic impurities in the drug substance-origin, control and measurement from FDA authors. This theme continues in the second chapter, which is written by an industrial chemist and which looks at impurities in pharmaceuticals in greater depth, illustrated with examples.

The third chapter considers stereochemical impurities. The focus is on enantiomers and there is useful information on the most common analytical techniques for measurement of chiral impurities, including HPLC and capillary electrophoresis. History has shown the importance of identifying variability in effect and efficacy of chiral forms of pharmaceutical active ingredients and this chapter underlines the developments which have taken place in stereospecific analytical approaches.

The next chapter, again by an industrial analyst, describes the significant challenge involved in the low-level measurement of potential toxins. Classes of genotoxic impurities (alkylating agents, reactive amines, fused tricyclics, substituted purines and pyrimidines, and hydroperoxides) are outlined, before the author goes on to discuss analysis of these typically low- (and in some cases parts per billion) level impurities. The chapter considers gas chromatography (GC), high-performance liquid chromatography (HPLC), thin-layer chromatography (TLC), and other analytical techniques. It includes specific examples and concludes with a review of validation of trace analytical methods.

The references in the chapter on ‘Systematic Approach to Impurity Identification’ are in the main post 2000 and again draw on FDA and ICH guidelines as the cornerstones of the industrial analytical approaches. This chapter contains a number of illustrative examples and diagrams.

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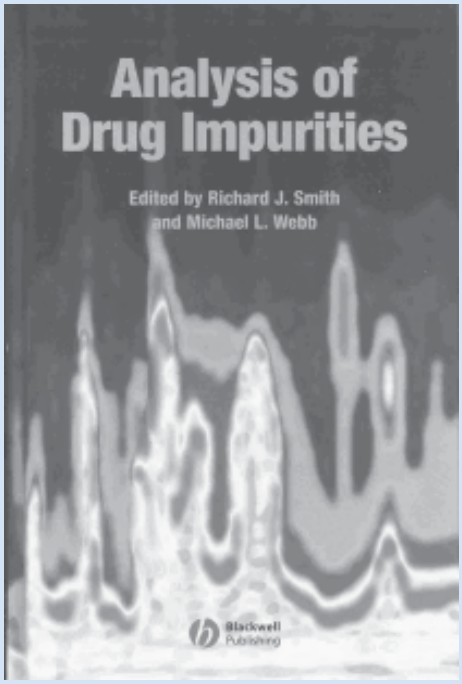
October 2007

Continued on page 12

Analysis of Drug Impurities



From the publisher...

Analysis of Drug Impurities

By Smith, Richard J and Webb, Michael L.

The presence of impurities, even in small amounts, may affect the efficacy and safety of pharmaceuticals. The methods for detecting and controlling them are subject to continuous review and improvement. Characterisation of impurities is a crucial aspect of drug development and approval, and is central to quality control. This book provides a source of reference on the techniques available for accurate identification and quantification of drug impurities, and it brings together all the relevant disciplines within one volume for the first time.

978-1-4051-3358-6 275pp 2007 £99.50

Continued from page 11

'The Use of Chromatography and On-Line Structure Elucidation using Spectroscopy' is an excellent and detailed review of coupled methods (LC–MS and LC–NMR) again with lots of examples to aid the theoretical transfer to actual analytical techniques. There is one small criticism of this chapter in the spelling on the header 'Chrom**o**tography' seems to jump out at the top of every second page: something to be corrected for a second print!

This is followed by a shorter chapter on preparative isolation of impurities including scale up. This includes flow diagrams which give information about impurity isolation, identification, work flow, method development scouting, and task performance.

The final chapter addresses 'The Impact of Continuous Processing' and is one of the most generally readable chapters in the book (ie it does not require the same level of technical expertise or experience as some of the others). It concludes the volume by addressing the topic of 'Process Analytical Technology', concluding with the view that this is becoming the technology of the future for pharmaceutical analysis, with no going back to end-point testing and traditional batch analyses. It includes short reviews of process analysis using IR, UV, Raman, NIR, NMR, MS and other techniques.

This is an excellent reference book which spans analytical developments from the 1960s to date and re-emphasises the importance of analysis in the context of Good Manufacturing Practices. It is generally very readable but not a stand-alone, in that it would require access to other materials for more in-depth explanations and links to regulatory guidelines. Each chapter has an extensive list of references at the end, 168 for chapter 8 alone! The tables and illustrations tend to provide useful summaries and practical examples. It is definitely to be recommended as library material.

Chemical Calculations: mathematics for chemistry

Subject area
Mathematics, General Chemistry

Description
This book covers the relevant mathematics in the context of topics covered in various branches of chemistry

Authors
Paul Yates

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

Date/Edition
2007/2nd edition

ISBN
978-0-8493-9164-4

Level
Undergraduate

Price
£19.99

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

This book is aimed at those undergraduate students who have a weak background in mathematics and who want to adopt chemical courses in their degree program. Each chapter of this book has been written in a similar style, starting with some equation or article followed by some worked examples, the chemical background and then the solution of the worked examples. All the necessary mathematics related to that article has been illustrated in the best possible way. Also the use of an electronic calculator has been explained in almost each chapter on the side of the pages. The book is divided into nine chapters.

The first chapter deals with some fundamental concepts, the second with uncertainty in experimental techniques, the third chapter describes thermodynamics, the fourth chapter is about solution chemistry, and the fifth chapter is on kinetics. The sixth chapter is about structural chemistry, the seventh chapter deals with quantum mechanics, while the eighth chapter describes spectroscopy and the last chapter describes the calculations related to statistical mechanics.

In the first chapter, the very basic concepts of mathematics, such as additions, subtractions, multiplication and division, have been introduced and then these are directly correlated to some important functions such as entropy (of universe, system and surroundings), followed by useful numerical problems. Subtraction is related to difference in energy levels of electronic spectra ie, $\Delta E = E2-E1$ etc.

Multiplication is related to the free energy equation, which relates Gibbs free energy to the equilibrium constant with suitable examples. Division is related to some other state functions, such as enthalpy and entropy to the absolute temperature, T. In the next section, the precedence in equations has been discussed which is supported by BODMAS rules (ie Brackets Of Divide Multiply Add Subtract). For example, $2^4 = 2x2x2x2$.

This is then related to some useful forms of van der Waal's equation, followed by some numerical examples. In the next section rearranging equations has been discussed and these are related to heat capacity, C_P, temperature, T, etc. Fractions are also related to the van der Waal's equation and then multiplication is related to some equilibrium constant equations. The next section relates indices, with some useful equilibrium constants, mainly of water, K_w, followed by roots and negative powers which also correlate with equilibrium equations.

In the second chapter, uncertainty in experimental techniques is discussed. This chapter shows some important mathematical steps followed by relevant lab experimental data, such as significant figures, stoichiometric calculations, uncertainty in measurement, and statistical treatment etc. All these sections have been related to some worked examples, the chemical background and wherever possible, solutions to worked examples.

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Muhammad Hussain Road,
Model Town A,
Bahawalpur,
Pakistan
November 2007

Continued on page 14

Chemical Calculations: mathematics for chemistry

Continued from page 13

Chapter 3 is related to problems in thermodynamics. Here fractions and indices applied to the equilibrium constant, bond enthalpy, the Born-Haber cycle, heat capacities (C_p, C_v), Clapeyron equation, Clausius-Clapeyron equation have been discussed with many worked examples and the relevant mathematics. Furthermore the ideal gas equation, van der Waal's equation, and equilibrium constants have been discussed with the help of experimental data, graphs, figures and the essential mathematics.

In chapter 4, solution chemistry has been discussed. Activity and activity coefficients have been introduced with the help of some experimental data, followed by molality and Raoult's law supported by helpful worked examples and the appropriate mathematics. The next topic deals with the Debye-Hückel equation, which relates activity coefficients to the square root of molar concentration. This topic has also been supported with some worked examples and solutions. After that the Ostwald dilution law, and partial molar volumes have been discussed using useful experimental data with suitable mathematical steps.

Chapter 5 deals with kinetics. The basic rate equation has been used with helpful worked examples, then rate of change follows with some examples and appropriate mathematics. Zero order reactions are discussed in detail with easy to follow mathematical steps, followed by some examples and then 1st, and 2nd order reactions are discussed in an excellent way. Most of the students find the solution to kinetic reactions very complicated, but the author has made it so interesting and easy, by introducing logarithm equations, integration, straight line, partial fraction and differentiation of the logarithm functions and integration of functions. There are appropriate worked examples with solutions, tables and figures. After that the Arrhenius equation is discussed with the help of inverse functions, useful experimental data and figures. Lastly the steady state approximation, is described with some mathematical steps and solved worked examples.

Chapter 6 deals with structural chemistry. Packing fractions of atoms in metals have been discussed. Then after that, arrangement of atoms in crystals is explained using Pythagoras' theorem in as interesting way as possible by discussing it in three dimensions. The next important topic is Bragg's law, and it has been discussed with suitable examples in an appropriate way (some interesting figures of some trigonometric function plots). The unit cell is one of the most important topics in chemical and physical sciences and a useful introduction to unit vectors algebra (like scalar and vector triple product) have been included with some interesting illustrations and examples.

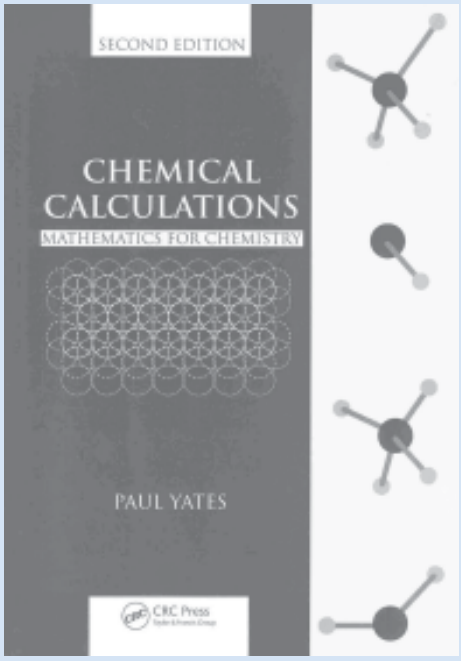
X-ray diffraction is the next topic which needs some logical mathematics and useful examples. The author has tried to simplify as much as possible the introduction of complex numbers, Fourier synthesis, the structure factor and finally the diffractional signals. Then symmetry operators have been explained with the help of some matrix algebra, conformation matrices and some solutions to worked examples of the symmetry of CH_4. There are some good exercises and problems as well.

Chapter 7 deals with quantum mechanics, initially with some basic concepts like energy levels and transformations. Planck's equation, followed by calculation of energy and forces between atoms are discussed using the vibrational energy equation, and easy to follow mathematical steps. This is followed by the particle in a box problem. The solution of such problems needs a thorough knowledge of complex numbers and complex equations, sequences etc. The author has successfully made this section easy to follow using all the necessary mathematical steps, examples and figures wherever required. The expression for a one-dimensional and three-dimensional box has been described. Some other important mathematical techniques like differentiation of fractional indices and some integrals have also been described here. Additionally, the free particle model has been presented with the help of some good solved worked examples.

The next section is the hydrogen atom wave function. This section has been correlated with differential calculus, calculus of experimental function, multiple integration, calculus of trigonometric functions, and with the help of some worked examples along with their solutions. The last part of this chapter is the helium atom followed by useful examples and figures.

Chapter 8 deals with spectroscopy, and the author has introduced dipole moment, dipole and quadrupole moment along with some good solved examples. The next section deals with nuclear magnetic resonance spectroscopy, with some useful examples. After that rotational spectroscopy is introduced, using some classical mechanics to obtain the rotational energy and other useful parameters. In the vibrational spectroscopy section, the author has described the expressions for the vibrational energy using suitable mathematics and illustrations. Then rotational-vibrational spectroscopy expression has been given, with suitable examples. Nuclear magnetic spectroscopy has been described briefly, using Pascal's triangle, some systematic mathematical steps and the simple example of ethanol NMR. After that, Fourier transform spectroscopy has been described.

Chemical Calculations: mathematics for chemistry



From the publisher...

Chemical Calculations: Mathematics for Chemistry, Second Edition

By Paul Yates Keele University, Staffordshire, UK

Uniquely organized by chemical-rather than mathematical-topics, this book relates each mathematical technique to the chemical concepts where it applies. The new edition features additional, revised, and updated material in every chapter. It achieves greater clarity with newly improved organization of topics and cross-referencing where mathematical techniques occur more than once. The text also contains numerous worked examples along with end-of-chapter exercises and detailed solution-giving students the opportunity to apply previously introduced techniques to chemically related problems.

978-0-8493-9164-4 384pp 2007 £19.99

The last chapter deals with statistical mechanics, starting with molecular energy distributions followed by useful figures, relevant mathematics like factorials, some solved worked examples and figures. Then the Boltzman equation, with some useful mathematics like differential logarithm (with some solved examples) has been added. Another important topic is the partition function, which also requires the knowledge of some advanced mathematics and the author has simplified this topic with easy equations and some interesting solved examples. This article has further been strengthened with the use of spreadsheets. The Strilling approximation has been used to obtain the expression for rotational partition function and some useful thermodynamic parameters.

Finally, it can be stated with a high measure of confidence that this book is very useful for all those students who have either no or very weak mathematical background, and they want to study the chemical sciences in their undergraduate courses. However, this book can also be useful for some advanced users if some of the chapters, like structural chemistry, spectroscopy, quantum mechanics and statistical mechanics are improved, by adding some more relevant topics.

Concepts in Thermal Physics

Subject area
Applied Physics

Description
An introduction to thermal physics, thermodynamics and statistical physics with a broad and appealing range of applications

Authors
Stephen Blundell and Katherine Blundell

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

Date/Edition
2006/1st edition

ISBN
978-0-19-856770-7

Level
Undergraduate

Price
£24.00

Summary Review

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

For many years, undergraduates have learnt electromagnetism from a large dark blue volume recognised by the simple moniker *B & B*. The abbreviation is doubly appropriate as the authors are Betty and Brebis Bleaney, a wife and husband academic team also notable, if I remember right, for their gifts on the tennis court. Now Oxford can boast another winning doubles pairing, for Stephen and Katherine Blundell have produced an outstanding introductory text on thermal physics. They are both popular instructors, and it is a pleasure to report that the charm and wit that inform their lectures and talks also pervade this book.

Sometimes a reviewer can feel, on entering sections of a standard text, the same unease experienced walking through a private, precious and over-tended garden. Visitors however are assuredly welcome here, with an engaging prose style and blissfully accessible choice of problems to guide the way. This is no cottage garden mind; the broad landscape of this book is one of its outstanding features. There are few (if any) competitors that have time to mention Simon's pragmatic statement of the Third Law, quantum information theory, anyons, relativistic gases, shock waves and those most beautiful of thermodynamic machines, black holes. Topics from the authors' fields of expertise in condensed matter and astrophysics bring a real freshness to the treatment too, and should prove attractive to Schools who rely on students interested in these areas to support recruitment. The core material of a thermal physics course is all here, with a nice balance between phenomenology and statistical physics; and how many books contain derivation of the Saha equation for the equilibrium of an ionised gas as an end-of-chapter problem? It says a lot for the authors' clarity that this becomes a perfectly reasonable exercise. However I have one request for the authors when they try to accommodate all tastes and gamely suggest that a nut roast ball can stand in for the spherical chicken in the discussion of thermal conduction. It would be nice to know - and surely now possible with reconstituted and easily reshaped meat - how much the movement of juices affects the cooking time. Is the chicken really a two-phase problem – only Sunday morning in the Blundells' kitchen can provide the answer!

The text is also punctuated with pen portraits of some of the most influential characters in the development of thermal physics. The life experiences of these pioneers might not necessarily attract you to follow in their footsteps: at times they read like discarded characters from *Kind Hearts and Coronets* – Boltzmann was driven to suicide, Lavoisier was guillotined, and Count Rumford claimed he'd met a fate worse than death by marrying Lavoisier's widow! These anecdotes are the literary equivalent of an energy bar, providing a quick dose of sugars to sweeten the maths, which requires the student to be comfortable with vector calculus and partial differential equations. These portraits are also a reminder that this is a subject sometime forged out of a concern with real engines, their speed and power. It is curious how far removed the language of thermal physics is from the fuel-rich vapours of an engine shed. Many undergraduates will have struggled with austere texts of a generation or two ago: learning the gymnastics behind Maxwell's relations; memorising the scratchy hieroglyphics of various plots in the P-V plane; and finding themselves ultimately stranded in some infinite (and mysterious) thermal

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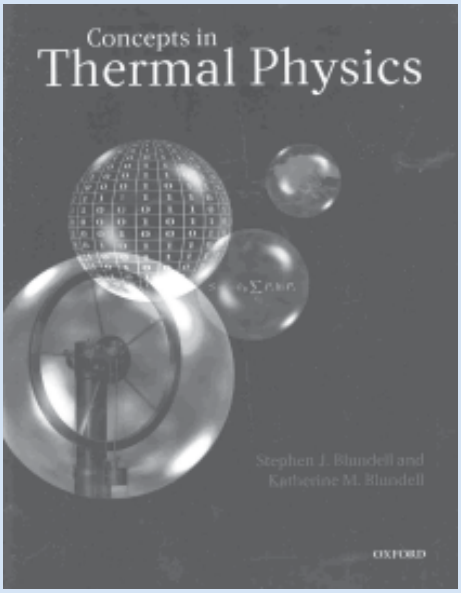
Concepts in Thermal Physics



From the publisher...

Concepts in Thermal Physics

By Stephen Blundell and Katherine Blundell

An understanding of thermal physics is crucial to much of modern physics, chemistry and engineering. This book provides a modern introduction to the main principles that are foundational to thermal physics, thermodynamics, and statistical mechanics. The key concepts are carefully presented in a clear way, and new ideas are illustrated with copious worked examples as well as a description of the historical background to their discovery. Applications are presented to subjects as diverse as stellar astrophysics, information and communication theory, condensed matter physics, and climate change. Each chapter concludes with detailed exercises.

978-0-19-856770-7 488pp 2006 £24.00

reservoir waiting for a small and unnoticeable trickle of energy to ignite their understanding. However this book should prove a real winner as an accompaniment to a core course in thermal physics.

A final suggestion – pack a good lunch and take this book with you to the Kew Bridge Steam Museum on one of the selected weekends when the Cornish engines are in steam; you won't regret it.

CRC Handbook of Chemistry and Physics

Subject area
Physical Sciences and Biological Sciences

Description
Handbook and key data source

Authors
David R Lide (editor in chief)

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

Date/Edition
2006-2007/87th Edition

ISBN
0-8493-0483-0

Level
Undergraduate, research

Price
£78.13 (www.amazon.co.uk)

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September 2007

Summary Review

range: * poor to ***** good

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

The ever expanding new edition of the **CRC Handbook of Chemistry and Physics**, edited by the *former* Director of the NIST (USA) is an accomplished handbook dating back to 1918. It is a comprehensive physical sciences database required by R&D professionals, engineers and students alike and in its current form has twenty-nine expert contributors. The handbook is known in some circles, as the *rubber bible,* perhaps because it was first published by *The Chemical Rubber Company*. It is improved upon with the passing of each new edition and has become a common source of reference.

This immense multi-authored volume for physical scientists is over 2400-pages, with *fourteen* key sections listed as follows (Section 3 through to Section 16):

- Physical Constants Of Organic Compounds
- Properties Of The Elements And Inorganic Compounds
- Thermochemistry, Electrochemistry, And Kinetics
- Fluid Properties
- Biochemistry
- Analytical Chemistry
- Molecular Structure And Spectroscopy
- Atomic, Molecular, And Optical Physics
- Nuclear And Particle Physics
- Properties Of Solids
- Polymer Properties
- Geophysics, Astronomy, And Acoustics
- Practical Laboratory Data
- Health And Safety Information

The opening two sections cover the ‘Basic Constants, Units & Conversion Factors’ together with ‘Symbols, Terminology, & Nomenclature’. These sections act both as a glossary and a reference point for the reader to understand and interpret the data contained within this colossal hardback.

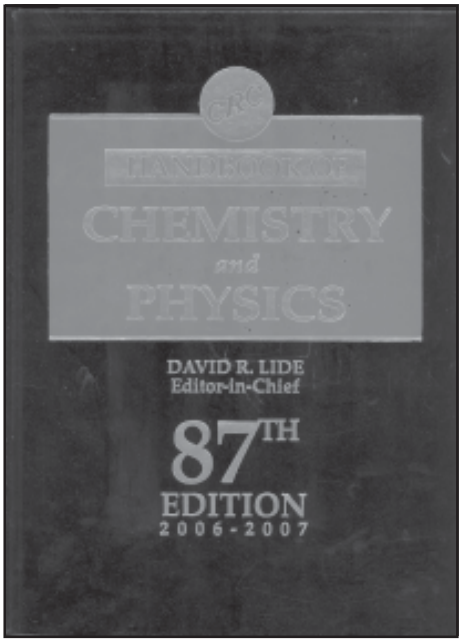
Each section and most subsections commence with a well referenced introduction. The introduction provides a legible and concise account of the data preceding it. The sources of reference are supplied at the end of each introductory sub-section. References such as the CODATA are a useful means of enhancing the concreteness of the data especially when such data is adapted from standards agencies and regulating authorities. It is a way to ensure the data contained is reliable, but most importantly is accurate, precise and agreed upon at local, national and international levels.

The individual section data have not been referenced to a single source hence verification of the data can be cumbersome and difficult. Also, some references stated in the handbook use the **CRC Handbook for Chemistry & Physics** as a source which in itself is convoluted. Nonetheless, the ability to use this handbook as a quick reference guide is rudimentary to its purposes. Thus it is essential that the data is housed in a convenient and user friendly manner, which we feel has been accomplished.

CRC Handbook of Chemistry and Physics

This publication dictates several improvements in comparison to the previous edition, namely *the revision of the four heavily used tables; physical constants of inorganic compound, bond dissociation energies, table of isotopes and the scientific abbreviations and symbols have all been updated and expanded. Fourteen other tables have been updated, including standard atomic weight (2005) and nomenclatures for inorganic ions and ligands and a new table added on specific enthalpies of solution of polymers and co polymers.*

We have not been able to compare and contrast the previous revision to this, due to not having the 86th edition at hand. We have been able to verify some of the data with the stated reference sources and feel that the data is consistent and the references reliable. By going through each section and sub-section, we feel that compiling such a reference source must require an endless effort to update the existing data and satisfy the needs of the users. To this end, this edition does demonstrate improvements taking into account criticisms from existing readers and reviewers as well as recognising updates from the relevant sources.



The third section offers a sizeable volume of data on most, if not all the familiar organic compounds used within the laboratory. The layout in this chapter is clear, definitive and well referenced. Each compound is provided with a pictorial of the theoretical structure, providing a comprehensive understanding of the functional groups utilised within the investigation. This chapter accounts for more than a quarter of the handbook due to the sheer volume of compounds listed and structures provided for each complex. The remaining sections look very similar in format to section three with the Section on 'Fluid Properties' being the most diverse.

There is a section contents list to most sub-sections, a concise introduction, information about the changes made since the last revision and all the relevant references. Moreover, there is a detailed description of the data tables themselves, the way they are tabulated and constructed, where they are sourced from and clears subtle ambiguities.

There is a lot of cross-referencing within the book itself thus improving its readability. It is clear however, that the sections themselves are uneven in length some being as little as 18-pages and some as large as 672-pages long. The thumb indent to each chapter is a useful feature of the handbook and additionally, within the provided references, there are convenient links to data sources on the WWW.

The two appendices provide a wealth of information. Appendix A pertains to 'Mathematical Tables' and contains much useful information such as constants, integrals, and differentials as well as Statistical Data tables. Appendix B introduces the reader to further sources of physical and chemical data and includes data journals, data centres, major single and multi-volume handbooks as well as useful websites.

In our view, this is a well written and beautifully presented handbook, is reasonably priced, and houses a diverse range of data and information required by professionals. The data contained within this edition is *concise*, *consistent* and *reliable*, in-line with the aim of the Handbook. It is, in our opinion, a prerequisite reference source for any investigational research in the physical sciences sector.

We would strongly recommend this handbook to departmental libraries, physical scientists and engineers. Moreover, it is well suited as a quick reference source for undergraduate students studying the physical, chemical and biological sciences.

CRC Handbook of Chemistry and Physics

Subject area
Physical Sciences

Description
Handbook and key data source

Authors
David R Lide (Editor-in-Chief)

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

Date/Edition
2007-2008/88th edition

ISBN
0-8493-0488-1

Level
Professional, academic

Price
£71.10

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October 2007

This is a wonderful book. I think I first came across *the Rubber book* when studying A-levels at my comprehensive school's sixth form: it seemed to be the book the chemistry teacher turned to when a final arbiter was needed. The book had the air of a holy book (say a family bible) that deserved utmost respect.

Summary Review

range: * poor to ***** good

Academic content	*****
Usefulness to student	****
Usefulness to teacher	*****
Meets objectives	*****
Accuracy	not rated

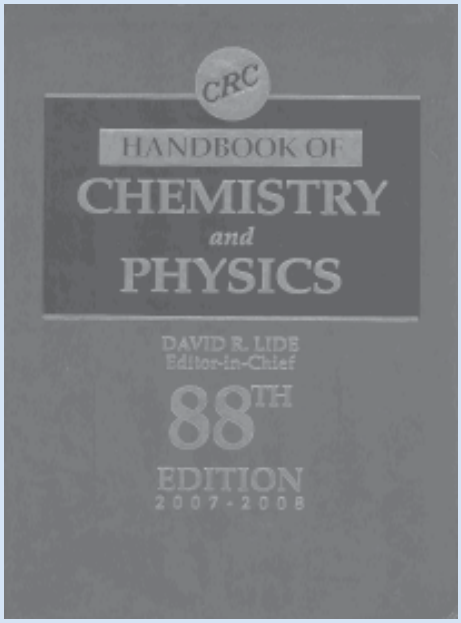
The handbook is at one level a glorified data book – but what a data book. Although there are clearly reference books available in specialised areas of science, and modern communications technology makes it easier to access data from primary literature, the handbook offers a fairly comprehensive reference work across physics and chemistry in one manageable volume.

This is not really a book for most students, neither in terms of need nor expense, although I recall the excitement of finding an affordable discounted superseded volume in my own student days. It is certainly an essential book for any serious science library, and one that high schools and colleges should be encouraged to obtain for the benefit of their students. Any well equipped lab could also benefit from a copy, to supplement more specialist reference materials. However, the book is especially valuable for the teacher (at college as well as University level). As a source of ideas and examples the book is extremely valuable. The Handbook is an ideal reference work for the teacher who wishes to use authentic data in examples and exercises, but wishes to move beyond standard examples used in student books. Such variety does not only offer intrinsic interest, but is a useful way of selecting a diversity of examples to encourage students to analyse and apply their knowledge in answering questions, rather than following simple algorithmic procedures.

The solid hardback book is rather heavy to manipulate, and is spread over 2640 pages. Even then, the pages are thin, and the font size small to keep everything within one bound volume. Interestingly some materials are in a serif font and some sans serif, seemingly linked to the format of different tables. The printing is somewhat uneven, so that for example parts of the text on p.16-15 are much darker (appearing bold) than that on p.16-14 in the copy reviewed despite being part of the same table. Similarly text on p.2-6 of the copy reviewed was very faint, where the continuation of the same table on p.2-7 was of normal intensity. Despite these limitations the text is generally quite clear. (A CD-ROM volume of the publication is available, and might be more suitable for those with failing eyesight.)

The book is arranged in major sections (such as 'Thermochemistry, electrochemistry, and kinetics' and 'Geophysics, astronomy, and acoustics'), and page numbering follows this, ie the tables of vapour pressure of fluids at temperatures below 300K (a randomly selected entry) begins on page 6-91. Personally I would appreciate continuous page numbers as well to help one see how far one is from a target page when moving through the book: how close am I on this page to finding the dissociation constants of organic acids and bases on p.8-42? However, this is a quibble, and the start of each section is marked by a useful thumb index. Pages have bold headings and a detailed index is provided to supplement the main contents list, and there are supplementary summary contents listings at the start of the sections.

CRC Handbook of Chemistry and Physics



From the publisher...

CRC Handbook of Chemistry and Physics, 88th Edition

By David R. Lide National Institute of Standards & Technology (retired), USA

The CRC Handbook of Chemistry and Physics, 88th Edition continues to offer the most authoritative, up-to-date data to scientists around the world. This edition contains NEW tables on Properties of Ionic Liquids, Solubilities of Hydrocarbons in Sea Water, Solubility of Organic Compounds in Superheated Water, and Nutritive Value of Foods. It also updates many tables including Critical Constants, Heats of Vaporization, Aqueous Solubility of Organic Compounds, Vapor Pressure of Mercury, Scientific Abbreviations and Symbols, and Bond Dissociation Energies. The 88th Edition also presents a new Foreword written by Dr. Harold Kroto, a 1996 Nobel Laureate in Chemistry.

0-8493-0488-1 2640pp 2007 £71.10

Although many of the entries are based on tables, the Handbook also includes mathematical and structural formulae, mathematical constants, and definitions – indeed section 2 offers a basic dictionary of science. Sources, abbreviations used, and the logic of data ordering are explained as appropriate.

The 88th Edition reports several new topics. These reflect the expanding reach of the Handbook (nutritional values of food); developing areas of science (organic semiconductors); and environmental concerns (solubility of hydrocarbons in seawater). Other material has been expanded or updated. Libraries should clearly update this reference work with each new edition, but for a teacher such revisions are likely to bring marginal value unless a change relates directly to a key focus of teaching or research.

I have always found there to be something reassuring about having a copy of this book on the shelf. I began this review by suggesting there was something wonderful about this book. Of course that wonder comes less from the book than the physical world it tells us so much about, and the disciplines of physical science that have uncovered all this information. In his foreword to this new edition Prof. Harry Kroto refers to how the Handbook always seemed to be full of “all the facts in the Universe and more”. This book certainly offers a good many reliable scientific facts, and indeed more, for it also offers a strong insight into those established scientific theories and models that offer the conceptual frameworks for appreciating the meaning and significance of all this hard-earned information. It is a wonderful book indeed.

Developing Your Teaching: ideas, insight and action

Subject area
General

Description
This text will be particularly helpful for new lecturers, tutors and graduate teaching assistants. Experienced staff involved in ongoing professional development for their teaching will also benefit, as this book is for everyone who would like to think more deeply about their teaching

Authors
Peter Kahn and Lorraine Walsh

Publishers/Suppliers
RoutledgeFalmer
(www.routledge.com)

Date/Edition
2006

ISBN
0-415-37272-0

Level
Teachers

Price
£75.00

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School of Health,
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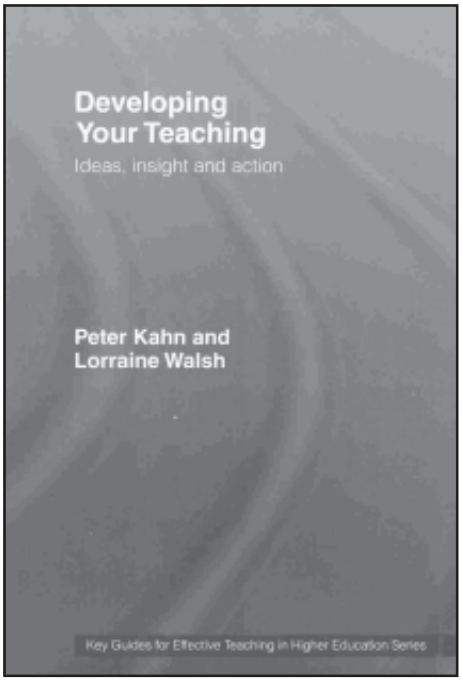
October 2007

This book is one of a series aimed to help those new to teaching in higher education. The series provides practical advice, based on research and education theory, and should appeal to practitioners across the subject disciplines.

Summary Review

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

The text moves seamlessly from the individual teacher reflecting upon their own teaching, towards working with mentors, peer observation and team teaching. The extensive use of case studies provides a context within which to explore the ideas raised in each chapter. The focus here is clearly set in practice and the authors write in a clear and accessible way. Review tasks are included at regular intervals and whilst more experienced teachers may not find these especially useful, they provide helpful reflection points for the new teacher.



The structure of the book, with chapters including self-evaluation, learning from others, the role of mentors and finally chapters looking at career development, is entirely sensible. The writing is fluid and the case studies illustrate how various techniques can be applied across the curriculum.

As this is one of a series of books, there are elements of practice such as assessment and use of information technology that are not fully covered, however if the other texts are as well written as this one, they would make a useful library for staff induction/development. If I have one criticism, the chapters on career development do not sit as comfortably as the others but it is no bad thing to offer such advice to those new to teaching.

I commend the authors on the style and quality of writing. Even with twenty plus years in teaching, I found each chapter had something to offer me. The text is friendly, almost conversational in its approach, and should appeal to most readers.

This book is highly recommended, accessible and full of sound advice without being patronising. Those new to HE teaching and those with years experience will find something here to help them develop their teaching. The case studies demonstrate how the techniques can be successfully used across the curriculum and lend weight to the practical advice given. This should be in the library of anyone starting to teach in further or higher education. The very plain and uninspiring blue cover certainly supports the old adage ‘never judge a book by its cover.’

Elegant Solutions: ten beautiful experiments in chemistry

Subject area
General Chemistry

Description
An account of ten notable experiments in chemistry that demonstrate the scientific process and the history of (mainly) chemical progress

Authors
Philip Ball

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

Date/Edition
2005

ISBN
0-85404-674-7

Level
A-level, access, foundation

Price
£19.95 (hardback)

Summary Review

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

This is a delightful (beautiful?) book that deserves a wide audience. This is not a book designed to improve the understanding of science, but one that tackles the perception of science, scientists and the scientific method. The book contains ten chapters that do more than describe individual experiments; they put it in the context of contemporary thought and attitudes and the characters of the chemists themselves. Each experiment is described and the science explained well, but it is the material that is left out of most text books that makes the best reading. The first experiment described is of Van Helmont's willow tree. This demonstrates how experimental evidence leads, via theory, to conclusions. In this case, the conclusions were false, but the episode was still an important step in the progress of science because it was based on experimental evidence. From here, the book travels through elemental analysis, radiation, molecular and crystalline shapes to the synthesis of large organic molecules and in so doing covers experiments that are elegant due to their simplicity to ones involving huge instruments, from single researchers to large, multi-national teams. These chapters would make this volume a worthy addition to any chemistry bookshelf, but it is the additional sections that contain much material that chemists and would-be chemists should consider.

The introduction raises the questions "What is an experiment? What is beauty?" The answer to the first question would appear trivial to many, but Phillip Ball makes several points that undermine the commonly-held view of a procedure designed to test a hypothesis. He demonstrates that the experiment historically comes from the 'art' of technology. The answer to the second question is, of course, open to discussion as it is based in value judgements – something most practising scientists would claim is excluded from science – and yet the author proves from the ten experiments presented that value judgements are always being made by those who perform experiments. Sometimes these judgements help the progress of science, more often they do not.

In a couple of "Divertissements", Phillip Ball looks at the perception of science and scientists as attitudes in society have changed (or not) and how scientists have re-told their exploits in the laboratory and 'spun' their slow progress into flashes of inspiration that are now taught as fact (eg Kekule's dreams). These are well placed between the experiment chapters and serve to underline all the more that chemistry is a human endeavour. In his Coda, the author briefly examines chemical aesthetics, the way chemistry assails the senses. Surely this is one reason why chemists became chemists? Maybe if we considered and celebrated these delights we would have students flocking to the lab rather than running from it?

I started this review by stating that this book deserves a wide audience. It should be read by A-level students to put their learning in context and by undergraduates to examine the experimental process. I fear that it will be read by neither because it doesn't directly impact upon their studies and we will all (and our science) be the worse of for it. It is an excellent addition to Phillip Ball's growing list of popular science titles.

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October 2007

Experimental Organic Chemistry

Subject area
Organic Chemistry

Description
This text provides a rigorous account of the principles and practice of experimental organic chemistry, taking students from their first day in the laboratory right through to research work

Authors
L M Harwood, C J Moody and J M Percy

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

Date/Edition
2nd edition

ISBN
978-0-6320-4819-9

Level
Undergraduate

Price
£36.50

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Amazonas Federal University,
Av Gal Rodrigo Otávio Jordão,
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Japiim, Manaus-AM,
Brazil
July 2007

Summary Review

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

Harwood's book is an outstanding organic chemistry laboratory book with an excellent view on ways of teaching organic chemistry. But what makes it different from other chemistry books is the fact that it is not only a simple collection of organic chemistry practices (with a huge list of old and new, sophisticated and expensive experiments). Indeed, this book provides the reader with fundamentals and instructive information necessary to comprehend the subject thoroughly and to apply this knowledge to the practice. This second edition contains new chapters, which cover the most important reaction types (like functional groups interconversions and carbon-carbon bond-forming reactions) as well as many synthetic procedures. In addition, a group of twenty projects is attached at the end of the book, which deal with natural products extraction and synthesis, including dyes, pherormones and flavones.

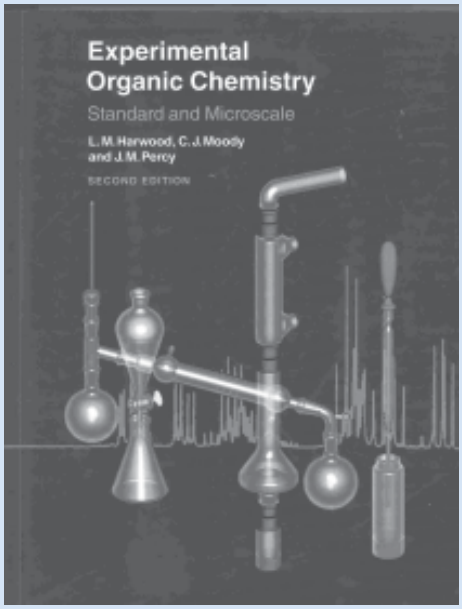
The book is divided into two parts: 'Laboratory Practice' and 'Experimental Procedures'. The first one presents the organic chemistry lab, its glassware, gas and vacuum equipment. Some of the usual care and details which are involved in organic chemistry reactions are very well explained, for instance: handling, stirring, heating, extracting and purifying procedures, including chromatography and distillation. The microscale is used not only because of safety concerns on synthesis (which are widely distributed over the whole book), but also because of the characterisation of the analytes by chemical methods using TLC.

Chapter five, 'Spectroscopic Analysis of Organic Compounds', provides the reader with very useful spectroscopic information, introducing briefly the theory, which is followed by a practical approach that satisfies one of the most common students needs: how to prepare properly the sample for spectroscopic analysis and obtain the most important information from the spectrum. This is true not only for Infrared but also for UV, Mass Spectrometry and NMR. The chapter is brilliantly illustrated with several well designed examples (even though there are almost no tables). This first part ends with an educative collection of tips on how to write and document information in the laboratory notebook.

Part Two explores the experimental procedures, using sequences for illustrating particular techniques. The procedures are divided into four levels: introductory, more complex procedures, complex procedures with emphasis on spectroscopy, and research level.

Chapters seven and eight are composed of 66 experiments: basic techniques and spectroscopic experiments. They deal basically with reactions. Chapter seven covers the organic chemistry reactions, here functional group interconversion plays a central role with reductions, oxidations, substitutions, alkene reactions and rearrangements. Chapter eight focuses on 'Carbon-Carbon Bond-Forming Reactions': Grignard and organolithium reagents; enolate anions; heteroatom-stabilised carbanions; aromatic electrophilic substitution; and pericyclic reactions. These two chapters are filled with plenty of details of the reactions, sometimes with mechanisms, sometimes with spectra, but always with problems that should be solved by the students.

Experimental Organic Chemistry



From the publisher...

Experimental Organic Chemistry

By L. Harwood, Christopher J. Moody, Jonathan Percy

This established text continues to provide a rigorous account of the principles and practice of experimental organic chemistry, taking students from their first day in the laboratory right through to research work. New to this edition, a microscale approach has been integrated into the entire text, alongside conventional manipulations, bringing it in line with current laboratory. Maintaining the unique structure of the previous edition, the first half of the book surveys all aspects of safe laboratory practice, the use of a wide range of purification and analytical techniques, particularly spectroscopic analysis. The second half contains easy-to-follow experimental procedures, each designed to illustrate an important reaction type of basic principle of organic chemistry.

978-0-6320-4819-9 728pp 1998 £36.50

The entire book presents several figures showing the right and the wrong way of using materials in the lab. To reinforce these safety concepts, beside the text red words turn the attention to the important and especially dangerous procedures. At the end of each topic, a 'Further Reading' section presents some references. They are not very up-to-date but contain some interesting original literature.

Finally, taking into account the facts explained above, using Harwood's book for undergraduate students working in an organic laboratory and for teachers elaborating experimental disciplines of organic chemistry would definitely be recommended.

Fundamental Physics for Probing and Imaging

Subject area
Medical and Environmental Physics

Description
This book explains the fundamental physics behind modern probing and imaging

Authors
Wade Allison

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

Date/Edition
2006/1st Edition

ISBN
978-0-19-920389-5

Level
Undergraduate

Price
£24.95

Professor Allison has developed this recent edition from his shorter option course module in '*Medical & Environmental Physics*'. It is taught to third year mainstream physics undergraduates at the University of Oxford. The book is written primarily for all physicists, who wish to understand the physics basis of imaging and radiation therapy.

Summary Review

range: * poor to ***** good

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

This variably demanding book totals ten chapters spread over 334-pages and is structured in a way to aid lecturers to construct and disseminate course material effectively. This is achieved by separating out the core physics and applications and providing succinct summaries to each of the many carefully selected section topics. Each chapter commences with a list of the contents as a sidenote and page references alongside the section headings. There are sidenotes throughout the book which provide figures, tables and definitions.

The early chapters of the book cover fundamental areas of physics (ionising and non-ionising). The later chapters coherently build on these concepts to provide an advanced grounding in these areas and bridge physics and real world applications. The final chapter is a round-up of the topics discussed in the book yet providing the reader with a sense of direction of the developing technologies.

The first chapter identifies the principal approaches to imaging and 'sets the agenda for the rest of the book'. This is an opening chapter and as such provides a superficial coverage of applications of imaging physics. It gives a broad overview of the safety related aspects and criteria to evaluate the performance of multi-modal imaging systems. The keywords to web search in the main text and references to further reading at the end of each chapter are very useful.

Chapter two on 'Magnetism and Magnetic resonance' lays down the basic equations and concepts including decay and relaxation processes. There is a brief explanation of the hardware, software and measurement aspects of Nuclear Magnetic Resonance (NMR). This part is composed of theory and derivations that is descriptive, concise and has useful tables and illustrations.

The next two chapters cover the physics of ionising radiation, mechanical waves and the properties of matter. The sources of radiation and their relation to imaging are described; the collisional processes and associated kinematics. There is a very useful section on elastic scattering by charged particles. Chapter three provides an excellent grounding of the fundamental processes in question. It is well explained, interesting and delves deep into the core, though some diagrams were inadequate. Chapter four provides the basic relationship of stress, strain and wave types in media and interactions of sound in media. It is well written and has an emphasis on geophysical applications.

The self-contained chapter five introduces the reader to information and data analysis. The early part of the chapter is concerned with 'useful information' and examines the two types of noise. It emphasises accuracy and precision in data and as a consequence describes two approaches of signal-noise separation.

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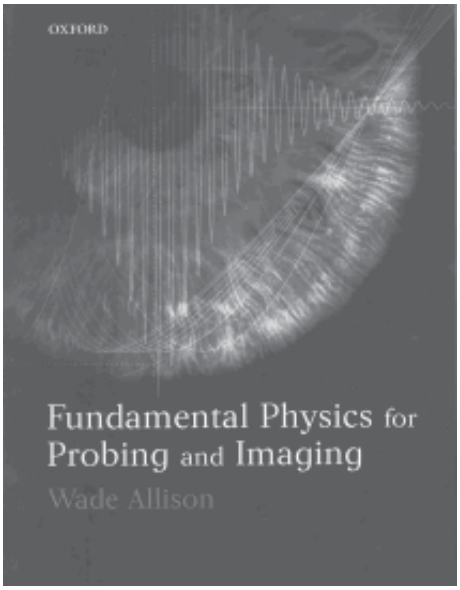
July 2007

Fundamental Physics for Probing and Imaging

Chapter six ‘analysis and damage by irradiation’ describes the physical processes involved, background exposures and past incidents. There is coverage of detector specification and types. Several methods of elemental and isotope concentration analysis are discussed. There is a very interesting hierarchical illustration of the biological effects of radiation. The tables on the survival data are useful though illustrations are very simple: photographs would have been very helpful. This chapter is mainly descriptive, broad and provides a good analysis of errors in measurements.



Chapter seven concentrates on imaging with MR discussing spatial encoding, pulse sequences and detector coils. It then builds on this and discusses *f*MRI (functional magnetic resonance imaging), safety and its limitations. There is a seamless integration of the components that make up a clinical MRI scanner. Moreover, there is an array of excellent photographs which emphasise its clinical relevance.

The descriptive chapter eight, ‘medical imaging and therapy with ionising radiation’ is concerned with the production of X-rays, CT (or CAT Scan: Computerised Axial Tomography), the algorithms used for image reconstruction, image quality and patient exposures. The use of functional imaging is described and a comparison with a useful discourse on the use of image fusion. A section is solely devoted to radiation oncology, with an interesting one on radiobiology, though certain sections could have had more depth.

The next chapter on ‘Ultrasound for imaging and therapy’ considers the techniques used in ultrasound imaging, generation of ultrasound beams, factors affecting image quality, and a round-up of the pros and cons of using ultrasound for medical imaging. The chapter also extends to discuss applications which albeit brief includes welding of layered materials, lithotripsy and cancer therapy using HIFU (High intensity focused ultrasound).

The final chapter provides a forward look, is short and covers the developments in imaging, revolutions in cancer therapy and clinical aspects of radiotherapy. It looks into avenues capable of improving treatment outcome. The safety of ultrasound and radiation is discussed and there is an excellent chart related to patient doses. There is a discussion on the nuclear risks of the past, public response, and models used to derive safe levels of ionising radiation. The chapter rounds-up with the developing technologies, ideas and education.

With a relaxed and semi-formal writing style, principal methods are explained and questions are raised to help engage the reader in understanding a developing concept. Allison emphasises incorrect terminology *or misnomers* throughout the text. There are numerous performance comparisons between methods which help distinguish areas in which each modality excels. The illustrations, figures and diagrams are explained thoroughly in the main text. The author does make ample references to suggestive reading and to questions at the end of each chapter as well as the glossary.

There was a need to reference statistical data given in the main text but nonetheless all tables have been referenced. There is some unevenness between chapter lengths and minor discrepancies in the book. The overlapping of the material between chapters purposely “encourages parallel thinking about the choice of methods available”.

This is a very good text for the prospective reader with a decent price tag. It would be useful for undergraduates in physics and related disciplines and those interested in medical imaging and therapy.

Fundamental Toxicology

Subject area
Toxicology

Description
This is a concise and comprehensive review of toxicology. It is based on the highly successful *Fundamental Toxicology for Chemists* and has been enriched and expanded

Authors
John H Duffus (Editor), Howard G J Worth (Editor)

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

Date/Edition
2006

ISBN
978-0-85404-614-0

Level
Undergraduate, research

Price
£39.95

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November 2007

Summary Review

range: * poor to ***** good

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

Following the enforcement in June 2007 of the European legislation REACH (Registration, Evaluation, Authorisation and Restriction of CHemical substances) giving greater responsibility to industry to manage chemical risks, an appreciation of the toxicological effects of chemicals has become ever more important to chemists. This book, although published before the enactment of REACH, provides an excellent introduction to toxicology and will provide the reader with a solid grounding in the subject.

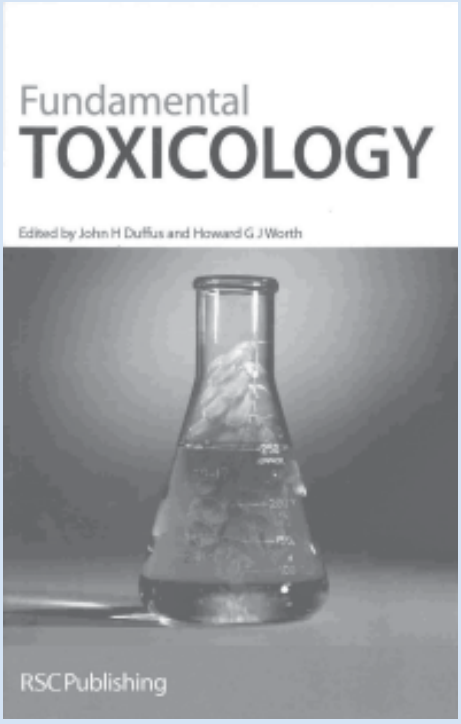
Although not particularly clear from the title, this book is effectively the 2nd edition of *Fundamental Toxicology for Chemists*, previously published in 1996, the title change reflecting that toxicology fundamentals are now important for a broader range of scientists than just chemists. For example environmentalists now need to be far more understanding about the mobility and toxic effects of chemicals in the environment when dealing with risk assessments. Alongside the addition of four new chapters, all other chapters have been updated; however there remain occasional references from the earlier edition which means that it may be difficult for some readers to find some of the older references.

Although the book initially appears an imposing tome of 490 pages, the text is divided into 25 self contained 'review' chapters of approximately 15 pages each, plus appendices, making the book more digestible than first impressions suggest.

Each chapter is generally well written by an established expert in the field, and the text carries both an air of authority and depth, giving the reader confidence in the quality of the presented material. The book is well edited as, considering the breadth of material, individual chapters follow a relatively consistent tone, and the text follows a logical structure. Introductory material is devoted to the fundamentals of toxicology with individual chapters devoted to topics such as toxicokinetics and exposure monitoring and the use of toxicological data within risk assessments. The next group of chapters build upon these established fundamentals and deliver more specialised topics such as immunology and carcinogenicity, and the effects of toxins on specific target organs such as the respiratory system and the liver. The book then concludes in a 'case study' type approach with a section on environmental toxicity, including chapters on named pollutants such as radionuclides and pesticides, and a section devoted to the more traditional consideration of toxicology, ie pharmaceutical chemicals and safe chemical handling.

The text is contextualised well throughout with many appropriate examples and where necessary, such as in the risk assessment and management chapters, details of the appropriate legal context (up to 2005) are given. Within any review type book such as this there are always a few omissions or examples that one would like to have seen, but these are minor when considering the wealth of material presented.

Fundamental Toxicology



From the publisher...

Fundamental Toxicology

By John H Duffus (Editor), Howard G J Worth (Editor)

Fundamental Toxicology is a concise and comprehensive review of toxicology. It is based on the highly successful Fundamental Toxicology for Chemists and has been enriched and expanded. Every chapter in this new edition has been revised and updated, and four new chapters have been added.
The book includes new information on: risk assessment and risk management; toxicogenomics; effects of toxic substances on the human body; environmental distribution of chemicals and ecotoxicology; clinical toxicology; pharmaceutical toxicology; and aspects of laboratory measurement and safe laboratory practice.
Fundamental Toxicology is ideal for students and includes extensive pedagogical features, such as an extensive glossary, a bibliography after each chapter and recommended further reading.

978-0-85404-614-0 490pp 2006 £39.95

One minor criticism of the book is that the text is sparsely and inconsistently illustrated. Additional tables or diagrams would often be helpful to students, particularly where the text covers complex issues, as there are some occasions where the authors do assume more background knowledge than may be expected of the reader studying the fundamentals of a subject.

Other than the core material the appendices also contain very useful features. The first appendix is especially useful for lecturers as it presents a proposed curriculum for teaching toxicology, and offers a source of additional web based resources in the form of pdf versions of presentations. The combination of curriculum, presentations and book provide an essential resource for newly appointed lecturers in toxicology. The second, and extensive, appendix is an IUPAC approved glossary of toxicology terms, which should act as a useful reference for all toxicological professionals.

Whilst targeted towards advanced chemistry undergraduate study, overall this is an excellent and authoritative text that can be strongly recommended to students and teachers across many scientific fields, as well as practitioners. As the public become more attuned to the effects of toxic chemicals on man and the environment, it is important that scientists have an awareness of toxicology fundamentals, and this book will satisfy those needs. Finally the authors and publishers should be commended for keeping the cover price to a very reasonable £40, making this valuable text within the financial reach of students and not just libraries and their tutors.

How Things Work: the physics of everyday life

Subject area
General Physics

Description
This book is an unconventional introduction to physics and science that starts with whole objects and looks inside them to see what makes them work

Authors
Louis A Bloomfield

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

Date/Edition
2006/3rd edition

ISBN
978-0-471-46886-8

Level
A-level, access, foundation, undergraduate

Price
£32.95

Summary Review

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

There are quite a few books with the title “How Everything Works” and to locate this one in the list you must include the sub-title. There are sixteen chapters covering virtually the whole of physics,
Laws of Motion: 2 chapters
Mechanical Objects: 2 chapters
Fluids: 2 chapters
Thermodynamics: 2 chapters
Resonance and Mechanical Waves
Electricity, Magnetism and Electrodynamics: 2 chapters
Electronics
Electromagnetic Waves
Light and Optics: 2 chapters
Modern Physics – Nuclear Weapons, Medical Imaging

This is an excellent book which is written for non-scientists and adopts an approach which is, in my experience at least, refreshingly different. The standard textbook will usually approach its subject beginning with fairly abstract principles, developing the arguments from there on and maybe including a few real world examples at the end of the chapter, or even only within the problems or further examples section. There is nothing peculiar to physics about this – all texts seem to follow this procedure but those in science may serve to alienate many potential students. In this book the author adopts the reverse approach by introducing the real objects and phenomena that we encounter in our ordinary lives and then proceeding to deal with the basic physical principles that underpin such observed behaviour. The author’s stated objectives can be summarised as,
See science in everyday life.
Learn that science isn’t frightening.
Think logically.
Develop physical intuition.
Learn how things work.
Understand that the universe is logical, not magical.
Obtain a perspective on the history of science.

Just to give you an example of the author’s style, let us have a look at the first chapter on the laws of motion. This begins with an opening paragraph explaining that the chapter will be used to introduce the language of physics followed by an analysis of the laws of motion since everything else depends upon them. Immediately after, and still on page 1, we dive straight into the first experiment - ‘Removing a Tablecloth from a Table’. The mechanics of carrying out the experiment are presented and we learn in useful detail exactly how to do it. The physics is not discussed at this point; instead we are asked to defer our curiosity as some other phenomena will provide an insight into the mechanism.

This is followed by a series of discussions that gradually introduce the laws of motion and their concomitant detail. Each section is prefaced by a short summary of the coverage, some questions to think about and a few simple experiments that pose more questions that will be answered in that section.

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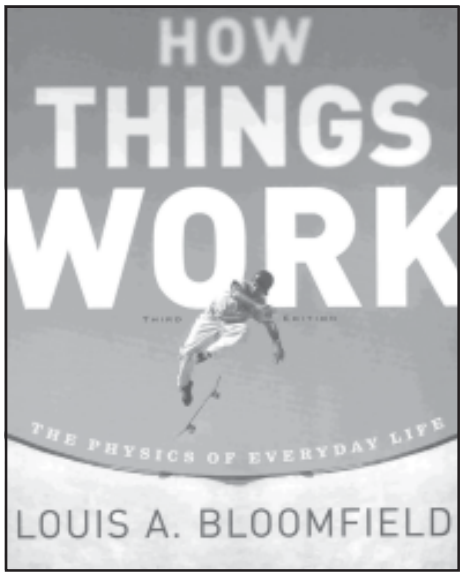
November 2007

How Things Work: the physics of everyday life

For the first chapter on the laws of motion, there are three such sections:
Ice skating: Inertia, vectors, speed, distance, time, forces, first law, acceleration, second law, frames of reference, units.
Falling balls: Weight, mass, gravity, projectiles.
Ramps: Third law, balancing forces, energy, work, potential energy.

Finally we are presented with the explanation of the tablecloth experiment using the concepts explored in the preceding sections. At every stage there are highlighted inserts summarising important points such as the definitions of force, kinetic energy and so on. More importantly there are numerous simple questions interspersed within the text to test your understanding of the previous passage such as "As you ride upwards on an elevator at constant velocity, what two forces act on your body and what is the net force on you?" The answers are given in full at the end of the chapter together with a summary of the important laws and equations used plus a number of additional examples.



In certain places there are highlighted paragraphs containing "Common Misconceptions" and their resolutions. I found these to be particularly appealing.

Mathematics is kept to a minimum and only introduced when a quantitative analysis is appropriate. This occurs in every chapter since we are dealing with a physical science. The author emphasises the beauty and importance of equations but, by introducing them after the narrative descriptions, they are made to seem more natural and unthreatening. There are plenty of numerical problems at the end of each chapter.

I have tried this book out on my grandson, a reasonably bright 12-year old, in his first year at secondary school. He had for some time wondered about nuclear fusion and chose this chapter (16. Modern Physics) to study. He struggled with the nomenclature – ^{2}H, ^{238}U which he hasn't yet covered but was completely happy with the textual explanations and is now quite at home with the topic.

In the preface, it states that …"a curious layperson, advanced physicist, or a beginning physics student, most everyone will find this book an interesting and enlightening read and will go away comforted in that the world is not so strange and inexplicable after all." My feelings exactly.

There are two websites supporting the book. The one by the publisher and the other by the author,
http://www.wiley.com/college/bloomfield
http://howthingswork.virginia.edu/

The Wiley site contains a wealth of additional material, both for the instructor and the student, unfortunately the one for staff requires registration in order to view such useful items as problems with answers and downloadable PowerPoint presentations. This took a couple of hours despite requiring the approval of my local 'Wiley' representative. Once registered you have the following additional resources.
Test Bank
Solutions Manual
Cases
Image Galleries
Demonstrations Ideas
Computerized Test Bank
Lecture Notes PowerPoint
Additional Web Chapters

Teachers wishing to make use of material like this may well find items in "The Physics Box" produced by the Physical Sciences Centre to be particularly useful (http://www.heacademy.ac.uk/assets/ps/documents/the_physics_box_contents.pdf).

The author has recently written an expanded text which should also prove to be a very valuable tool,
How Everything Works: Making Physics out of the Ordinary
Louis A Bloomfield
ISBN 0-471-74817-X, 720 pages, Hardback, 2007.

Interactions in Online Education

Subject area
General

Description
A collection of papers covering a broad spectrum of material within the realm of on-line learning. The text as a whole should be of value to anyone designing, using or managing on-line or flexible learning systems

Authors
Edited by Charles Juwah, (19 individual contributors)

Publishers/Suppliers
RoutledgeFalmer
(www.routledge.com)

Date/Edition
2006

ISBN
0-415-35741-1

Level
Undergraduate, research, teachers

Price
£80.00

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October 2007

Firstly I must confess that as a user rather than a researcher of on-line pedagogical tools I found this book hard work and in some places too much additional work would have been needed to do full justice to the material. However, that said, the editor must be congratulated on pulling together work across the whole spectrum of on-line education.

Summary Review

range: * poor to ***** good

Academic content	*****
Usefulness to student	****
Usefulness to teacher	****
Meets objectives	****
Accuracy	n/a

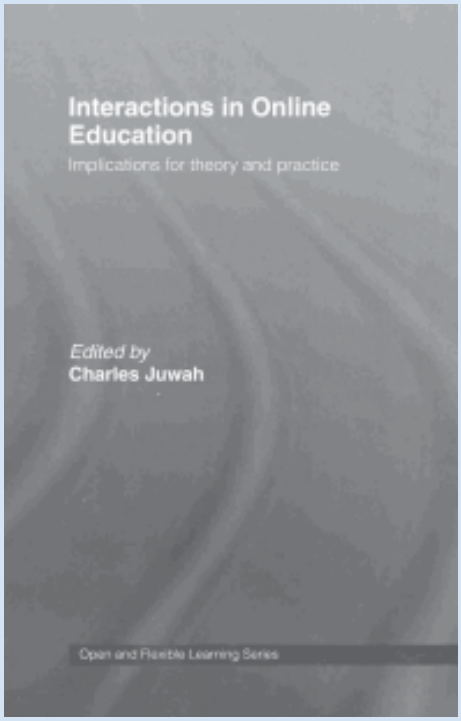
The text itself is split into four main sections: theoretical and pedagogical perspectives; design and learning environment; practice and professional development. In all these four sections run to 13 *chapters* plus a conclusion by the editor. The *chapters,* however, are more in the style of individual papers which gives the book more of a conference proceeding feel.

The first section develops the theoretical background stressing the importance of interactivity and engagement in the learning process. Working through the three chapters in this first section the reader is moved from a Kolb[1] style experiential learning setting through person-computer interaction to the thesis that current taxonomies of learning are not adequate to cope with the complexity of e-learning. The final chapter in this section sets out a three stage system for classifying e-learning interactivity and its impact on learning.

The second section, of four chapters, explores the design of the e-learning environment. The first chapter develops the notion of using *dialogue games* as a means of creating an engaging learning environment. Using Wittgenstein[2] as a starting point and using the software package *InterLoc* as an exemplar for a mediated educational dialogue package made this chapter particularly difficult for this reviewer. The remaining chapters in this section look at modelling authentic activities in on-line learning, the development and use of learning objects and the use of simulations for discovery type learning and the development of, without specifically referring to, higher order cognitive skills. This final chapter of the section also develops the *PI theory for learning environments* this may be known to the readers but was something else new to this reviewer. PI or parallel instruction was developed by the author of this chapter, Rik Min, and he is cited in almost half the references at the end of the chapter. However, as a newcomer to PI, I'm not fully informed by this chapter and more work would need to be done in order to fully comment on its applicability here.

With section three, of four chapters, I felt I was on safer ground. The section deals very well with the ideas of on-line discussion, peer learning and videoconferencing. The final chapter in this section may prove to be of particular interest to readers as it presents the pedagogic model developed for the University of the Highlands and Islands giving a clear pedagogic model for blended learning. The on-line, face-to-face, videoconferencing mix is, I am sure, an area many of us will be exploring through either interest or need in the near future.

Interactions in Online Education



From the publisher...

Interactions in Online Education: Implications for Theory and Practice

By Charles Juwah

Interactivity is at the very heart of learning and is evident at all levels of engagement, whether between fellow students, students and tutors, online learning materials or interfacing with the learning environment. Covering both theory and the practical implications of the issues discussed, this book provides international perspectives on key topics including: analysing and designing e-learning interactions, social and conceptual dimensions of learning, interactions in online discussions, interactions in peer learning and professional development of online facilitators.
It is essential reading for all those involved in the design, implementation, management and use of open and flexible learning.

0-415-35741-1 272pp 2006 £80.00

The final section runs to just two chapters which explore the role of on-line facilitators and their professional development needs.

Having worked through the whole text I am now far more aware of my own developmental needs in terms of on-line or e-learning. Many reading this text may, like myself, be in the state of not knowing what I don't know. This in itself is, I would argue, good for all of us as educators.

The final chapter of the text, conclusion, written by the editor attempts to summarise the thirteen previous chapters. The conclusion looks at the *key issues, design of the learning environment, peer learning* and *professional development.*

Taken as a whole this text would have something for everyone, staff and student alike, but it is more something to be dipped into rather than read through and don't expect an easy read!

References

1. Kolb, D A *Experiential learning: Experience as a Source of learning and Development*, Englewood Cliffs, Prentice-Hall (1984).

2. Wittgenstein, L *Philosophical investigations,* Oxford, Blackwell (1953).

Introductory Physics with Algebra
Success with Mathematics

Subject area
Physics, Mathematics

Description
Both books are aimed mainly at students beginning their university study. They are designed to be used by the student without support from a tutor and are unlikely to be useful as core texts

Authors
Introductory Physics with Algebra by Stuart E Loucks.
Success with Mathematics by Heather Cooke

Publishers/Suppliers
John Wiley and Sons Ltd (www.wiley.co.uk) for Loucks
Routledge Falmer (www.routledge.com) for Cooke

Date/Edition
Introductory Physics with Algebra: 2007
Success with Mathematics: 2003

ISBN
Introductory Physics with Algebra: 0-471-76250-4
Success with Mathematics: 0-415-29861-X

Level
Foundation, A-level, undergraduate

Price
(www.amazon.co.uk)
Introductory Physics with Algebra: £17.05
Success with Mathematics: £11.99

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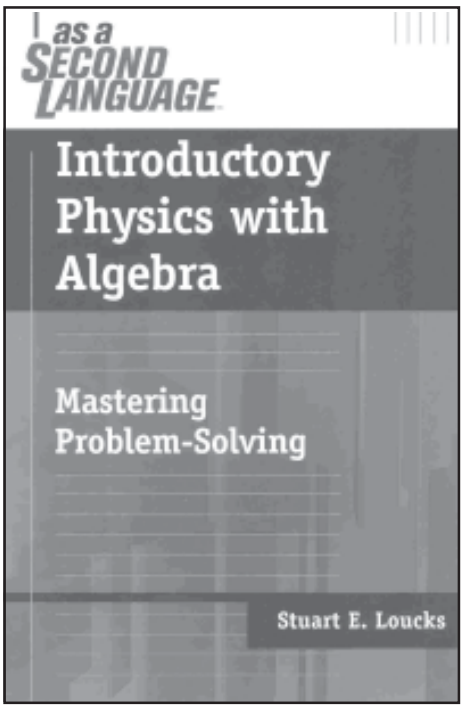
November 2007

Summary Review

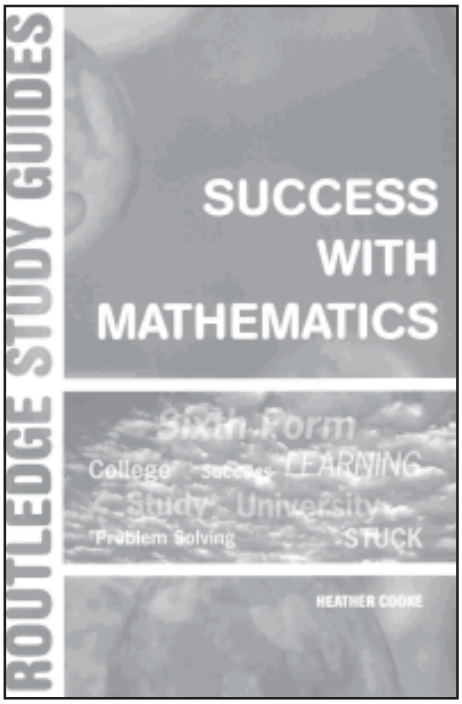
range: * poor to ***** good	Loucks
Academic content	****
Usefulness to student	****
Usefulness to teacher	**
Meets objectives	****
Accuracy	*****

Being able to do algebra is not enough to be able to do physics. This statement, however obvious to anyone who works with physics on a daily basis is still one that we need to make each year to the new intake of physics students. Far too many students making the transition from high school to university physics have an ingrained belief that 'doing' physics is all about plugging numbers into a formula and pushing a few buttons on a pocket calculator. **Introductory Physics with Algebra** (Mastering Problem-Solving) by Stuart Loucks is a book that emphasises the crucial role that properly framing a situation in mathematical terms plays in the process of solving physical problems. He points out that once set up, a problem can be solved by anyone who knows how to do maths – the art of the physicist is in the mathematical specification of a situation. Early in chapter one Loucks spells out in clear terms the major errors in the approach to physics which the diligent student should aim to avoid; these are errors that everyone involved with teaching first (and sometimes later) year physics will recognise – and may have committed themselves from time to time. Given a problem, students are advised not to look up the solution; not to find a similar solved problem in a text book and follow the recipe; and not to go looking for someone else to show them how to do it. Instead the student is guided to learn the "mental and written steps" involved with setting up physics problems. "Focus on the process of *setting up* the problem and you will succeed in your physics class" is the strong and worthy advice delivered at the end of the introductory chapter. The author promises to help the student "know what to have in [his/her] mind and on […] paper when setting up physics problems!"



In the remainder of the book Loucks introduces the reader to his semi-diagrammatic approach to building the final mathematical statement of a problem and then demonstrates it in various mechanics scenarios. Having tried these techniques out with a few of my own students I can vouch for the fact that they do work, however, to gain the most from this book, a student must be prepared to be patient. Loucks' method requires a diligent application through every step and the student must avoid the temptation to skip steps because they think that they can see where they are headed. It is in these skipped steps that most people introduce errors and misconceptions.

Introductory Physics with Algebra
Success with Mathematics



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

This book is self contained and well structured. It will best be deployed by the student working through it at their own pace. It is not particularly suited for adoption as a core text to accompany a lecture course. My main criticism is that the book only uses examples from elementary mechanics (most of which is at A-level). Physics covers so much more that this book and the methods outlined certainly work in fields other than just mechanics; this book would benefit from some 'harder' examples drawn from across the typical first year syllabus. Similarly, in its focus on the very foundations of sound mathematical modelling it avoids the calculus. Perhaps the author may consider a second volume where he extends his method to include this vital mathematical tool. The other thing this book lacks is end-of-chapter problem sets for the reader to try out unaided. That said, given the misconceptions of many incoming students and the importance of being able to set up physics problems I believe that a copy of this book should be on the study desk of every fresher from week one of their studies. Loucks' book will also provide a firm foundation for students embarking on the final stages of high school physics.

Heather Cooke has written a book that forms part of the *Routledge Study Guide* series. **Success with Mathematics** is aimed at anyone, not just physicists, enrolled on a degree programme that involves some mathematical content. What it is not is a traditional maths text book; rather, this offering could be better classified as 'meta-mathematics' as its central theme is the *process* of doing maths rather than mathematical methods and techniques themselves. The potential learning outcomes of the book are explicitly listed early on so that the reader knows what to expect. They include developing successful study strategies – most of which are transferable to other subjects; accessing on and off line resources; and, most interestingly, what to do when the reader becomes 'stuck' on a mathematical problem. Because of the broad profile of the target audience, a lot of the advice is of a general nature, possibly too general in many places. However, I did like the section entitled 'On being stuck', a familiar situation for all who venture into the realm of mathematics. It is on this topic where there is perhaps the greatest crossover with Loucks' book, although the advice offered is perhaps a little contradictory.

Cooke works in academic liaison at the Centre for Mathematical Education at the Open University and the clarity of style employed in the text reflects the high quality of OU publications. On the downside, the many references in the text to the OU make it appear as if the text was originally written purely for OU students with little more than lip-service being paid to the wider community of mathematics learners in UK higher education in general.

Both of these books will prove useful for first year undergraduate physicists (with Cooke's book being equally valid for chemists). Probably the best place for them would be on the pre-reading lists that many departments send to students in the month before their course begins.

Light and Matter: electromagnetism, optics, spectroscopy and lasers

Subject area
Physics, Physical Chemistry, Electrical Engineering, Material Science

Description
This book introduces the reader to the nature of light, explains key procedures which occur as light travels through matter and delves into the effects and applications, exploring spectroscopy, lasers, nonlinear optics, fibre optics, quantum optics and light scattering

Authors
Yehuda B Band

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

Date/Edition
2006

ISBN
978-0-471-89931-0

Level
Undergraduate, research

Price
£39.99

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October 2007

The interaction of light and matter is important to many areas of science and technology, including chemistry, electrical engineering, material science and physics. This book sets out a solid theoretical foundation and is aimed at both practitioners and advanced students.

Summary Review

range: * poor to ***** good

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

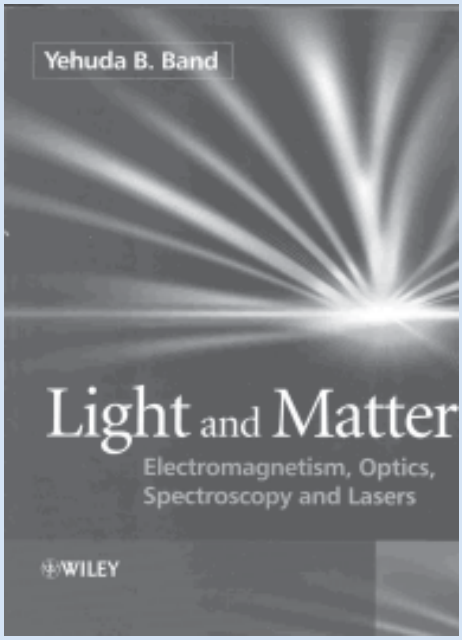
The book's subtitle 'Electromagnetism, Optics, Spectroscopy and Lasers' is a fair summary of the content. Overall, the book has a physics or engineering approach. It is strong in electromagnetism, non-linear optics and various laser phenomena. The discussion focuses on the interaction of visible and ultraviolet light with matter, associated with electronic transitions. There is some, but limited discussion of molecular spectroscopy involving vibrational, rotational and/or nuclear transitions. The 'optics' sections of the book introduce effects like refraction, dispersion, nonlinear optics, quantum-optical processes and light propagation in optical fibres. Light propagation through multiple optical elements (eg a sequence of lenses and/or slits) is not included. Clear, easy-to-understand, black-and-white diagrams support the text. A few key diagrams are reproduced in colour in the colour-plate section in the centre of the book.

Revision problems are placed through the text, near the topic or concept being revised, instead of being collated at the end of chapters. Hints and answers, where appropriate, are printed immediately after the problem. A weakness of the book is that many of the problems are of the derive-an-equation type, and do not have a detailed answer (derivation). The number of problems per chapter is highly variable, ranging from 1 problem for each two pages of content in chapters 1 and 9 to 2 problems in the 22-page chapter 10. Students will want more revision problems especially in the latter chapters, and significantly more numerical problems to get an appreciation of the magnitude of the effects and properties discussed in the text.

The preface states that an elementary course in electricity and magnetism is assumed. Some of this assumed knowledge, electromagnetism and Maxwell's equations, the Schrödinger equation and perturbation theory, is summarised briefly in the Appendices. Not stated, but also assumed is a strong grasp of mathematics. For example, Maxwell's equations are introduced on page 2 in their concise vector notation form involving grad operators, dot and cross vector products, and partial derivatives. This is not a book for the faint of heart, nor those lacking mathematical confidence.

This is a first edition, and has several minor, but annoying aspects. Abbreviations are defined, and many are listed in the index, but I found it hard to keep track of the abbreviations. Perhaps Professor Band will add a glossary to the website (www.bgu.ac.il/~band/Light&Matter.html) associated with the book. (One very useful feature of the website is the links to related websites.) There is a list of more than 100 references, which is very good. There is a separate bibliography, arranged by topic, which will be very useful for those needing more information, but it is unclear how the bibliography topics are arranged, as the sequence corresponds neither to the chapter order, nor to alphabetical order.

Light and Matter: electromagnetism, optics, spectroscopy and lasers



From the publisher...

Light and Matter: Electromagnetism, Optics, Spectroscopy and Lasers

By Yehuda B. Band

Light and Matter: Electromagnetism, Optics, Spectroscopy and Lasers provides comprehensive coverage of the interaction of light and matter and resulting outcomes. Covering theory, practical consequencies and applications, this modern text serves to bridge the gap between electromagnetism, optics, spectroscopy and lasers. The book introduces the reader to the nature of light, explains key procedures which occur as light travels through matter and delves into the effects and applications, exploring spectroscopy, lasers, nonlinear optics, fiber optics, quantum optics and light scattering. Extensive examples ensure clarity of meaning while the dynamic structure allows sections to be studied independently of one another.

978-0-471-89931-0 656pp 2006 £39.99

Who should read and buy this book? Graduate students and practitioners in physics, engineering, and perhaps some areas of physical chemistry, who need to have a firm understanding of theory, would benefit from this book. Those who are looking for an 'applied' book would be disappointed.

Modern HPLC for Practicing Scientists

Subject area
Analytical Chemistry

Description
This is a concise text which presents the most important High Performance Liquid Chromatography fundamentals, applications, and developments

Authors
Michael W Dong

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

Date/Edition
2006

ISBN
978-0-471-72789-7

Level
Undergraduate, research

Price
£28.95

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Japiim, Manaus-AM,
Brazil
July 2007

Summary Review

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

Modern HPLC for Practicing Scientists is a very useful and practical book. Using the author's words: "written for practitioners by a practitioner", Dong's book is addressed to people who have chosen HPLC (particularly the reversed-phase type), as the main technique for method development and routine analysis in the pharmaceutical industry. The book is composed of eleven chapters (several of them focusing on pharmaceutical applications of HPLC), all of them filled with many chromatograms, figures, useful examples and an updated set of references (including web pages addresses).

The first two chapters, entitled 'Introduction' and 'Basic Terms and Concepts', present a basic and extremely useful terminology (eg: normal and reverse phase, resolution, retention); and include some characteristics of the solvents which can be used as mobile phase; eg their physical properties, strength, selectivity and preparation of buffers.

The next chapter deals with 'HPLC Columns and Trends'. It explains the way the stationary phase performs to promote the analyte separation. As well it presents the different types of columns, packing characteristics and modern trends like Fast and Micro LC, including modern and speciality columns (from proteins bioseparation to chiral molecules).

Chapter four was supposed to be of great importance since it describes the HPLC system, injectors, pumps and detectors. Nonetheless, the impression given is that it lacks organisation. The figures are very well drawn but there are several errors in the links between them and the graphics (the reader must go back four pages to find a graphic referred to in the text). In addition, the text is confusing, making understanding particularly difficult. The author makes his excuses: in the preface, Dr Dong explains that the book was written in only ten months. Focusing on the practical aspects of HPLC, the author loses excellent opportunities to explain some interesting issues about it, for instance, the huge development of the interfaces for hyphenated techniques during the last decade. Concerning this, the 'Reference Section' is a very useful way to a thorough understanding of the topic (even in some cases the only chance to obtain information about it).

Chapter five ('Operation Guide'), together with chapter ten ('Maintenance and Troubleshooting Guide'), balanced the inaccuracies of chapter four by showing a detailed view of the problems that beginners and professional analysts usually face. 'Operation Guide' teaches how to prepare the mobile phase (including degassing, filtration, buffer addition and premixing) and how to avoid spilling and to protect the pump and columns by using the best practices while operating the auto-sampler and the detector. Chapter ten complements this chapter, presenting four case studies which are followed by several tips on how to resolve the most common problems in operating HPLC.

Modern HPLC for Practicing Scientists

From the publisher...

Modern HPLC for Practicing Scientists

By Michael W. Dong

Written for practitioners by a practitioner, Modern HPLC for Practicing Scientists is a concise text which presents the most important High-Performance Liquid Chromatography (HPLC) fundamentals, applications, and developments. It describes basic theory and terminology for the novice, and reviews relevant concepts, best practices, and modern trends for the experienced practitioner. Moreover, the book serves well as an updated reference guide for busy laboratory analysts and researchers.

978-0-471-72789-7 304pp 2006 £28.95

Chapters six ('Pharmaceutical Analysis'), eight ('Method Development') and nine ('Regulatory Aspects') are the most complete chapters, giving countless examples of applications, methods and fundamentals of validation for pharmaceutical analysis. As a link, chapter seven gives several examples on how to apply this powerful technique to food, environment, chemical and life sciences. The last (and shortest) chapter, the eleventh, presents some modern trends in HPLC.

In conclusion, it could be inferred that this book does not intend to be a comprehensive treatise about HPLC, but it can be properly used by undergraduate, graduate and post-graduate professionals at several universities, industries and agencies that need to work with HPLC as a validation technique. This title should certainly be reviewed and turned into an excellent book for everyone who plans to work with column chromatography.

Optics and Spectroscopy at Surfaces & Interfaces

Subject area
Spectroscopy, Surface Science, Optics

Description
This book covers linear and nonlinear optics as well as optical spectroscopy at solid surfaces and at interfaces between a solid and a liquid or gas

Authors
Vladimir G Bordo, Horst-Günter Rubahn

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

Date/Edition
2006/1st Edition

ISBN
978-3-527-40560-2

Level
Research

Price
£45.00

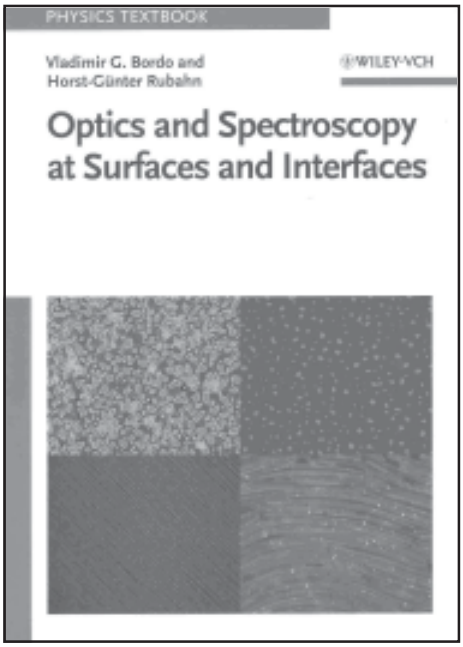
This is the second book written in English by Horst-Günter Rubahn. His first book, also published by Wiley, is *Laser Applications in Surface Science and Technology*.

Summary Review

range: * poor to ***** good

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

This book is written as a graduate textbook: each chapter has a further reading list and problems for students (solutions are given at the end of book). In the first part, the physics of surfaces and interfaces (especially adsorption phenomena), linear optical properties of surfaces and interfaces are concisely introduced. The second part includes traditional topics such as linear optical properties and techniques, infrared spectroscopy. In the third part, more advanced topics like nonlinear optical techniques and optical spectroscopy at a gas-solid interface are covered. The last part, a chapter on optical microscopy, deals with the modern topic of nano-optics and local spectroscopy, which are developing quickly since the birth of the scanning probe microscope.



The chapters of this book are as follows:

1. Introduction.
2. Surfaces and Interfaces.
3. Linear Optical Properties of Surfaces and Interfaces.
4. Infrared Spectroscopy at Surfaces and Interfaces.
5. Linear Optical Techniques at Surfaces and Interfaces.
6. Nonlinear Optical Techniques at Surfaces and Interfaces.
7. Optical Spectroscopy at a Gas-Solid Interface.
8. Optical Microscopy.
9. Nano-optics and Local Spectroscopy.
10. Solutions to Problems.

This self-contained book will be a good textbook for graduate students and those working in physics, chemistry, materials and biology.

Regretfully, the first 22 pages were missing in the book I received for review.

Yang Gan,
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Harbin Institute of Technology,
Heilongjiang 150001,
P R China
October 2007

Principles and Applications of Fluorescence Spectroscopy

Subject area
Analytical Chemistry

Description
This book gives the student and new user the essential information to help them to understand and use fluorescence spectroscopy confidently in their research

Authors
Jihad Rene Albani

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

Date/Edition
2007/1st edition

ISBN
978-1-4051-3891-8

Level
Undergraduate, research

Price
£37.50

Nichola Porter,
RMIT University,
GPO Box 2476V,
Melbourne 3001,
Victoria,
Australia
November 2007

Summary Review

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

The content of this book is useful and has some excellent practical exercises but the title only partly describes the content. The first half of the book is about absorption spectroscopy, with practical exercises dealing only with the absorption phenomenon. Fluorescence spectroscopy starts in the second half. Since the applications were mainly of a biochemical nature, a better title might have been *Principles of Absorption and Fluorescence Spectroscopy with Biochemical Applications*.

It is an unusual book in that very detailed experiments are provided directly following the theory, much as it might do in a laboratory manual. This makes it a particularly useful book for those designing practical courses to demonstrate theory of absorption and fluorescence spectroscopy. However, it assumes a knowledge of various biochemical molecules. A glossary would have been helpful for those readers without that background.

The book takes the reader through the basic concepts of absorption and fluorescence phenomena. The discussion of absorption covers the concepts of the Beer Lambert-Bouguer Law, the characteristics of absorption spectra and the variables which influence the bandwidth, intensity and position of absorption maxima. The reader is then provided with a number of experiments which demonstrate the usefulness of this spectroscopic technique including following products in enzyme catalysed reactions, modification of extinction coefficients through complexation, determining kinetic parameters and determining the pKa value for an acidic dye.

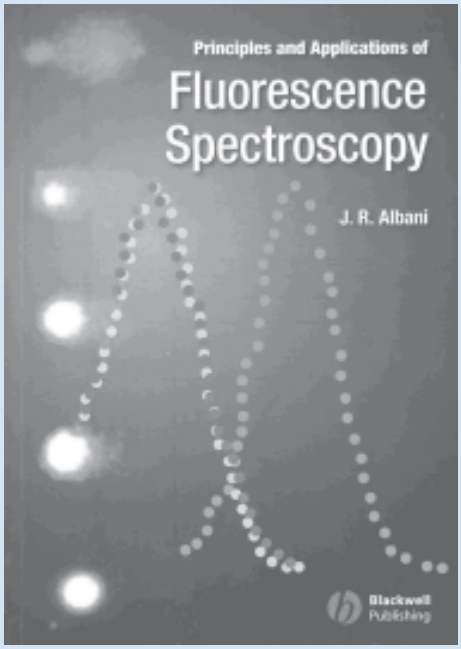
The theoretical aspects of fluorescence include a standard description of electronic transitions using the Jablonski diagram, the conditions under which fluorescence occurs, the relationship between excitation and emission spectra, and the various environmental conditions which alter the intensity and position of the fluorescence bands, fluorescence lifetimes and quantum yields. There is excellent detail on different types of fluorophores, quenching mechanisms, polarisation and energy transfer mechanisms. The experiments provided in this section are also very practical, ranging from using quenching experiments to determine the accessibility of fluorophores in proteins to the use of the Comet test in determining the extent of cell damage from carcinogens.

Apart from the theory of spectroscopy, there are a number of other concepts relevant to the experiments provided. Particularly well done was a discussion of enzyme kinetics and derivation of the Michaelis-Menten equation. The accompanying explanation was one of the clearest this reader has read.

The final chapter has a series of in depth questions with answers provided. In these questions, the students are presented with many sets of data on which to try out their interpretive skills.

Continued on page 42

Principles and Applications of Fluorescence Spectroscopy



From the publisher...

Principles and Applications of Fluorescence Spectroscopy

By Albani, Jihad Rene

"Principles and Applications of Fluorescence Spectroscopy" gives the student and new user the essential information to help them to understand and use the technique confidently in their research. By integrating the treatment of absorption and fluorescence, the student is shown how fluorescence phenomena arise and how these can be used to probe a range of analytical problems. A key element of the book is the inclusion of practical laboratory experiments that illustrate the fundamental points and applications of the technique.

978-1-4051-3891-8 255pp 2007 £37.50

Continued from page 41

There were some errors in the book which should have been corrected during proof reading and some of the diagrams could have been improved with a little more detail provided. In general, the explanations are quite detailed but on occasions, because of typographical errors or implicit assumptions not stated, there are sections which may leave a student confused. Hopefully, this will be addressed in the next edition.

Overall, this text provides a comprehensive overview of the theory behind absorption and fluorescence spectroscopy and includes a wide range of interesting and detailed experiments with example results. These experiments will be particularly useful (but not exclusively) to those wanting biochemical applications.

Properties of Materials: anisotropy, symmetry, structure

Subject area
Materials Science

Description
This text gives broad coverage of nearly every topic in crystal physics

Authors
Robert E Newnham

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

Date/Edition
2005/1st edition

ISBN
978-0-19-852075-7 (hardback)
978-0-19-852076-4 (paperback)

Level
Undergraduate, research

Price
£77.00 (hardback)
£37.00 (paperback)

Anthony Harker,
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University College London,
Gower Street,
London WC1E 6BT
November 2007

Summary Review

range: * poor to ***** good

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

Many practical applications of materials rely on properties that are far beyond the homogeneous, linear and isotropic responses that are assumed in many undergraduate courses. Students who want to learn about the consequences of crystal structure and symmetry might resort to classic texts such as those by Nye[1] or Wooster[2], but whilst these present the formalism they are rather dry and largely devoid of practical examples. Professor Newnham's book comes like a breath of fresh air in the field.

The first six chapters cover the mathematical and crystallographic groundwork: this is done concisely but clearly. One chapter on a scalar property of materials (specific heat) extends the treatment of thermodynamics. There follow 25 chapters which cover a comprehensive range of the tensor properties of materials. Nonlinear properties are covered too, including nonlinear dielectric and elastic response, electrostriction, magnetostriction and electromagnetostriction. The chapter on acoustics includes loss mechanisms, and nonlinear optics is covered.

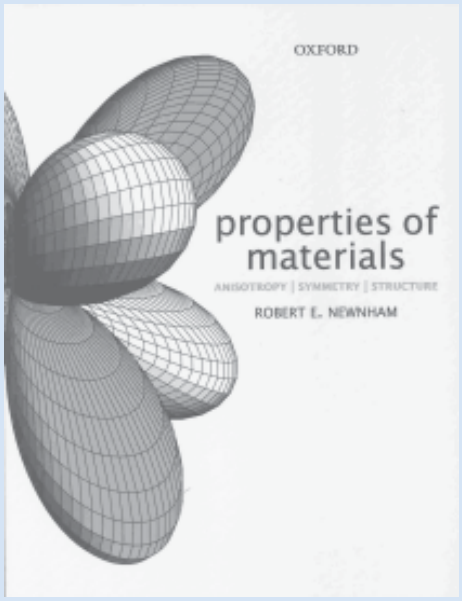
More significant than the breadth, though, is the clarity of the treatment. The physical phenomena are linked to their origins at the atomic and/or electronic scale: to achieve this for electronic phenomena is quite challenging, but the descriptions capture the essence of what is going on. There are clear worked examples which show how one may decide whether particular phenomena will occur in a given crystal class. The theoretical derivations and descriptions of phenomena are illuminated with copious examples to illustrate the points being made. The whole treatment is firmly tied in to the real world. Professor Newnham describes the practical aspects of the measurement of tensor quantities, and the tedious sample cutting and alignment that may involve, and gives examples of technological applications of the phenomena he describes.

This is a book from which one can really learn. There is an obvious appreciation of the points which beginners find difficult: a particular example is in the chapters on stress and strain, where special attention is given to the confusing factors of two which appear in various places when transforming between the tensor and matrix notations. Numerous exercises are included, and anybody who can solve all of them will really have mastered the subject. The emphasis on the physical dimensions of quantities is commendable, but unfortunately at the start of chapter 6 the change of specific entropy is given as $\mathrm{d}S=C_p\,\mathrm{d}T$ rather than $(C_p/T)\,\mathrm{d}T$, which leads to the omission of an inverse Kelvin from the dimensions of entropy, and this dimensional error recurs later in the book.

The layout is in the style of many of Oxford's scientific texts, with a wide margin into which tables of contents for chapters most (but not all) figure captions and many figures are placed. This leaves a good deal of white space: in many cases it is not clear why a figure has been left in the text rather than placed in the margin, and it is unfortunate that the space available was not used to ensure that more figures were placed on the pages which refer to them.

Continued on page 44

Properties of Materials: anisotropy, symmetry, structure



From the publisher...

Properties of Materials
Anisotropy, Symmetry, Structure
By Robert E. Newnham

Crystals are sometimes called 'Flowers of the Mineral Kingdom'. In addition to their great beauty, crystals and other textured materials are enormously useful in electronics, optics, acoustics, and many other engineering applications. This book describes the underlying principles of crystal physics and chemistry, covering a wide range of topics, and illustrating numerous applications in many fields of engineering using the most important materials. It has been written at a level suitable for science and engineering students and can be used for teaching a one- or two-semester course.

978-0-19-852076-4 390pp 2004 £37.00

Continued from page 43

Inevitably in a work as comprehensive as this, any reviewer will find something to quibble with. Sometimes effects are mentioned without being explained: superexchange, for example. The usefulness of photoelasticity would be better illustrated with a photograph of a real experiment than with a sketch. The electrical conductivity of semiconductors is incorrectly stated to be proportional to $\exp(-E_g/kT)$ instead of $\exp(-E_g/2kT)$. The approach to magnetic properties may be a little surprising to a reader with a background in physics, couched as it is in terms of magnetic charges: furthermore the magnetic charge unit is taken as [Wb] rather than [A m], so that the energy of a dipole $\boldsymbol{\mu}$ in a field is $-\boldsymbol{\mu}.\mathbf{H}$ rather than $-\boldsymbol{\mu}.\mathbf{B}$. But these are minor points, and easy to adjust in the later editions to which this book deserves to run.

What makes **Properties of Materials** special is that it has been written by an expert who has taught the material for many years and who is in touch with the practicalities as well as the formalism. It would form an excellent text for a final-year undergraduate or Masters level course, as well as deserving a place on the shelf of researchers in materials.

References

1. Nye, J F *Physical Properties of Crystals. Oxford* University Press (1957).
2. Wooster, W A *A Textbook on Crystal Physics*, Cambridge University Press (1938).

Quantum Mechanics: classical results, modern systems and visualized examples

Subject area
General Science

Description
A clear and detailed textbook on quantum mechanics emphasising conceptual understanding as well as the mathematical theory

Authors
Richard W Robinett

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

Date/Edition
2006/2nd Edition

ISBN
978-0-19-853097-8

Level
Undergraduate

Price
£42.00

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St Andrews,
KY16 9SS
November 2007

This book is based on experience of the author teaching a two-semester long course at the junior-senior level. However, the book can be used for a one-semester long course focusing on core material. The website accompanying the book, robinett.phys.psu.edu/qm, gives suggestions for such a syllabus.

Summary Review

range: * poor to ***** good

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

The subtitle 'Classical Results, Modern Systems and Visualized Examples' illustrates the emphasis of the book. 'Classical results' both refer to expected familiar topics and examples found in standard quantum mechanics texts as well as a focus on the classical-quantum connection. As an example of the latter, the solutions to the infinite square well and the harmonic oscillator detail the momentum-space probability distributions, time-dependent wave packet solutions and the correspondence principle for large quantum numbers. 'Modern Systems' refers to recent examples of applications and experimental realisations of quantum phenomena, such as Bose-Einstein condensates, the Quantum Hall effect and quantum wave packet revivals. These are covered both in the text and in problems. Finally, 'Visualized Examples' refers to the large number of figures of stationary wave functions, time-dependent wave packets and real data, which help to reinforce conceptual understanding.

Recent results of Physics Education Research have gone into this second edition: concepts which students often find difficult, such as probability, reading potential energy diagrams and the time-development of wave packets, are carefully explained and stressed. As an example, the chapter on interpreting the Schrödinger equation first discusses discrete and continuous classical probability distributions (focusing on the Gaussian distribution) and expectation values prior to discussion of the quantum mechanical case.

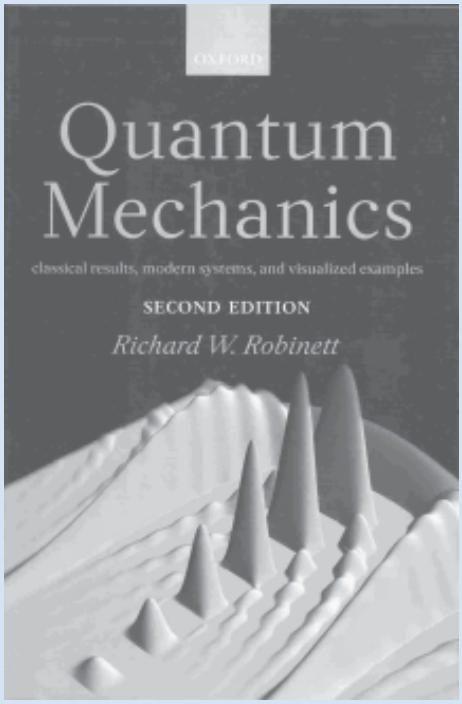
New sections in the second edition include the Wigner Quasi-Probability Distribution, periodic potentials and the Dirac comb, time-dependent perturbation theory and timescales in bound state systems: classical period and quantum revival times. There are also some new in-text examples and end-of-chapter problems.

Most chapters contain several worked examples for illustration, but students may wish for more. In addition to the end-of-chapter problems found in most quantum mechanics textbooks, there are also excellent end-of-chapter questions which focus on conceptual understanding.

The text is more detailed than many other quantum mechanics texts at similar level, and students will presumably find the text more accessible and easier to understand. The student may also find helpful the large number of appendices, which include complex numbers, the Gaussian probability distribution, calculus results such as integral tables and series expansions, special functions and the Hamiltonian formulation of classical mechanics. The inside back cover has important integrals, trigonometric identities and results for free-particle Gaussian wave packets.

Continued on page 46

Quantum Mechanics: classical results, modern systems and visualized examples



From the publisher...

Quantum Mechanics
Classical Results, Modern Systems, and Visualized Examples
By Richard Robinett

Quantum Mechanics: Classical Results, Modern Systems, and Visualized Examples is a comprehensive introduction to non-relativistic quantum mechanics for advanced undergraduate students in physics and related fields. It provides students with a strong conceptual background in the most important theoretical aspects of quantum mechanics, extensive experience with the mathematical tools required to solve problems, the opportunity to use quantum ideas to confront modern experimental realizations of quantum systems, and numerous visualizations of quantum concepts and phenomena.

978-0-19-853097-8 720pp 2006 £42.00

Continued from page 45

The website accompanying the book (robinett.phys.psu.edu/qm) is useful both for instructors as well as students. Material for instructors includes suggestions for syllabi, a solutions manual and a guide to pedagogical literature on quantum mechanics. For students, there are additional homework problems and supplementary chapters on advanced topics such as quantum chaos, supersymmetry in quantum mechanics and neutrino oscillations.

In summary, this book can be highly recommended. It is comparable in price to other standard quantum mechanics texts.

Speaking For Yourself: a guide for students to effective communication

Subject area
General

Description
This book is aimed at encouraging students to think more about what they say and how they say it in serious conversations and discussions, as well as when they have to attend an interview or address an audience, giving useful hints and guidelines

Authors
Robert Barrass

Publishers/Suppliers
RoutledgeFalmer
(www.routledge.com)

Date/Edition
2006

ISBN
0-415-37857-5

Level
Undergraduate, research

Price
£16.99

Summary Review

range: * poor to ***** good

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

The main objective of this book is to help students to develop good oral communication skills, that is, the ability to converse, to discuss, to argue persuasively, and to speak in public. It provides advice that helps one to be a good listener, express clearly and persuasively, contribute effectively to discussions, prepare talks or presentations, prepare effective visual aids, deliver effective presentations, and perform well in interviews.

To achieve this goal, the book is organised as follows:

1. Speaking for yourself,
2. Conversing,
3. Discussing your work,
4. Choosing the right word,
5. Using words effectively,
6. Preparing a talk or presentation,
7. Preparing visual aids,
8. Speaking to an audience,
9. Finding information,
10. Speaking in an interview.

Through all these chapters, the author points out the importance of verbal and non-verbal communication, of active listening, and of correct talking. For instance, to be brief, clear, polite and accurate are key features when trying to communicate an idea or a project.

In summary, every chapter explains very clearly the most appropriate steps and tasks to achieve good oral communication.

Guadalupe Muñoz,
Calle de las Delicias,
35 4 B – 28045,
Madrid,
Spain
November 2007

Students Must Write: a guide to better writing in coursework and examinations

Subject area
General

Description
This text gives advice on note-taking in lectures, writing essay-type coursework and dissertations, answering exam questions, writing letters. Information is given on punctuation, common word errors and finding information

Authors
Robert Barrass

Publishers/Suppliers
RoutledgeFalmer
(www.routledge.com)

Date/Edition
2006/3rd edition

ISBN
0-415-35825-6

Level
Undergraduate

Price
£70.00

Martin Pitt,
Chemical & Process Engineering,
University of Sheffield,
Sheffield S1 3JD
November 2007

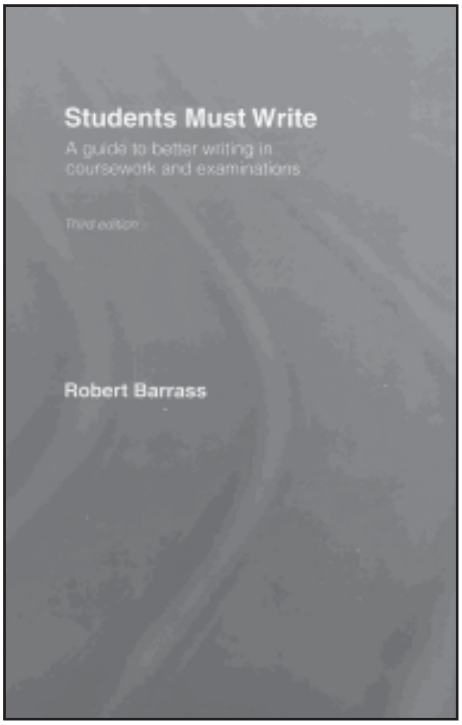
Summary Review

range: * poor to ***** good

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

While it contains some good advice, this is not a book I would recommend to students of science and related subjects. There is some mention of science and engineering, but it seems clear that the author is addressing a native English speaker of literary bent, studying the arts or humanities. Such a reader might appreciate the many quotations, often with biographical dates such as “Francis Bacon (1561-1626)”, but I believe they would put off the majority of students from a science background.

The vocabulary is too high-flown for most foreign and many British science students. Other words are old-fashioned. How many, I wonder, would understand what was meant when they are urged to avoid hackneyed phrases or surplusage? It would certainly be less than helpful for students with any degree of dyslexia.



Sections on the SI system and on the production of graphs and diagrams would probably be valuable to a student of history but are too limited for a student of science.

I cannot blame the author for the fact that the sections on the use of computers already look a bit dated, since the technology and young people’s use of it have both changed so fast.

The book contains much of the standard advice that academics would give to students about examination technique, and notes on punctuation which should be known to first year university students (but sadly is not always known). Given the title, it is perhaps fair that so many pages are on the subject of fine distinctions in word meanings and grammatical use. However, this is clearly intended to improve essays in non-science subjects. It would be less useful to science students and I think they are unlikely to read through so much irrelevant to them. Indeed, the students most in need of help would be least able to extract something of value from this book.

A more accessible text is *A Guide to Writing as an Engineer* by Beer & McMurrey, which is closer to the needs of science students.

Surface-Enhanced Vibrational Spectroscopy

Subject area
Spectroscopy, Physical Chemistry, Analytical Chemistry, Nanochemistry

Description
This book combines the two important techniques of surface-enhanced Raman scattering and surface-enhanced infrared into one text that serves as the definitive resource on this topic

Authors
Ricardo Aroca

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

Date/Edition
2006/1st Edition

ISBN
978-0-471-60731-1

Level
Research

Price
£70.00

Yang Gan,
Department of Applied Chemistry,
Harbin Institute of Technology,
Heilongjiang 150001,
P R China
October 2007

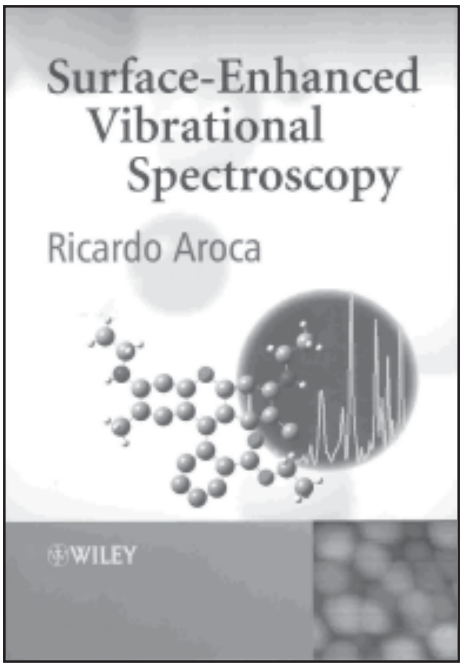
Professor Ricardo F Aroca (PhD, DSc) is a University Professor at University of Windsor, Canada. He is the principal investigator of the Materials and Surface Science Group in the Department of Chemistry & Biochemistry and Department of Physics.

Summary Review

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

The author has worked in the area of surface spectroscopy for more than 20 years and made a series of important contributions. He successfully brought to readers his understanding and passion of Surface Enhanced Vibrational Spectroscopy (SEVS).

In this book, both theory (Chapter 1 and 2) and applications (Chapter 3-7) are covered with references up to 2004. Noteworthily, two closely related techniques - surface-enhanced Raman scattering (SERS) and surface-enhanced infrared (SEIR) are treated together to give readers a coherent view of SEVS.



The structure of this book is organised in a way that both beginners and experts (especially experimentalists) can find easily the materials they need. Particularly, it should be pointed out that the author discusses the protocol of interpretation of SERS spectra step by step (p. 114) aided by examples: experimental researchers will benefit from this treatment.

Regretfully, the Tip-Enhanced Raman Spectroscopy (TERS) was not covered. An author index is also lacking.

This book has seven chapters:

1. Theory of Molecular Vibrations. The Origin of Infrared and Raman Spectra.
2. The Interaction of Light with Nanoscopic Metal Particles and Molecules on Smooth Reflecting Surfaces.
3. Surface-Enhanced Raman Scattering (SERS).
4. Chemical Effects and the SERS Spectrum.
5. Is SERS Molecule Specific?
6. SERS/SERRS, the Analytical Tool.
7. Surface-Enhanced Infrared Spectroscopy.

I would strongly recommend this book to anyone who is interested in SEVS.

The Science of Ice Cream

Subject area
Chemistry, Physics, Food Technology

Description
Description of the science behind the manufacture and development of ice cream and ice cream desserts

Authors
Chris Clarke

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

Date/Edition
2004, reprint 2006

ISBN
978-0-85404-629-4

Level
Secondary school, A-level, access, foundation, undergraduate

Price
£24.95

Mark Robertson,
Portlethen Academy,
Bruntland Road,
Portlethen,
AB12 4QL
November 2007

The Science of Ice Cream is a book which shows in great detail how the manufacture of a simple dessert can be used as a vehicle for accessing a great deal of science. Even a cursory glance at the index is enough to confirm this with sections as diverse as food chemistry to freezing to the engineering required to assemble a given ice cream product.

Summary Review

range: * poor to ***** good

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

The book is split into 8 main sections. The first provides some background on the subject of ice cream tracing its history from a Roman dessert through to modern times. This would provide an excellent source of material for comprehension exercises as well as an opportunity to introduce cross curricular exercises with other departments in the Secondary Education sector such as art and design and food technology.

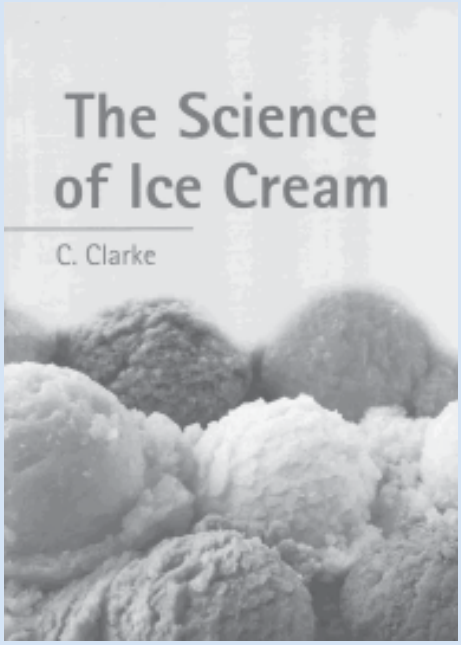
The second section discusses some important concepts in the physics and chemistry of the make up of ice creams. This includes subsections looking at emulsions and colloids, freezing (examining both the chemical and physical aspects) and viscosity and rheology of small molecules and larger polymer chains.

The third chapter takes a brief look at the various ingredients that make up ice cream. This section provides a new way of introducing students studying chemistry and biology to the structures and functionalities of sugars and fats as well as describing the role of stabilisers and flavouring which could be of interest to food technologists.

The following chapter looks at how the ingredients described in chapter 3 are brought together in a factory setting to actually produce the ice cream. This chapter includes sections on pasteurising and freezing. This is then followed by a section looking at how different commercial ice cream products are assembled. Both this and the proceeding section make for interesting reading but could have specific appeal to those with an interest in (product) engineering.

The next two chapters introduce the reader to the foundations behind research into producing novel ice cream desserts. Chapter 6 introduces ways in which the structure and properties of ice cream can be investigated. In doing so, the reader is introduced to various microscopy techniques (both optical and electron), ways to measure the hardness and elasticity of an ice cream sample, calorimetry to determine melting points and ice content. Of more interest to a general reader, this chapter also includes a section on sensory tests in which trained panellists score various ice creams in such areas as firmness, chewiness and coldness when eaten. (Sounds like a good career). The final chapter looks at some of the results of these characterisation tests, in particular examining the microstructure of the ice cream and how it can be related to the resulting texture. This is probably one of the more technical sections of the book and is probably more geared towards undergraduate level.

The Science of Ice Cream



From the publisher...

Science of Ice Cream

By C Clarke

The Science of Ice Cream begins with an introductory chapter on the history of ice cream. Subsequent chapters outline the physical chemistry underlying its manufacture, describe the ingredients and industrial production of ice cream and ice cream products respectively, detail the wide range of different physical and sensory techniques used to measure and assess ice cream, describe its microstructure (i.e. ice crystals, air bubbles, fat droplets and sugar solution), and how this relates to the physical properties and ultimately the texture that you experience when you eat it. Finally, some suggestions are provided for experiments relating to ice cream and ways to make ice cream at home or in a school laboratory.

978-0-85404-629-4 18pp 2004 £24.95

The final chapter is probably the most fun and contains 16 different experiments to do with ice cream. These range from simple experiments such as comparing the sensory qualities of ice cream (as detailed in Chapter 6 of the book) and investigating the taste of ice lollies at different temperatures which can be done safely at home, to making ice cream using liquid nitrogen which is clearly more suited to being carried out in a laboratory. These experiments all provide re-enforcement of ideas covered within the main text of the book and the necessary sections contain links to the relevant experiments.

Overall the book is well written and presented with information logically laid out making it easy to find that information. The individual sections provide a good mix of technical information and more general access science aimed towards the lay reader or those in the middle stages of secondary school. The more technical aspects provide an interesting context to stimulate learning. The experiments at the end of the book provide a good way of bringing the text to life, re-enforcing the ideas covered. Many of the experiments are at a level which could be adapted for homework (as well as an excuse to eat ice cream).

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- re-direction from our old web site will continue but please change bookmarks to the new address