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Physical Sciences Educational Reviews

The journal of the Physical Sciences Centre *Number 12*

Reviewed in this issue:

46 books

9 software packages

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Physical Sciences Educational Reviews

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Analytical Chemistry for Technicians

Subject area
Analytical Chemistry

Description
This is an introductory level textbook including text, problems sets, problem answers, laboratory experiments, and interactive CDROM. It requires minimal prior knowledge of chemistry and mathematics.

Authors
John Kenkel

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

Date/Edition
2002/3rd edition

ISBN
1-56670-519-3

Level
Undergraduate

Price
£46.99

Quentin Hanley
School of Biomedical and Natural Sciences
Nottingham Trent University
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Nottingham NG11 8NS
May 2006

Analytical Chemistry for Technicians provides an alternative approach to the presentation of analytical chemistry by focusing on material of use to chemical technicians. The book has been through 3 editions and the current edition includes an interactive CDROM to assist in reinforcing material from the text. The book's heart is in the right place, but the presentation is uneven and this leads to a disappointing book overall.

Summary Review

range: * poor to ***** good

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

There is much to like about the book. However, there is also much to feel let down by. The outstanding feature of the book is its focus on basics for technicians. This, I feel, will be greatly appreciated. As an example, despite many years in research, nearly 5 years of teaching and 6 years as a technician, I have never loaded a liquid IR cell. I have seen them, and can easily imagine wanting to use one, but never used one myself. There are excellent pictures, both photographs and drawings, making the process abundantly clear. I would not hesitate handing the book to someone and saying "use it." This is only one example of what are many very well presented methods, techniques, and discussions of instruments. The book is filled with clear and concise presentations that would allow a technician (or a graduate student) to feel confident proceeding to the lab with book in hand to get on with the job.

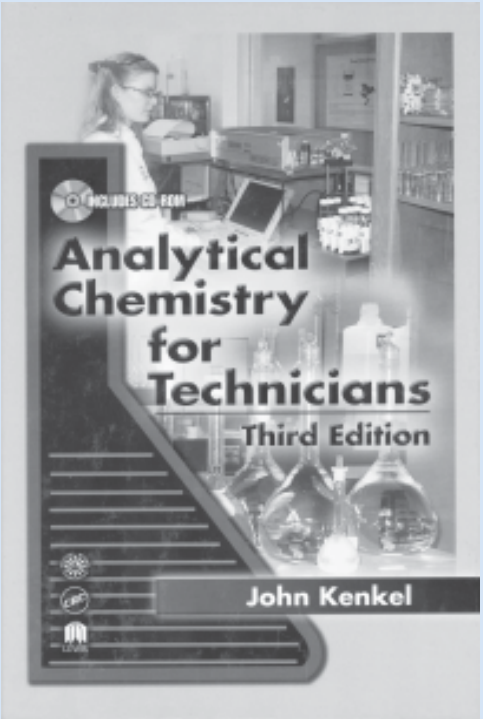
Other noteworthy features are a set of more than 50 'Workplace Scenes'. These supply a context that anchors the presentation in a workplace reality that is effective and well considered. There are a number of 'traditional' physical test methods that are rarely, if ever, taught in Universities, but widely used in industrial settings. These include methods to measure density, hardness, viscosity, tensile strength, etc. These are important methods and during my short time in industry, I spent far more time using these than I spent doing titrations (yet, we have students titrate and titrate and titrate…). The author is to be commended for putting them into accessible form and providing appropriate emphasis.

These strengths aside, the book leaves much to be desired. It lacks a number of methods, for example flash point determination, that would find a welcome place in a book of this type. While it is, perhaps, unfair to insist that the book be encyclopaedic, there are other weaknesses.

The section on nuclear magnetic resonance (NMR) is woefully inadequate and gives an antiquated presentation that stops at 100 MHz. It does not mention that modern NMR includes cryogenically cooled super-conducting magnets. From a technician's point of view, it is worth noting that a routine part of the job might include filling the NMR magnet with liquid nitrogen (or helium). A few sentences to explain why, with illustrations, would be a great help. Further, while it mentions that NMR is used analytically, it gives no sense of the revolution in NMR methods and NMR's increasing analytical uses.

Related issues arise in the treatment of different mass spectrometers (MS). Most of the standard mass analysers are represented, but none are presented well. Descriptions run to a maximum of 10 lines of text. Contrast that with 3 pages on use of liquid cells in IR. Depending on the organisation, technicians are often intimately involved in the selection,

Analytical Chemistry for Technicians



From the publisher...

Analytical Chemistry for Technicians, Third Edition

By John Kenkel Southeast Community College, Lincoln, Nebraska, USA

Surpassing its bestselling predecessors, this thoroughly updated third edition is designed to be a powerful training tool for entry-level chemistry technicians. Analytical Chemistry for Technicians, Third Edition explains analytical chemistry and instrumental analysis principles and how to apply them in the real world. A unique feature of this edition is that it brings the workplace of the chemical technician into the classroom. With over 50 workplace scene sidebars, it offers stories and photographs of technicians and chemists working with the equipment or performing the techniques discussed in the text. It includes a supplemental CD that enhances training activities. A CD containing a sample LIMS system is also available to professors who adopt this book.

1-56670-519-3 584pp 2002 £46.99

costing, and specification of new instruments. The presentation of MS in this context is not enlightening. When might one choose a sector instrument over a time of flight system? Given the importance of NMR and mass spectroscopy to modern chemistry, both sections represent serious deficiencies.

Having spent an evening interacting with the CDROM, I found it unhelpful. There are only a few problems and the interactive format only slows down the learning process. A text based paper presentation would be more effective and the attempts at 'humour' come off more as 'cute' (for example a cartoon super potato). The presentation of safety on the CDROM is nearly entirely based on the US regulatory environment (OHSA, etc.) and is inadequate for the UK context. The UK environment is more stringent and technicians will spend considerable time doing COSHH mandated risk assessments and there is no material to assist them.

Generally, the accuracy of the material is quite good. It includes one classic mistake – one included in nearly all analytical textbooks - the deprotonation of boric acid to give "$H_2BO_3^-$". Boric acid is a Lewis acid and the correct form is $B(OH)_4^-$.

In summary, many things about the book are very well done. It is useful and informative, but it has serious weaknesses and the safety section on CDROM is not in step with the UK context. It is a very good source for many standard chemical test methods not commonly presented in the analytical curriculum. In that sense, it is a good complement to the standard textbooks of analytical chemistry.

An Introduction to the Optical Spectroscopy of Inorganic Solids

Subject area
Spectroscopy

Description
This is an introductory text on optical spectroscopy

Authors
José García Solé, Luisa E Bausá, Daniel Jaque

Publishers/Suppliers
John Wiley and Sons Ltd (www.wiley.co.uk)

Date/Edition
2005

ISBN
0-470-86886-4

Level
Undergraduate, research

Price
£37.50

Tony Harker
Department of Physics and Astronomy
University College London
Gower Street
London WC1E 6BT
May 2006

Summary Review

range: * poor to ***** good

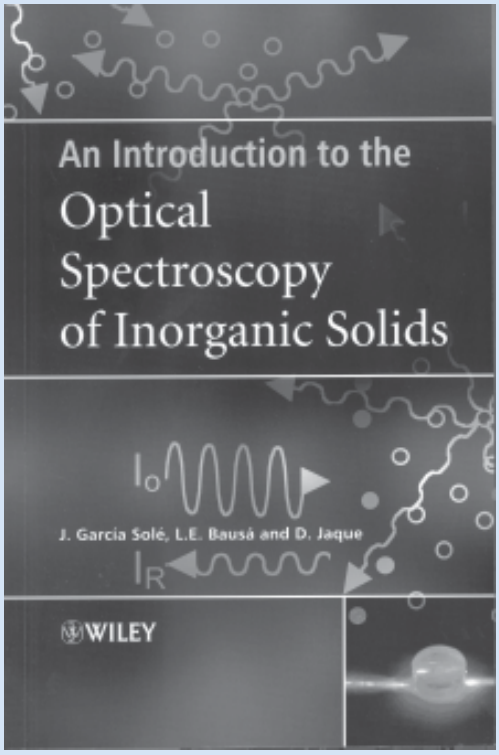
Academic content	****
Usefulness to student	****
Usefulness to teacher	****
Meets objectives	****
Accuracy	****

Optical spectroscopy plays an important role in a wide range of technologies, and optical devices lie at the heart of many devices. This means that there is a real need for a good introductory text on optical spectroscopy, and this book satisfies the need very well. In a little fewer than 300 pages the authors cover a wide range of material, and do so with great clarity. Because it is conceived as an introduction to spectroscopy, spectroscopic tools including light sources are described before the light-emitting centres are discussed in detail, which results in the early chapters containing quite a large number of references to material later in the book. This is managed quite well, and does not distract too much from the flow, but sometimes the forward references do not give the full story. As some of the sources described are not solid-state sources, these early chapters also mention processes which are not taken up later. About 40% of the content covers spectroscopy, 40% is devoted to specific light absorption and emission mechanisms and optically active centres, and the remainder covers group theory, tabular material, and detailed appendices.

The scene is set with a chapter which introduces key ideas such as absorption, luminescence, and elastic and inelastic scattering. Optical sources are reviewed, including lasers. The discussion of lasers is quite clear, but illustrates the problem of forward references mentioned above. If the reader tries to understand why equal degeneracies in ground and excited states lead to equal upward and downward transition probabilities to be equal, following the references to Chapter 5 and thence to Appendix A3 will not provide the answer, as degeneracy is not mentioned there. Despite quibbles of this sort, a range of broad-band, narrow-band and tunable sources is covered in enough detail to show what is available and how it works. The next chapter does the same job for monochromators and detectors, and addresses practical features such as the rise time and noise characteristics of photomultipliers, methods for increasing signal-to-noise ratio, and special techniques for analysing short pulses.

With the measurement technology established, the book moves on to relate the spectroscopic features (absorption, reflection and transmission spectra) to the structure of the material - first to continuum properties such as the dielectric constant and the band structure, and then to localised optically active centres. Inevitably in such a brief treatment some topics are only mentioned en passant: examples include sum rules for transitions and the Kramers-Kronig relations. The general principles emerge clearly, and the features discussed include the shapes of the absorption band edge in direct and indirect band gap semiconductors and the colours of metals. Some previous knowledge of the concepts of solid state physics, effective-mass theory for example, is expected. Colour centres and impurity ions are covered well, including treatments of the effects of lattice vibrations and distortions and non-radiative transitions, though the Jahn-Teller effect is not described. The final chapter on group theory stands slightly apart from the rest of the book, but a reader should be able to relate its contents to the earlier chapters and understand the symmetry states of active centres.

An Introduction to the Optical Spectroscopy of Inorganic Solids



From the publisher...

An Introduction to the Optical Spectroscopy of Inorganic Solids

By Jose Solé, Luisa Bausa, Daniel Jaque

This practical guide to spectroscopy and inorganic materials meets the demand from academia and the science community for an introductory text that introduces the different optical spectroscopic techniques, used in many laboratories, for material characterisation.

Treats the most basic aspects to be introduced into the field of optical spectroscopy of inorganic materials, enabling a student to interpret simple optical (absorption, reflectivity, emission and scattering) spectra.

Contains simple, illustrative examples and solved exercises.

Covers the theory, instrumentation and applications of spectroscopy for the characterisation of inorganic materials, including lasers, phosphors and optical materials such as photonics.

0-470-86886-4 304pp 2005 £37.50

The presentation is generally good, but there are some rough edges. The diagrams are clear and helpful, except in one or two cases where they have been reproduced from other sources by a noisy scanning process: these would have been better if they had been redrawn. “Dimmer” for “dimer” in the description of the excimer laser is probably the result of the intervention of a spell checker, where “pirometer” comes from is less clear, and “antifacts” on page 36 is a useful new coinage. The mathematical formulae seem to be accurate.

The level of treatment throughout is suitable for an undergraduate or an early-stage postgraduate. This book would be suitable for an introductory course in spectroscopy, and contains a useful range of problems (but solutions are not included). There is a good range of references to important review papers and to more advanced treatises. I can recommend this as a student text-book, though it does not have the depth to serve as a reference work for an active spectroscopist.

Astronomy: Principles and Practices

Subject area
Astronomy

Description
Undergraduate (first-year) text covering basic concepts and observational techniques in astronomy.

Authors
A E Roy, D Clarke

Publishers/Suppliers
Institute of Physics Publishing (www.iop.org)

Date/Edition
2003/4th Edition

ISBN
0-7503-0917-2

Level
Undergraduate

Price
£29.99

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

Now in its fourth edition, **Astronomy: Principles and Practices** (first published in 1977) is an undergraduate text, aimed primarily at two groups of first-year students - those who intend to pursue a career in astronomy (or some other science), and those who are non-science majors and who simply wish to gain some insight into how science works and the scientific method. As the title suggests, the book seeks to provide students with a solid grounding in the mathematical formulations and physical processes fundamental to the study of astronomy (e.g. planetary orbits), as well as supply students with practical training in the skills essential to the astronomer's trade (e.g. observational techniques). As such, knowledge of mathematics at AS/A2 level is a prerequisite. Although the authors suggest that in conjunction with its companion volume *Astronomy: Structure of the Universe*, these two texts would fulfil the needs of a first-year science course, it seems that more information is provided in the book than could feasibly be dealt with in an academic year. This would give tutors some flexibility in what to include when designing their courses.

The book is well-organised and conveniently divided into four sections. Part 1 (Chs 1-6) introduces the subject by investigating simple observations made by the naked eye, and discusses past civilizations' understanding and interpretation of such observations, together with their resulting world models. Part 2 (Chs 7-14) deals with the concepts associated with making positional measurements, in order to study the orbits of planets and satellites. It covers the basic principles of celestial mechanics, beginning with an outline of spherical geometry and trigonometry, before going on to descriptions of coordinate and timekeeping systems. Following on from this is a discussion of correction procedures (reduction of positional observations), Kepler's and Newton's laws and their impact on solving the two-body and many-body gravitational problems.

Part 3 (Chs 15-23) is devoted to observational techniques, starting off with a description of the radiation laws and the means by which radiation is collected and analysed, ie basic spectrometry. This is followed by sections on optical telescopes (refractors and reflectors), and various detection devices (from photoplates to photoelectric devices to charge coupled devices). Modern telescopes, radio telescopes and high energy instruments are also described. Part 4, the final chapter (Ch 24) of the book, is entitled 'experimental work', and provides a variety of practical tasks and projects students could undertake. Throughout the text there are worked examples, and problems are provided at the end of chapters (where appropriate), with answers at the back of the book.

A feature of the text which I found particularly appealing, was the almost conversational style in which it is written, making it not only more accessible and enjoyable for students, but also, at times, making it riveting reading. Another aspect which was striking, was the manner in which the authors very successfully integrated historical and factual information. By placing major advances in astronomy into their historical context, the authors facilitate students' understanding about how and where the knowledge (and skills) they are now acquiring, fits into the accumulation of knowledge through the centuries. Right through the book, the authors

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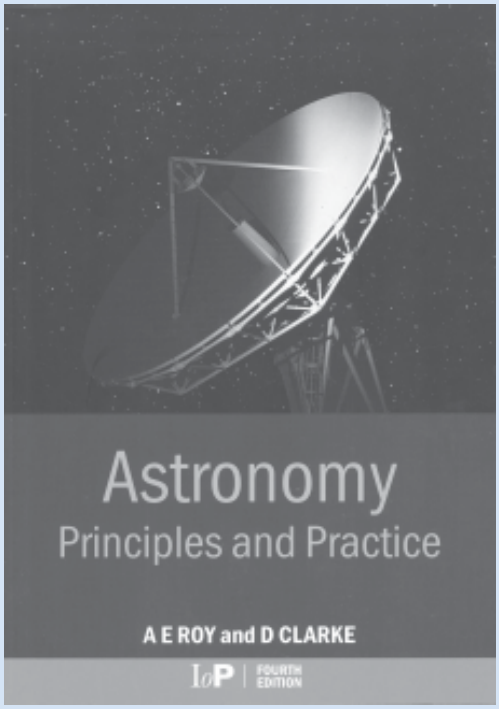
May 2006

Astronomy: Principles and Practices



From the publisher...

Astronomy: Principles and Practice, Fourth Edition

By A E Roy University of Glasgow, Scotland
and D Clarke University of Glasgow, Scotland

This reference furthers your study of astronomy by presenting the basic software and hardware, providing several straightforward mathematical tools, and discussing some simple physical processes that are either involved in the astronomer's tools of trade or concerned in the mechanisms associated with astronomical bodies. The first six chapters introduce the simple observations that can be made by the eye as well as discuss how such observations were interpreted by previous civilizations. The next several chapters examine the interpretation of positional measurements and the basic principles of celestial mechanics. The authors then explore radiation, optical telescopes, and radio and high-energy technologies. They conclude with practical projects and exercises.

0-7503-0917-2 475pp 2003 £29.99

consistently provide readers with anecdotal stories related to discoveries and breakthroughs in astronomy, and explain the development of these ideas, alongside a discussion of the theoretical concepts involved. This has the effect of making students feel they are a link in the continuing process of scientific progress.

Although the line drawings which accompany many of the mathematical formulations and descriptive explanations of concepts, are really excellent, a downside of the book is the absence of any colour images - the few black and white photos included being of poor quality by today's standards. Admittedly, this text is aimed primarily at the serious student who might be embarking on a career in science, and not at the non-science major who would probably find the glossy, magazine-type texts with accompanying CDROMs, more appealing. Nevertheless, there can be little doubt that the book would have benefited by the inclusion of better quality images.

On the whole, the book provides first-year students with a solid basis on which to continue studies in astronomy or physics.

Biophysical Chemistry

Subject area
Physics, Chemistry, Biology

Description
A collection of principles and techniques that are related to Biophysics and Biochemistry.

Authors
Alan Cooper

Publishers/Suppliers
Royal Society of Chemistry (www.rsc.org)

Date/Edition
2004/1st edition

ISBN
0-85404-480-9

Level
Undergraduate

Price
£15.95

Dipak K Sarker
School of Pharmacy &
Biomolecular Sciences
The University of Brighton
Brighton BN2 4GJ
March 2006

Summary Review

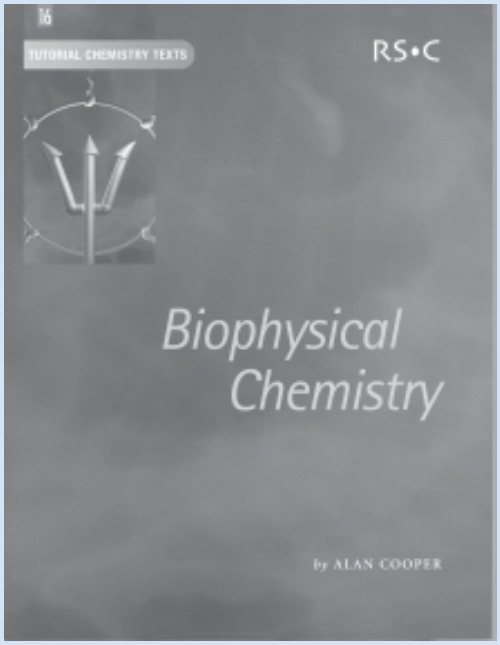
range: * poor to ***** good	
Academic content	*****
Usefulness to student	*****
Usefulness to teacher	*****
Meets objectives	*****
Accuracy	*****

The book flows purposely through apparently distinct themes united under the banner of biophysical chemistry in a most successful manner and aims to target introduction to the interface of both biophysics and biochemistry in eight chapters. The book is well aimed at providing global knowledge of these areas to undergraduates, industrialists and those in the early stages of advanced research, particularly when coming from other disciplines. As indicated on the rear cover of the text, the book does indeed provide a "digestible" approach to this subject matter. The book is presented in a way which does not overburden the reader and thus, provides a foundation on which to build a more detailed and specific knowledge[1,2]. The reader is only required to have a basic science knowledge at pre-university level to fully understand the text.

The text is likely to be of significant interest to those scientists and students working in the area of chemical biology, biophysics, the surface chemistry of biological and natural product systems, the pharmaceutical sciences and aspects of bio-pharmaceutics and drug delivery and a limited number of themes within molecular cell biology. To this end the objectives of the book are accomplished succinctly as desired by the author in that the book provides a valuable "taster" of the regular[2-5], unconventional[6] and novel developmental aspects[1,7] of biophysical chemistry. There are books which detail themes more extensively[3] but as a rule they have not covered the subject matter in as universal a manner[2,3] as is presented here and are consequently of limited use as start up teaching tools. The book is of significant and appropriate value to newcomers to this area and in its user friendly approach provides the means to better understanding through an explanation of key themes such as the Levinthal paradox, energetics, electrophoretic mobility and magic angle spinning that are relevant to most biopolymer systems, and their now routine analysis. One example of this accommodating approach is the explanation of partial specific volume by reference to mixing footballs with ball-bearings (p 83), this is done in an anecdotal manner which lightens the subject matter; an ideal way to enthuse multidisciplinary undergraduates. The little snippets of factual and historical information littered throughout the text also serve to increase the book's readability and appeal. The book provides a fine example of a teaching-focused text with a summary of key points at the end of a topic that students find most useful in picking the bones out of a subject.

It is noteworthy that one chapter is solely dedicated to mass spectrometry and this certainly reflects a very large scale interest in "mass spec" as a diagnostic tool for branches of biophysical chemistry such as genomics, proteomics (section 3.6.3)[7] and lipidomics[1,4]. There are interesting sections in the book on stopped flow analysis, equilibrium dialysis, isothermal titration calorimetry, circular dichroism, surface plasmon resonance and atomic force microscopy[4,7] as cutting edge diagnostic tools and "common techniques" such as chromatography and electrophoresis[3,7,8]. The less common methodologies now represent science that is at the forefront of bioanalysis and are frequently more revealing than conventional bioanalytical techniques. Such inclusion proves to be very useful and quite novel for a text of this size. The book delves nicely into biomolecule and drug analysis using what have now become conventional experimental techniques such as nuclear magnetic resonance spectroscopy[4,8] that are conceptually difficult to grasp but are here discussed in a sensitive and instructive manner.

Biophysical Chemistry



From the publisher...

Biophysical Chemistry

By A Cooper University of Glasgow, UK

Biophysical Chemistry covers the physical chemistry of biological macromolecules and the experimental techniques used to study them. Topics covered include; an introduction to biological molecules; spectroscopy, mass spectrometry and hydrodynamics of macromolecules; a bluffers guide to molecular thermodynamics; biomolecular kinetics; chromatography and electrophoresis; and single-molecule methods. The easily digestible pragmatic approach captures the reader with the fascinating challenges the subject poses for theoretical and experimental scientists. This book will be ideal for early undergraduates studying chemical or physical sciences and will act as a basis for more advanced study. Students in other areas of biological sciences will appreciate the less intimidating approach to physical chemistry as demonstrated here.

0-85404-480-9 184pp 2004 £15.95

As an introduction to the subject the book works well and delivers a broad complement of techniques, theoretical notions and raises discussion points, paradoxes and 'unproven' theories that will be useful in undergraduate lectures. Exercises (problems) and worked problems provide a clear point of practice for complex themes or practical and numerate aspects of biophysics. What is more they provide a means of practising routine calculations, which can in some cases be the sticking points to enjoyment of the subject for those students that do not enjoy playing with numbers but are more keen on scientific notions.

The main body of the text with its clear tables (with useful examples that point to a theme and that have been carefully selected) and figures is wonderfully presented with discussion that is undertaken in a consistent manner. Figures are colourful, unambiguous, never over-complicated and consistent and this makes the subject matter clear, light and interesting. This text would be a worthy pocket filler for biophysics and biochemistry students.

References

1. Cantor, C R and Schimmel, P R *Biophysical Chemistry. Part II*: 'Techniques for the Study of Biological Structure and Function', W H Freeman and Co, New York (1980).
2. Ball, D W *Physical Chemistry*, Thomson Learning (Brooks/Cole) (2003).
3. Chang, R *Physical Chemistry for the Biosciences*, University Science Books, California (2005).
4. Sinko, P J *Martin's Physical Pharmacy and Pharmaceutical Sciences*, Lippincott, Williams and Wilkins, Philadelphia (2006).
5. Duncan, G *Physics in the Life Sciences*, Blackwell Scientific Publications, Oxford (1990).
6. Banwell, C N and McCash, E M *Fundamentals of Molecular Spectroscopy*, McGraw-Hill, London (1994).
7. Christian, G D *Analytical Chemistry*, Wiley, UK (2004).
8. McLaughlin, K A *Molecular Physical Chemistry*, Royal Society of Chemistry, Cambridge (2004).

Chemistry

Subject area
Chemistry, Applied Chemistry

Description
A general text book of chemistry, now in its 4th edition, which serves as a good introduction to the subject for those studying degree level science; foundation or A-level chemistry.

Authors
John Olmsted, Gregory Williams

Publishers/Suppliers
John Wiley and Sons Ltd
(www.wiley.co.uk)

Date/Edition
2006/4th Edition

ISBN
0-471-47811-3

Level
A-level, access, foundation

Price
£107.00

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

Summary Review

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

Libraries these days have well-stocked shelves of general chemistry texts which seek to introduce the would-be chemist to the subject and stimulate the curiosity of science students studying other disciplines. Olmsted and Williams continue to make their mark in this area with an updated, well-revised text. Right from the beginning their examples are contemporary and the opening pages take us from the planetary to the atomic scale. The underpinning philosophy of the text is to focus the student on the molecular world.

The molecular theme is underpinned throughout with classic line structures compared to other ways of representing molecules such as space-fill structures, ball and line diagrams and representations of molecular models.

Measurement and quantitative aspects of chemistry are introduced at an early stage alongside fundamental ideas and concepts. The text is full of worked examples and problems for the student. There is also an emphasis on problem solving and the techniques for solving problems. Each chapter has an excellent visual summary of its content as well as learning exercises, themed problems, group study problems and “more challenging problems” which provide an excellent aid to learning. Solutions to these are helpfully provided at the back of the book.

The book as a whole is superbly illustrated with photographs and clear diagrams which greatly add to the clarity of the text. Simplified diagrams of instruments, such as a mass spectrometer, and illustrated descriptions of classic experiments also add richness and colour to the subject. Organic, biochemical and medicinal examples are also much in evidence. There is also an applied environmental theme, establishing the fundamental relevance of chemistry to the study of any scientific discipline.

Each chapter is introduced by an applied theme: ‘the chemistry of shampoo’, or ‘silk - a natural macromolecule’ for example, which helps to reinforce the relevance of chemistry.

With 985 pages, this is not a small book but it covers much fundamental ground in an accessible way with plenty of problems to stretch the serious student. The authors strike a good balance between organic, inorganic and physical chemistry, as well as taking the trouble to apply the material widely in biological, physical and geoscientific areas. This would seem to be a book that would fit well with many first year ‘subsidiary chemistry’ university curricula, as well as foundation level and Access to Higher Education science courses. It would also be a useful aid to A and AS level chemistry teaching.

In an area of chemistry so well served with texts it is good to find one that stands out and this one is certainly worthy of serious attention.

Concepts in Biochemistry

Subject area
Biochemistry

Description
This book is written for students who need an introduction to the fundamental principles of biochemistry.

Authors
Rodney Boyer

Publishers/Suppliers
John Wiley & Sons Ltd
(www.wiley.co.uk)

Date/Edition
2005/3rd edition

ISBN
0-471-66179-1

Level
Undergraduate

Price
£92.50

Valdir F Veiga Junior
Departamento de Química
Universidade Federal do Amazonas
Rua Gal Rodrigo Otávio Jordão Ramos
3000 – Minicampus
Manaus 69077-000
Brazil
April 2006

Summary Review

range: * poor to ***** good

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

Quoting the author, Rodney Boyer: "This book is written for students who need an introduction to the fundamental principles of biochemistry". The main goals of this book were not only to offer students a view of modern biochemistry by identifying the most important biochemical concepts and theories but to develop a lively, even conversational tone, and strive for an accurate and concise presentation. In **Concepts in Biochemistry**, Boyer totally fulfils his objectives.

The book consists of 4 parts. 'Molecules and Life', the first part, is an introduction to biochemistry that shows in four chapters how cells and organelles are organised and how macromolecules, that store and transfer biological information, micromolecules and microelements are involved and react in an aqueous environment. The structures, properties and functions of water, amino acids, peptides and proteins are discussed.

The second part of the book presents carbohydrates and lipids and includes the regulation of the metabolism by the enzymes' action and inhibition. The title of this part, 'Dynamic Function of Biomolecules', clearly shows not only a huge view of the structures and functions of these molecules are presented but their role in the biological state that includes the structure of membranes and the cellular transport.

The third part, named 'Storage and Transfer of Biological Information', presents the major role of nucleic acids in the cell, their structure, function and biosynthesis. The genetic code, the whole genome and proteome concepts and some actual topics in applied biotechnology, as the use of recombinant DNA, are included too.

The last part of the book, 'Metabolism and Energy', focuses on bioenergetics and the biosynthesis and degradation reactions of carbohydrates, lipids and amino acids, including their regulation. All the main biochemical cycles, as Krebs, Calvin and urea; and pathways, as pentose phosphate, glycolysis and β-oxidation are presented and well discussed. This part also contains a chapter that relies on the integration of the cycles and pathways. Specialisation and the hormonal control complete this last part with several different views, as biochemistry of exercises, diabetes and obesity, for example.

There are still two special short topics at the end of the book: signal transduction and immunology that brings some important issues of the modern biochemistry: hormones and second messengers and the main principles of the immunologic system.

Different from the most common textbooks, **Concepts in Biochemistry** does not include the objective of the chapter at the beginning but a brief introduction of the subject to be studied in the chapter and a one line 'Learning Objective' at the opening of each section.

Continued on page 12

Concepts in Biochemistry

From the publisher...

Concepts in Biochemistry, 3rd Edition

By Rodney F Boyer

The third edition of Concepts in Biochemistry makes the most applied and accessible biochemistry text on the market. Students are more successful with Boyer because it isn't intimidating and it makes clear the relevance of the material to their future careers. Like the first two editions, Boyer is written for students who need an introduction to the fundamental principles of biochemistry and are preparing for a career in the allied health sciences, the biological sciences, and the environmental sciences.

0-471-66179-1 736pp 2005 £92.50

Continued from page 11

The learning process is stimulated by several and diverse ways in this book, that brings some improvements from the last edition. As special attributes, there are over forty boxes called 'Window On Biochemistry', with topics of interest.

'Biochemistry in the Clinic' is another kind of box that can be found inside the text that is used to reinforce the topics studied correlating the main concepts to clinical aspects, such as very rare or common diseases, but always with a view that fits the topic and helps the student to strengthen the theories learned.

Exercises are an outstanding topic from this book. They were increased in this new edition and are concise, objective and try to cover in several ways the topics studied. To obtain this, there are 5 types of exercises. 'Understand Terms', 'Reviewing Concepts', 'Solving Problems' and 'Writing Biochemistry' are exercises presented each chapter's end. There is still one more type of exercise, included for each end of topic, inside a chapter, named: 'Before You Go On'. This last kind of exercise is usually a provocative question about the theory that was just explained that clearly intends to make sure the topics were well understood.

In addition, beyond the end-of-chapter summary, an early revision, named: 'Just In Time Review', revisits some topics when there is some theory that must be better explained.

The references are very current, most of them less than ten years old and some from 2005. There are several articles from easy access periodicals, like *Chemical and Engineering News*, which can be accessed via the internet. The internet, by the way, is another theme that must be highlighted as there are several animations and tutorials, including over 50 multimedia units integrated with the text, illustrating some of the most challenging concepts in biochemistry that can be accessed at the site of the book.

The most difficult learning issue to the biochemistry students, metabolism, is explained in a quite particular way that summarises in tables the whole set of enzymes involved and their actions, which makes the understanding much clearer. Finally, the text is very concise and the range of examples is very useful. It is full of figures and schemes that will provide undergraduate students with a better understanding of the basic biochemistry.

Disabled Students in Higher Education: perspectives on widening access & changing policy

Subject area
General

Description
This book is a monograph on the access of disabled students to higher education.

Authors
Sheila Riddell, Teresa Tinklin, Alastair Wilson

Publishers/Suppliers
Taylor & Francis Ltd
(www.tandf.co.uk/books)

Date/Edition
2005/1st edition

ISBN
0-415-34079-9

Level
Teachers

Price
£25.99

Kieran F Lim (林百君)
School of Biological and Chemical Sciences
Deakin University
Geelong, VIC 3217
Australia
December 2005

Summary Review

range: * poor to ***** good

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

Students are not all the same: they have different learning styles and needs. The theme of **Disabled Students in Higher Education** is that disabled students have needs that are different from their fellow students. Although the numbers of 'non-traditional' (disadvantaged, ethnic minority or non-middle class) students in higher education have increased over recent years, disabled students are still an under-represented group.

The chapter titles give the favour and outline of the book: 'Setting the scene: disabled students and multiple policy innovations in higher education'; 'Patterns of participation of disabled students in higher education'; 'Policy and provision for disabled students in higher education: the current state of play'; 'Institutional ethos and support for disabled students in higher education'; 'The construction of *learning difficulties* and *reasonable adjustments* to teaching, learning and assessment'; 'Disabled students' experiences of access and independence'; 'Support for students with mental health difficulties in higher education: the students' perspective'; 'Disabled students in higher education: negotiating identity; and Conclusion: connecting the treads'.

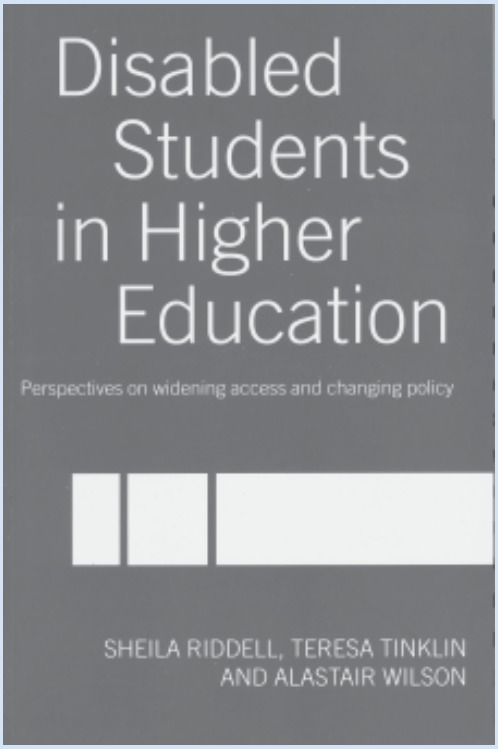
Every academic should read **Disabled Students in Higher Education**. We would all benefit from being more aware of how many students have some disability: Who are they? What impairments do they have? What subjects do they study? What are their social backgrounds? Why do some students hide their disability? What are our responsibilities and duties towards students with disability?

Disabled Students in Higher Education does not give 'hands-on' advice on how to teach students with a disability. There are excellent resources, which deal with that issue, for example[1-4]. What this book *does* have, are discussions of the background policy, equity and implications for implementation, with several case studies of how students with disability or mental health difficulties have sought assistance. The appendix has summaries of many other case studies. Some of these students have overcome the difficulties; others are struggling. Although the book **Disabled Students in Higher Education** focuses on the impact of the Disability Discrimination Act 1995 (as amended in 2002) in the UK, the themes are just as applicable in other countries.

As an Australian reviewer of a British book, I noticed some differences in terminology between the book and antipodean practice. We prefer the term 'students with disability' as this implies individuals are identified as students first, and less importantly by their disability. Similarly, Australian students who are deaf often identify themselves as a linguistic minority, because they communicate using sign language: English is viewed as a second language. This could be an instance of an overly pedantic reviewer or it may be due to international variations in English usage; it does not detract from the value of the book.

Continued on page 14

Disabled Students in Higher Education: perspectives on widening access & changing policy



From the publisher...

Disabled Students in Higher Education: Perspectives on Widening Access and Changing Policy

By Sheila Riddell, Teresa Tinklin, Alastair Wilson

As wider access to higher education becomes a top priority for governments in the UK and around the world, this ground-breaking piece of work raises the challenging questions that policy-makers, vice-chancellors and government officials are reluctant to ask.

0-415-34079-9 224pp 2005 £25.99

Continued from page 13

Disabled Students in Higher Education it is not intended for the average undergraduate science student, but rather for "students of education, social policy, politics, and disability studies, and for those working towards accredited university teacher status". I wish it had been published nine months earlier for use in my Graduate Certificate studies.

References

1. Mole, J and Peacock, D *Learning, teaching and assessment: a guide to good practice for staff teaching d/Deaf students in science and engineering*, University of Wolverhampton, Wolverhampton (2005) <www.wlv.ac.uk/teachingdeafstudents/>.
2. Supalo, C 'Techniques to enhance instructor's teaching effectiveness with chemistry students who are blind or visually impaired', *J Chem Educ* (2005) **82**, 1513-1518 <www.jce.divched.org/Journal/Issues/2005/Oct/abs1513.html>.
3. Sivan, Y *Teaching chemistry to blind students,* a contribution to the Chemistry Education Discussion List (2005) <mailer.uwf.edu/listserv/wa.exe?A1=ind0507&L=chemed-l#79> (accessed 16 November 2005).
4. The American Foundation for the Blind <www.afb.org/>.

Elements of the p Block – The Molecular World

Subject area
Inorganic Chemistry

Description
A self-study illustrated text with interactive CDROMs; penultimate book in second level OU course.

Authors
Charlie Harding, Rob Janes, David Johnson (editors)

Publishers/Suppliers
Open University and Royal Society of Chemistry (www.rsc.org)

Date/Edition
2002

ISBN
0-85404-690-9

Level
Undergraduate

Price
£32.00

David Ruddick
School of Health Sciences
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Newtownabbey
Co Antrim BT37 0QB
April 2006

Summary Review

range: * poor to ***** good

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

This is the 7th book (of 8) in the Molecular World series which forms the basis for the second level Open University course S205. The independent learning approach is the same as that used throughout the series, and there are numerous references to some of the earlier books which have already been reviewed[1,2,3,4]. There are two very useful CDROMs which install easily and contain all the required software for viewing complex structures and observing many chemical reactions. There is also an electronic databook.

The main predecessor to this book was *Metals and Chemical Change*[2], which introduced redox potentials, thermodynamics and lattice energies, followed by the chemistry of groups I and II. **Elements of the p Block** picks up on those aspects of bonding that have not been covered elsewhere, then develops the chemistry of hydrogen followed by each of the groups of the p block. General trends are emphasised throughout, and the industrial and biological significance of much of the chemistry is shown. There are two *Case Studies*.

The book starts with an explanation of group numbering systems for the periodic table, then goes on to show the use of oxidation numbers in balancing redox equations. The strengths of acids and bases are then discussed, using Bronsted-Lowry theory, and pH is defined and illustrated. This is well done, with clear diagrams, but I was irritated by the use of “equals” signs for equilibria instead of two-way arrows.

Lewis acids and bases follow, and this leads into a discussion of the strengths of covalent bonds (bond enthalpy terms). The relationship between these and Pauling electronegativities leads to dipole moments and finally intermolecular forces.

The next chapter describes the chemistry of hydrogen and the hydrides of the typical elements. There is a particular emphasis on the use of hydrogen as a fuel, and the importance of hydrogen bonding in biological systems.

The non-metal theme continues with the chemistry of the halogens, starting with a discussion of the thermodynamics of the formation of halide ions and covalent halides. This is followed by comparisons of the oxidising powers of oxides and oxoanions, and finally interhalogen compounds. The shapes of molecules (VSEPR theory) are emphasised; tables and reaction schemes are used to summarise data. The chemistry of the noble gases follows, starting with their discovery and separation, and continuing with the formation and reactions of xenon compounds in some detail.

A discussion of periodic trends then leads into the chemistry of the remaining four groups in four separate chapters. In each case, the chemistry of the first two elements in the group is described in detail and the reasons for the differences discussed, then the last three elements are done briefly but with an emphasis on the inert pair effect.

One of the CDROMs has, like its predecessor[2], a memorable set of video sequences of many of the reactions being studied in the book; they are clearly marked in the text. This is an excellent way of ‘bringing the text to

Continued on page 16

Elements of the p Block – The Molecular World

Continued from page 15

life' and several of the demonstrations would not normally be available to undergraduates because of safety considerations. The selection of experiments is, however, rather unevenly distributed: there are lots of reactions of N compounds, but none of P; group IV is illustrated only by solid CO_2 and the hydrolysis of calcium carbide (no reaction of carbonate with acid). The excitement of practical chemistry is clear, nonetheless. The three lower members of each group are not illustrated here, but demonstrations of several of their reactions can be found under "the inert pair effect" on the same CDROM. Although the presence of this file is referred to once in the text, it is not clear that all these reactions are *demonstrated* for groups III and IV (and the zinc group).

A highlight of the group III chapter is the use of Al^{3+} in water treatment, followed by a discussion of aluminium toxicity and the reasons for the extreme toxicity of thallium.

The group IV chapter directs the reader to examine the range of silicate structures on the second CDROM. This gives an excellent set of animations showing how SiO_4 tetrahedra can link together to give chains, sheets, etc which combine with octahedral metal ions to give a range of different structures. The physical properties of these structures are shown to be related to cleavage planes. My one reservation is that no idealised chemical formulae are given for any of the structures.

The CDROM also contains excellent animations of the structures of calcite, halite, pyrite and haematite, but again no chemical formulae are given; the book does not even refer to their presence on the CDROM. On the other hand, the group IV chapter shows good diagrams of the allotropes of carbon, including several fullerenes (and nanotubes) but these are not illustrated on the CDROM (an opportunity missed).

The group V chapter again starts with allotropes (of phosphorus), then goes on to give an extensive survey of the hydrides, oxides and oxoacids of nitrogen. The function of NO as a biological messenger is featured. As in group IV, the much greater strength of multiple bonds to the second period element (N) compared with the third period element (P) is emphasised. The halides and oxides of phosphorus are described, then there is an extensive feature on oxoacids, including their relative strengths (Pauling's rules). The importance of the ATP – ADP conversion as a source of biochemical energy is described.

Group VI includes features on gunpowder, sulfur volcanoes in the solar system and allotropes of sulfur and oxygen. Oxides and peroxides are summarised and compared to sulfides. The reactions and shapes of sulfur halides are described. Sulphur oxides and oxoacids are discussed in some detail.

A summary chapter then surveys the periodic trends that have been illustrated, both across periods and down groups. These feature mainly halides, oxides and hydrides. There is a set of summary questions on one CDROM which tests general concepts rather than factual detail.

The book concludes with two case studies. The first is rather long and is entitled 'Acid Rain: sulfur and power generation'. The sections illustrate the effects of acid rain; list energy sources; show that S can be readily removed from oil; describe the chemical characteristics of (abundantly available) coal and how S can be removed before or after combustion; describe the reactions of SO_2 in the atmosphere; the effects of acid rain on soils and groundwater; the effects of SO_2 on natural environmental systems; various cleaning processes in power stations.

The second case study is 'Industrial inorganic chemistry'. It is subdivided, with the first section being heavy inorganic chemicals, illustrated by sulphuric acid, phosphoric acid, ammonia, nitric acid and nitrates, the chlor-alkali industry and the inorganic fluorine industry. The raw materials, the principles behind the industrial processes and the scale of production are clearly described, but I was disappointed by the poor cross-referencing to the earlier chapters; we are merely referred to "earlier in the book" rather than specific sections. The second section covers speciality inorganic chemicals, and includes semiconductors for the electronics industry, medicinal compounds and pigments.

I found this book and CDROMs very stimulating. Throughout the book there are formative questions, and helpful chapter summaries. The numerous illustrations and summary tables make the text stimulating to read, although there are a significant number of typesetting errors. The CDROM material is excellent. The particular approach to the topics is characteristic of the series of books (and of the OU course for which it is designed), so may not fit easily into a particular year of many university programs, but the presentation makes excellent support material for most undergraduate chemistry courses.

References

1. Smart, L and Gagan, M *The Third Dimension.*
2. Johnson, D *Metals and Chemical Change.*
3. Mortimer, M and Taylor, P *Chemical Kinetics and Mechanism.*
4. Moore, E *Molecular Modelling and Bonding*.
All published 2002 by OU & RSC and reviewed in *Phys Sci Ed Rev* **6** (2003).

Essential Mathematics and Statistics for Science

Subject area
Mathematics, General Science

Description
Mathematics and statistics text for undergraduate science students of 'modest mathematical ability'.

Authors
Graham Currell, Antony Dowman

Publishers/Suppliers
John Wiley and Sons Ltd (www.wiley.co.uk)

Date/Edition
2005

ISBN
0-470-02229-9

Level
Undergraduate

Price
£24.95

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

The authors claim that the text is written to support undergraduates of a number of science programmes; "biological, environmental, chemical, forensic and sport sciences." They further state that the "introductory level of the book assumes that the reader will have studied mathematics with moderate success to year 11 (age 16 in UK) of normal schooling."

The text, whilst not divided as such, is in two parts with chapters 1 to 6 covering mathematics and chapters 7 to 13 covering statistics and experimental design.

Starting with chapters 1 to 6 I find it difficult to see a student with grade C GCSE mathematics, especially if they have taken a foundation paper, being able to cope with the rapid pace. For example, differentiation appears as just part of the final chapter and, including examples, runs to just over three pages. The first example here is the solution of:

dy/dx where y = AeBx

This is followed by a table of differential coefficient for common equation formats. If students follow this I fear that their approach will be entirely mechanistic and not develop the deeper understanding most tutors will want to see. My fear is that students of modest mathematical ability, ie the intended readership, will not follow it and require more formal teaching or recourse to the help currently available on campus.

A second example of this rapid pace is early in chapter 3, equations in science, where the reader is introduced to 'substitution of values'. This sub-topic is introduced via the solution of a quadratic using the standard formula, which is fine. Unfortunately the student of modest mathematical ability at GCSE has not been re-acquainted with either quadratic equations or the reason for two solutions. Again I fear that the intended reader will be at a loss in terms of developing any mathematical understanding.

However it must be said that the linked website, available at: eu.wiley.com/legacy/wileychi/currellmaths, allows more practice and access to additional questions. This does not though address the question of developing understanding.

Moving into the second half of the book; students are, in my view, further disadvantaged by the fact that they are unlikely to have been exposed to anything beyond mean, median, mode and simple probability during their school based mathematics. Again my fear is that this text drives students to adopt a mechanistic approach to their analysis.

A positive side to this half of the book is the sub-section on experimental design. The pity is that it only runs from page 304 to page 312 and doesn't come at the start of chapter 7 allowing the remainder of the text to be set in this context.

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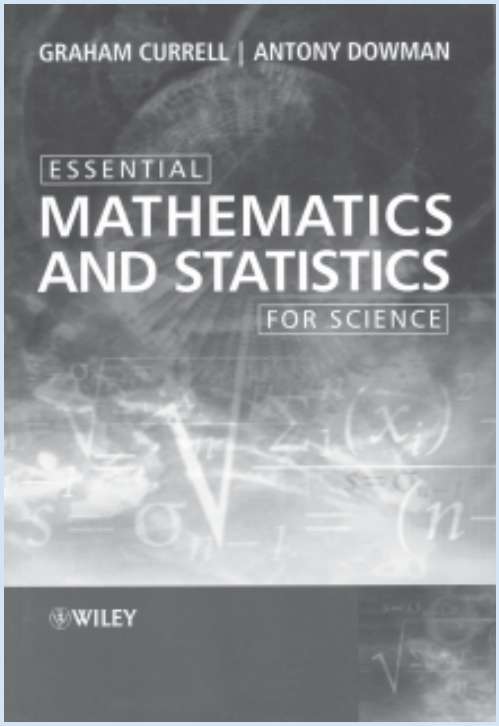
April 2006

Continued on page 18

Essential Mathematics and Statistics for Science



From the publisher...

Essential Mathematics and Statistics for Science

By Graham Currell, Antony Dowman

Basic Mathematics and Statistics for Science is a low-level introduction to the essential techniques students need to understand. It assumes little prior knowledge, and adopts a gentle approach that leads through examples in the book and website.
No other text provides this range of educational support for science students. The integration between book and website provides study options that would be impossible through a book alone, and allows students to study in ways that suit their own circumstances and preferences.
The book develops the mathematics and statistics through examples and questions that reflect the scientific context, and has succeeded in being relevant to a range of undergraduate science programmes.

0-470-02229-9 360pp 2005 £24.95

Continued from page 17

A further positive to take from the text is the fact that the authors take the trouble to set their examples and questions in a scientific context which, this time, I see as a benefit for the student of modest mathematical ability. At least the student can recognise the situation under analysis which may alleviate some of their fears.

To summarise I feel the text misses its target audience and I see this more as a refresher text for students who are starting well beyond a grade C GCSE mathematics. Having made this judgement I then wonder how many physical science undergraduates would be in the position of starting their undergraduate study with a grade C GCSE mathematics. Perhaps the text is better suited to being a class-text for an access course where students are carefully guided by a tutor through the overly complex presentation, taking advantage of the context led examples and the availability of the web-based materials.

Forensic Evidence: Science & the Criminal Law

Subject area
General Science, Law

Description
Written from a lawyer's perspective; this is a book about the inter-relationship between the American Criminal justice system and forensic scientific evidence, specfically, the applicability and allowability of types of forensic evidence.

Authors
Terence F Kiely

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

Date/Edition
2006/2nd Edition

ISBN
0-8493-2858-6

Level
Professional

Price
£56.99

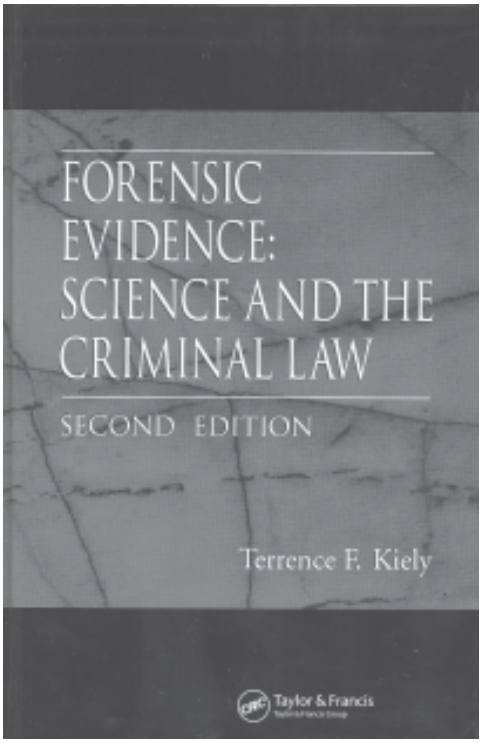
David Harwood
Institute for Science Education
University of Plymouth
Portland Square
Plymouth PL4 8AA
March 2006

Summary Review

range: * poor to ***** good

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

This is an excellent book for American Law students with a strong interest in the interface between the criminal justice system and forensic scientific evidence. After an introductory chapter on 'Science, Forensic Science and Evidence', followed by a second on the relationship between science and the criminal law, the author explores very competently and in some detail, the attitude of the United States courts to a number of categories of evidence. These are: hair and fibre analysis; ballistics and toolmarks; soil glass and paint; footwear and tyre impressions; fingerprints; blood spatter analysis, DNA and Forensic Anthropology and Entomology.



There are detailed case studies about each area and parts of this book are quite fascinating, for a non-lawyer, once the problem of jargon and writing style is overcome. The book is as up to date as it can be, taking into account the rapid advances being made in the biomolecular sciences and given the relatively slow pace of legal acceptance of new methodologies, this should not be regarded as a criticism.

This book is of limited value, however, to the forensic scientist as it is essentially intended for law students - and American law students at that. However, it does give a valuable insight into the complex nature of using forensic evidence in a legal context, as well as, I am bound to remark, the skill of the lawyer in imparting complexity whether it exists or not!. It is perhaps worthy of note that forensic evidence with regard to controlled substances is not covered at all. Perhaps because this is one area where identification of the substances present is less open to legal debate and interpretation?

Professor Kiely has succeeded in penning a cautionary tale for those tempted to enter the field of Forensic Science or graduates seeking to enter the police service or work as scenes of crime specialists. There are clear parallels with our own legal system of course, but many differences too and what is admissible in one legal framework may not be in another. A useful background work perhaps.

Forensic Science: an introduction to scientific and investigative techniques

Subject area
Forensic Science

Description
This is a very comprehensive book on forensic science.

Authors
Stuart H James, Jon J Nordby (editors)

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

Date/Edition
2005/2nd edition

ISBN
0-8493-2747-4

Level
Undergraduate, research

Price
£29.99

Summary Review

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

This is a very comprehensive book on forensic science. The editors have commissioned 34 chapters, all written by practising forensic scientists, investigators and legal experts. For example, their backgrounds include experience in the Federal Bureau of Investigation (FBI), the US Department of Justice, the International Association of Forensic Nurses, various Medical Examiner's Offices, Police Crime Laboratories, and as forensic consultancies. The first-hand experience of the authors and the use of real case studies, including photographs, captivate the reader. Even non-forensic-science students and the general public would find this book interesting reading.

As expected in a book called **Forensic Science**, there are chapters on toxicology, biological fluids and strains, DNA analysis, fingerprints, and related topics. More detailed books, like this one, might be expected to have some chapters on odontology (the study of teeth), taphonomy (what happens to a body after death), anthropology, forensic entomology (the role of insects associated with a dead body), evaluation of the crime scene, forensic psychology and psychiatry, and forensic science in the laboratory. This book, just doesn¹t have some of these chapters, it has all of them. The real bonus was the presence of chapters, which I did not expect: forensic nursing, forensic engineering, forensic computing, and legal and ethical issues. All these make for a very complete and comprehensive and balanced collection.

Given the current popularity of forensic-investigation television series and crime novels, it is easy to forget that there is more to forensic science than criminal investigations. For example, if a building collapses, is it due to negligence or fraud on the part of the designers and builders, negligence on the part of the part of the owner for failing to maintain the structure, inherent problems with past building practices, or other factors? Here, there are discussions of differences between mortar and cement, as well as formulae for the stress on load-bearing walls. As I write this review, the relevance of the chapters on forensic engineering is exemplified by the collapse of a small part of an external double-brick wall at a major hospital in Melbourne, Australia¹s second largest city. Unlike some hospitals in Great Britain or Europe, this building is only about 60 years old.

The various chapters are easy to read, although the technical aspects do require at least matriculation-level or first-year-university knowledge of the science and technology for full appreciation of the subject matter. For example, there are equations describing the physics of friction, accelerating forces and general kinematics applied to analysis of skid marks. If the references and exercises were removed, this book would have a good chance of making the best-seller lists! However, with colour photographs of bodies (some of which are skeletonised), and blood spatter patterns from real crime scenes, it may not be everyone's bedtime reading.

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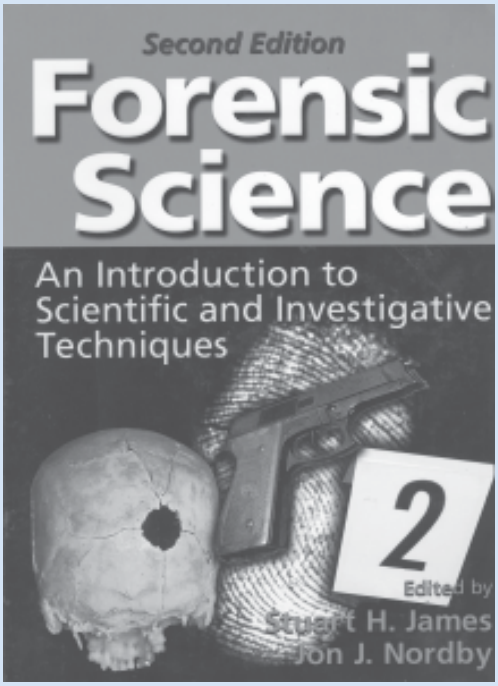
May 2006

Forensic Science: an introduction to scientific and investigative techniques



From the publisher...

Forensic Science: An Introduction to Scientific and Investigative Techniques, Second Edition

By Stuart H James James and Associates, Fort Lauderdale, Florida, USA
and Jon J Nordby Final Analysis, Tacoma, Washington, USA

Written by highly respected forensic scientists and legal practitioners, Forensic Science: An Introduction to Scientific and Investigative Techniques, Second Edition covers the latest theories and practices in areas such as DNA testing, toxicology, chemistry of explosives and arson, and vehicle accident reconstruction. This second edition offers a cutting-edge presentation of criminalistics and related laboratory subjects, including many exciting new features.

0-8493-2747-4 816pp 2005 £29.99

There is extensive (almost exclusive) use of non-SI units, but this is far out-weighed by the good features. Every chapter has a set of revision questions and a list of references and suggested readings. The appendices include listings of websites, imperial-to-metric conversions, detailed glossary and index.

Who would benefit from this book? Certainly students and teachers of forensic science should do so.

Teachers who do not teach forensic science would also benefit from this book. The authors have linked discussion of case studies with the relevant scientific content: biology, chemistry, physics, psychology, etc. Teachers of non-forensic disciplines will be able to enrich their teaching with ‘real world’ applications of their science.

Forensic Science Laboratory Manual and Workbook

Subject area
Forensic Science

Description
Laboratory companion to Forensic Science: An Introduction to Scientific and Investigative Techniques textbook.

Authors
Thomas Kubic, Nicholas Petraco

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

Date/Edition
2005/revised edition

ISBN
0-8493-2132-8

Level
Undergraduate

Price
£19.99

Marie Walsh
Department of Applied Science
Limerick Institute of Technology
Moylish
Limerick
ROI
April 2006

Summary Review

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

This is a laboratory companion to the textbook *Forensic Science: An Introduction to Scientific and Investigative Techniques*. However, it is a useful stand-alone text for anyone wishing to develop or deliver an introductory course in forensic investigation. The authors suggest that it would be useful as a workbook for non-science majors as well as those on mainstream science courses. The layout is thoughtful and the objective of encouraging hands-on activities built around the scientific method is successfully achieved.

The manual is designed for a cooperative learning setting and could form a solid backbone for any group-based problem-solving module. The range of experiments and suggested group sizes ensure that each participant would develop skills in a number of procedures, abilities and processes covered in the text.

The authors have compiled thirty-five hands-on experiments, many of which use basic, inexpensive and accessible resources. The first section usefully lists the equipment and supplies required to complete all the experiments and includes some laboratory safety guidelines.

The format for the experimental chapters is standardised:

- Teaching Goals
- Background information
- Equipment and supplies
- Hands-on activity
- Optional activity
- Data form and results sheets/report.

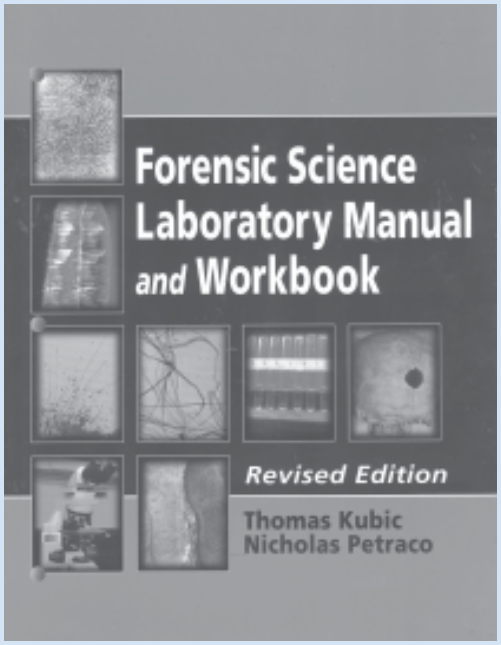
Each experiment includes black and white photographs of relevant equipment or examples of evidence. These are clearly labelled. Students are encouraged to keep a laboratory report book or folder with additional materials to support the manual.

There is an appendix with reference IR spectra of polymer films to support a number of the experiments. At the end of the manual there is a fairly comprehensive bibliography which would provide a focus for further research.

Each experiment is designed to be completed in two to four hours, and assumes no prior scientific training. This is an important concept even for science students at introductory undergraduate level. In our course in Pharmaceutical and Forensic Analysis, as in many science courses at third level, we have learned not to assume knowledge gained at second level. We also realise that many students with good scientific qualifications on paper do not necessarily have commensurate practical skills in reasoning, deduction and problem-solving scientifically. Completion of this laboratory manual would guarantee practice in these essential skills.

There is no index of experiments at the front of the manual, which is something that would be beneficial to add to later revisions. The experiments cover all typical trace element tests, including body fluids, soil, glass, fibres, ink and hair. Experiments involving impression evidence, like fingerprints, bite marks, footwear and firearms are also included.

Forensic Science Laboratory Manual and Workbook



From the publisher...

Forensic Science Laboratory Manual and Workbook, Revised Edition

By Thomas Kubic John Jay College, New York, USA
and Nicholas Petraco John Jay College, New York, USA

Unlike other forensic science laboratory manuals, Forensic Science Laboratory Experiment Manual and Workbook provides many experiments suitable for non-science students. The experiments cover all the typical trace evidence tests including body fluid, soil, glass, fiber, ink, and hair. The book also includes experiments for impression evidence, such as fingerprints, shoes, and firearms, as well as the use of photography and basic microscopy. A laboratory companion to the Forensic Science: Scientific and Investigative Techniques textbook, this revised edition adds experiments in odontology, anthropology, archeology, chemistry and trace evidence.

0-8493-2132-8 368pp 2005 £19.99

Exercises in the use of digital and traditional photography and basic microscopy are featured, as well as some instrumentation practicals (including FTIR, Gas Chromatography and UV-vis spectroscopy) which would benefit students on courses requiring a higher level of chemistry.

At the core of forensics is preservation of the chain of evidence gathered and documented following safeguarding and searching of a crime scene. There are exercises to illustrate the methodical nature of this work, particularly collection and preservation of sample evidence. The importance of measurement and application of mathematical skills in other areas is emphasised, for example in bloodstain geometry, forensic odontology and forensic archaeology.

The experiments do not have suggested individual time frames, but with an allowance for group work and sharing of results and resources, this manual would definitely provide a thorough and varied year long practical module. The background knowledge sections are a useful supplement to the text, and interesting reading in their own right. In our experience 'Forensics' is a very attractive medium for presenting the scientific method to students and I would recommend this manual as one of the better options for delivery of interesting skills-based science!

Functional Group Chemistry

Subject area
Organic Chemistry

Description
This book intends to be a low level book aimed at the first years of undergraduate organic chemistry studies.

Authors
J R Hanson

Publishers/Suppliers
Royal Society of Chemistry (www.rsc.org)

Date/Edition
2001

ISBN
0-85404-627-5

Level
Undergraduate

Price
£15.95

Summary Review

range: * poor to ***** good

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

This book by Hanson is part of the Tutorial Chemistry Series published by the Royal Society of Chemistry and intends to be a low level book aimed at the first years of undergraduate studies. As a pattern from this Series, the book is short and inexpensive. The writing style is clear and accessible, bringing several resolved problems and red marks inside the text that highlight some important keywords. As a choice of this whole book series, there is no reference section. Specially for this book, dealing with reactivity and with some specific reactions that might not be easy to find in textbooks, a bibliography would be very useful as a guide to first year undergraduate students in order to expand their knowledge.

The book consists of four chapters that bring some mechanistic approaches as a way to make clearer the reactions presented. The first one aims to describe the general principles that affect the reactivity of functional groups. Some of the topics will be better explained and exemplified later, such as nucleophilicity and reaction types, but some of them will not be deeply studied, being shown only in this first chapter. Bonding, inter-relationship of functional groups, electronegativity, resonance, kinetic and thermodynamic control, inductive, steric and mesomeric effects, tautomerism, the concepts of acids and bases and some clues on naming compounds are presented in this first part.

The second chapter deals with the chemistry of functional groups involving ó C–X bonds. Alcohols, amines, alkyl halides and ethers reactions are reviewed. The reactivity, preparation and conversion of these functional groups cover a considerable part of the topic. Additionally, the factors that affect nucleophilic substitution and the balance between them; elimination reactions; the factors that direct stereoselectivity and regioselectivity of these functional groups are also described. The formation of organometallic compounds from alkyl halides and their role as carbanions and some radical reactions are shown too.

The third chapter covers the chemistry of both symmetrical and unsymmetrical ð-bonded functional groups. The reactivity and several reactions from alkenes and alkynes to carbonyl and some nitrogen compounds, such as nitriles, imines and nitro groups, are shown and discussed. Elimination and oxidative reactions of ð-bond formation and the electrophilic and nucleophilic additions are presented too.

The final chapter shows a large collection of reactions involving functional groups attached to aromatic rings and discusses their reactivity and the orientation effect on aromatic substitution.

Overall, this book brings a valuable and interesting approach to reactivity in the learning process of undergraduate students.

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Brazil
April 2006

Fundamentals of Biochemistry: life at the molecular level

Subject area
Biochemistry

Description
An introductory textbook to provide students with a solid understanding of biochemistry as well as to foster a sense of wonder for the chemistry of life.

Authors
Donald Voet, Judith G Voet, Charlotte W Pratt

Publishers/Suppliers
John Wiley and Sons Ltd (www.wiley.co.uk)

Date/Edition
2005/2nd Edition

ISBN
0-471-21495-7

Level
Undergraduate

Price
£35.95

Christoph Nimptsch
Farnsburgerstrasse 5
CH-4052 Basel
Switzerland
May 2006

Summary Review

range: * poor to ***** good

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

Some 5 years after the first version the second edition of **Fundamentals of Biochemistry** has been released. It makes a big visual impact being a heavy 1264 pages tome for students providing a broad survey of biochemical topics to help them in their undergraduate biochemistry courses. The book has been written by Donald Voet and Judith G Voet with additional help from Charlotte W Pratt. Donald and Judith G Voet are commonly known for a number of other biochemistry books, whereas Charlotte W Pratt has written a book entitled *Essential Biochemistry*.

What has changed compared to the first edition? The text has been rewritten in order to incorporate newly discovered information and newly developed techniques. Additionally more problems have been included at the end of each chapter and throughout the book you will find more sample calculations, examples and newly designed graphics.

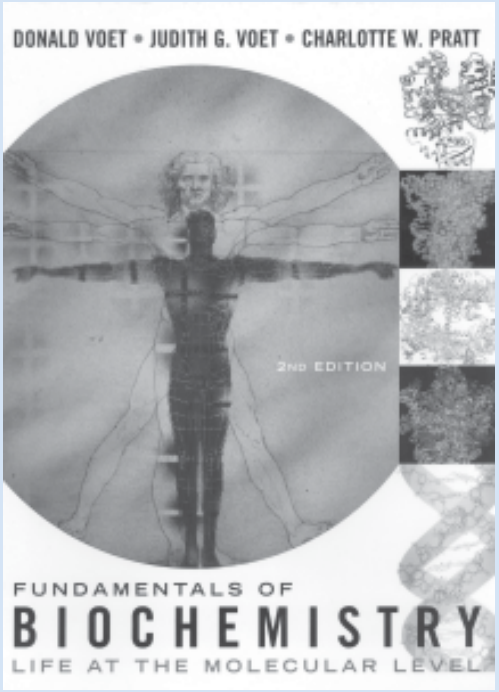
Still it's meant as an introductory textbook and the authors' goals is to provide students with a solid understanding of biochemistry as well as to foster a sense of wonder for the chemistry of life, as can be read on the back cover.

The textbook is basically divided into five parts and altogether into 28 chapters.
The five main parts of the book are 'Introduction', 'Biomolecules', 'Enzymes', 'Metabolism' and 'Gene Expression and Replication', of which the 'Metabolism' part is the biggest one with 10 corresponding chapters. Each chapter deals with one specific subject of the part, e.g. the amino acid metabolism within the 'Metabolism' part. Each chapter is subsequently divided into sections.
Every chapter has an overwhelming amount of beautiful colour pictures. Not only there are schematic drawings of chemical and biological mechanisms, but also very nice cartoon structures of enzymes. Additional interesting information for the subject of each section is given within so called "boxes", which give further insights into the discussed subject. The chapter concludes with a short summary of important topics and references to interesting scientific articles, mainly from 2000 to 2004. Key terms are also summarised for better memorisation. To check if the student has gained the fundamental points, there are study exercises and problems, which demand a thorough understanding of the subject. The solutions to these are found at the end of the book. The appendix contains a glossary with word definitions and an index.

This book is meant as a guidebook for beginners in biochemistry who should read this book to get to a solid understanding of the topic. Does it fulfil its ambitions?
On the good side it has a wealth of images and diagrams that should explain the structure and function of proteins. On the bad side it is not written in a understandable and brief language and sometimes the explanations are not clear.
Unfortunately I don't find the chapters of the book very well structured. It surely provides a wealth of information and surely cannot go into every subject (e.g. vitamins, stereochemistry), but the information isn´t very well structured. The mixing of chemical reactions, protein structures and

Continued on page 26

Fundamentals of Biochemistry: life at the molecular level



From the publisher...

Fundamentals of Biochemistry: Life at the Molecular Level, 2nd Edition

By Donald Voet, Judith G Voet, Charlotte W Pratt

This text uses a more brief and qualitative approach to present biochemistry with chemical rigor, focusing on the structures of biomolecules, chemical mechanisms, and evolutionary relationships. It is written to impart a sense of intellectual history of biochemistry, an understanding of the tools and approaches used to solve biochemical puzzles, and a hint of the excitement that accompanies new discoveries. This edition has been thoroughly updated to reflect the most recent advances in biochemistry, particularly in the areas of genomics and structural biology. A new chapter focuses on cytoskeletal and motor proteins, currently one of the most active areas of research in biochemistry.

0-471-21495-7 1264pp 2005 £35.95

Continued from page 25

diagrams makes the layout very unbalanced and sometimes the student is overwhelmed with an enzyme figure that looks nice but gives no information and isn´t further explained.
For example in the chapter 'Nucleid Acid Structure' on page 830 there is picture entitled "X-Ray structure of the Y328F mutant of E.coli topoisomerase III in complex with the single-stranded octanucleotide d(CGCAACTT)", which has no relevance to a beginner in biochemistry. The explanatory text is even more complicated than the title. It's a good idea to include new scientific information, but for a beginners' book first and foremost the main points have to be emphasised and pointed out. So here the student is confused with abundant information. One page later the more important figure of the "proposed mechanism for type IA topoisomerases" is awkwardly drawn, so one can hardly understand the function of a topoisomerase.
This is only one example, but the same problem reoccurs throughout the book.

Later in the text I have the impression that the figures only enlarge chapters which are a little on the short side, for example in chapter 23 'Nucleid Acid Structure'. I often have the feeling that the authors only slightly touch main points, but soon go on to the next fact and don't differentiate, which is confusing.

Further Online supplements are available on the internet but some of them require registration, eg the multiple choice questions for each chapter. Offered are amongst other things interactive exercises - mainly rotating 3d structures of molecules, guided explorations - animations of molecular dynamics - and animated figures. All of these are referenced in the book. They are nicely done and can help to make learning more interesting.

In my opinion the book leaves much to be desired. To be honest I found the colourful structures even to be distracting. The book relies too much on pictures, but forgets to point out the essentials. This can easily confuse the student, because figures are harder to memorise than facts and it's even more difficult to deduce the important facts out of the text.

Regrettably I cannot recommend this book to beginners in biochemistry, even though it tries to be a modern textbook with colourful figures and additional information on the internet.
Students should instead go with other books eg like the Lehningers, Stryers and Lippincotts.

A *Student Companion* (with solutions to the questions and the exercises from the main text) to accompany **Fundamentals of Biochemistry** - 2nd Edition and a *Take Note!* workbook (provides black & white images from the text) are also available.

Good Style: writing for science and technology

Subject area
General

Description
The book aims to demonstrate and describe some of the common pitfalls in scientific writing, and to suggest and illustrate ways to avoid them.

Authors
John Kirkman

Publishers/Suppliers
RoutledgeFalmer
(www.tandf.co.uk/books)

Date/Edition
2nd edition

ISBN
0-415-34502-2

Level
Research, teachers

Price
£14.99

Susan Armstrong
Department of Chemistry
University of Glasgow
Glasgow G12 8QQ
May 2006

Summary Review

range: * poor to ***** good

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

The first edition of **Good Style** was published in 1980. A revised version, with increased consideration of computer-related texts, was published as a Routledge Study Guide in 1992. This is the second edition of the Routledge Study Guide, and the third edition overall, of a text which has rightly been recommended to and by writers of scientific texts for over 25 years. The book itself does not define its target audience, except as "specialists in engineering, medicine and science". I feel that there are two main user groups: young researchers in the throes of producing their first few research reports or their thesis; and their supervisors, proof-readers, or line managers, struggling to explain why their first draft is unclear or difficult to read. Members of either group may well return to the book when they need to write a new type of text, since it also covers correspondence, specifications, and instruction manuals, among others. I have found remarkably few errors or inaccuracies in the text, as might be expected from a third edition and a careful, dedicated author.

The book aims to demonstrate and describe some of the common pitfalls in scientific writing, and to suggest and illustrate ways to avoid them. It is admirably concise, and its 150+ pages are divided into 25 chapters for ease of reference. After a definition of style and its importance, fourteen chapters discuss such general concepts as jargon, 'buzzwords', use of nouns, verbs, punctuation, and tone. The remaining chapters are devoted to more specialist issues, including computer-related texts, instructions, correspondence, and international audiences. Discussing the style of written English can be problematic, but John Kirkman's long experience enables him to write with skill and authority without being overly didactic. He successfully avoids defining usages as 'correct' or 'wrong', reserving these terms for the grosser grammatical points such as the presence or absence of a main verb.

Kirkman expertly dissects poorly written passages, defining exactly the reason for the lack of clarity, the ambiguity, or the difficulty in following the sense of each. I found this particularly fascinating, having often myself failed to convey concisely to my students just why I was suggesting changes to their written English. The book's main strength is undoubtedly the wealth of examples drawn from the author's years of experience in dealing with both clearly written and confusing, distorted scientific English. Each chapter contains many quotations from real texts illustrating the errors and ambiguities created by previous writers, and often adds suggestions for correcting or improving these. Kirkman's skill at demonstrating 'what not to write' will surely be appreciated by all users of his book. The index, although short, seems sufficient. It includes a useful variety of technical terms, descriptive phrases, and key 'problem' words, the last italicised.

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Good Style: writing for science and technology

From the publisher...

Good Style: Writing for Science and Technology

By John Kirkman

Many professional people in science and technology have an excellent command of their technical subject, but have difficulty in expressing their knowledge in simple, accurate English. Good Style explains the tactics that can be used to write technical material in a coherent, readable style. The book discusses in detail the choices of vocabulary, phrasing and sentence structure. Each piece of advice is supported by many examples of writing from a variety of technical contexts. The advice itself is based on evidence of the styles preferred by technical readers.

0-415-34502-2 160pp 2005 £14.99

Continued from page 27

My reservations about this book spring from Kirkman's own use of technical terms: in this case, grammatical ones. Here, perhaps, the book shows its age. When it was first written, in the late 1970s, the majority of senior researchers and a scattering of junior ones were probably familiar with terms such as 'transitive' and 'adjectival', although I recently heard a retired medical practitioner confess that she does not know what a preposition is. It is surprising now to find a junior researcher who does know the common grammatical terms, and many of their seniors do not. I fear that too many potential readers will be put off by these technicalities. Chapter 11, for example, is called 'Verbs: tense and voice'. Kirkman assumes that all readers will understand 'tense', although he does define 'voice'. I was myself challenged several times, in Chapter 8 ('Use of nouns as pre-modifiers'), to distinguish between adjectives, and nouns used adjectivally. For the determined reader, the multitude of illustrative examples will make clear what is meant, and I hope many readers will persevere. With this reservation, the book appears useful to both its presumed target audiences, and at £15 or less is good value. I shall continue to recommend it to students who are writing their first reports, and are seeking to overcome deficiencies in their writing.

Handbook of Chemistry and Physics

Subject area
General Physics, General Chemistry

Description
A data handbook

Authors
David R Lide (editor)

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

Date/Edition
2005-2006/86th Edition

ISBN
0-8493-0486-5 (book)
0-8493-9133-4 (CD)

Level
Undergraduate, research, professional

Price
£79.00

Summary Review

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

The latest edition of this mammoth publication arrives on your desk like a boulder. If it was any larger it would need its own health and safety analysis before you could lift it and at over 3.4Kg I'm only half joking. Each edition of this book normally represents an incremental change over the previous one but this time around there has been a significant facelift with a larger page size and a more modern typeface which, as someone with less than perfect eyesight, I certainly appreciate. Despite its bulk it's not as large and heavy as it might have been. The paper used is thin and this does lead to a certain amount of bleed through of text from the backing pages which is not excessive but is noticeable. Of course this problem disappears entirely with the CD version.

A number of new topics appear this time around including 'Electron Inelastic Free Paths', 'Proton Affinities', 'Vapor Pressures (Solvent Activities) for Binary Polymer Solutions', 'Selected Properties of Semiconductor Solid Solutions' and 'Electrical Conductivity of Aqueous Solutions'. There are also major updates and expansions of a number of tables including 'Bond Dissociation Energies' (previously called 'Strengths of Chemical Bonds'), 'NIST Atomic Transition Probability Tables', 'Properties of Semiconductors', 'Atomic Masses And Abundances', 'Threshold Limits for Airborne Contaminants', and 'Standard Transformed Gibbs Energy of Formation for Important Biological Species'.

Now I can't make direct comparisons with the 85th Edition because I don't have one to hand so I'm not exactly sure when various layout changes occurred so the following comments may date back through a significant number of editions. Things I particularly like about this edition include the linking of names and exact structures in the organic chemistry section - my venerable personal copy (56th Edition!) has these separated and the structures were often generic rather than exact. CAS Registry Numbers are also a welcome introduction. I also like the thumb-index cutouts to get you efficiently to the appropriate section. What I think I like about it most is quite simply its authority which comes from both its age and the constant revisions. I suppose there must inevitably be errors in a work of this size but I have to say that I have never found one and I have great confidence that any that do occur will be caught and corrected at the first available opportunity. It's hard to identify any major areas of omission, though I suspect that most users will have their own particular grumbles about specific material dear to their own hearts. For what it's worth, my own complaint would be the relatively small amount of mass spectral data which is confined to those for common solvents but if the editors heeded every bit of special pleading the book would be so large it would have to come with its own V8 engine and wheel set.

The CD version allows you access to everything in the printed version but with the benefits of a search function and some potentially useful cross compilations of data. You can choose between a complete installation of all information (~335MB on disk) or a selective install which occupies less disk space but requires access to the CD to run. I must say that the CD installation procedure felt a bit primitive. I'm so used to an Autorun facility that having installation instructions that tell you to type what amounts to a DOS command line feels rather strange. However once you are up and running the interface is reasonably intuitive though again it feels a little old

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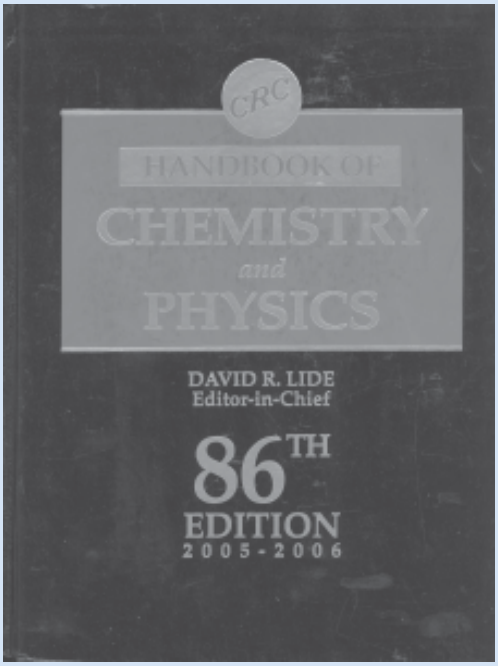
March 2006

Handbook of Chemistry and Physics



From the publisher...

CRC Handbook of Chemistry and Physics, 86th Edition

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

Continues to be the most accurate, reliable, and current resource available on chemical data.
Provides the widest and most complete coverage of data on properties of inorganic and organic compounds.
Includes seven important new tables and extensive updates and expansion of 20 others.
Incorporates substantial revisions to the Bond Dissociation Energy and Standard Transformed Gibbs Energy of Formation for Important Biochemical Species.
Updates the valuable Sources of Physical and Chemical Data appendix.

0-8493-0486-5 2544pp 2005 £79.00

Continued from page 29

fashioned and only the help section is internally hyperlinked. As someone who tends to regard reading the instructions as a sign of inadequacy (probably a man thing) I did find myself resorting to the help section more than I was expecting at the beginning. In such cases a 'Getting Started' section in the 'Contents' section would have helped or even dare I say it a printed leaflet version. Once installed, data is available in one or other of two forms; either as pdf files or as a table. Each form is identifiable by specific icon. The tabular versions allow you the option of exporting or merging data tables in a form that can be exported to a spreadsheet. So, for example, you can take the table of 'Physical Constants of Organic Compounds' and merge it with the 'Table of Octanol-Water Partition Coefficients'. This could then be exported and sorted within a spreadsheet to identify a spectrum of behaviour of potential pollutants. Now this is a rather specialised example but I imagine that all users of this will be able to think of cross-compilations that would be useful to them within their own disciplines. You are only limited by your imagination and the availability of information in the appropriate format. One slight quibble is that some of the pdf files are not as legible as they might be; picking one example the 'Summary Table of Particle Properties' is not easy to read at normal screen resolution but can be magnified up to something that is readable. Initially I found that I was getting stray windows from a failed Internet Explorer call when opening pdf files. It didn't stop them loading in a separate window but it left a mildly irritating screen litter of open windows with error messages. An email to the technical support section did not get an immediate response and I did manage to solve the problem myself and it related to already having a copy of Acrobat installed. Uninstalling this then installing the Handbook followed by reinstalling Acrobat sorted it out. The handbook installation wasn't recognising the pre-installed version of Acrobat even though it was the correct version.

As a reviewer I have to confess that I have not read this from cover to cover (2500+ pages I think). But I hope that's not really all that relevant. The general style and coverage is familiar from years of previous use. This publication has a long and honourable track record and in that sense this has to be the simplest of all books to review. I've had a copy since my undergraduate days and it's easily the most consistently useful single source of information I have. I don't think it's too bold to say that if you don't have easy access to one of these, what are you doing in a physical science laboratory? Unequivocal recommendation for the library and if you can raise the cash, a personal copy is a thoroughly worthwhile and long-lasting investment. The CD version seems slightly clunky and a bit choosy about installation but still lets you do things easily that working with the printed copy that would be really hard work. As a package, a scientific must have.

ICP and Mass Spectrometry Handbook

Subject area
Analytical Chemistry

Description
A refresher to existing users of ICP Mass Spectrometry, or new users who are already aware of and understand the fundamentals of ICP.

Authors
Simon M Nelms

Publishers/Suppliers
Blackwell Publishing
(www.blackwellpublishing.com)

Date/Edition
2005

ISBN
1-4051-0916-5

Level
Undergraduate, research

Price
£109.00

Gordon Macpherson
Science Dept
Inverness College
Crown Ave
Inverness IV2 3NF
May 2006

Summary Review

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

An excellent refresher to existing users of ICP Mass Spectrometry, or new users who are already aware of and understand the fundamentals of ICP Mass Spectrometry.

Not ideal for an introductory book on ICP mass spectrometry but excellent for a second or third year undergraduate student who wishes to get a real in-depth knowledge of a specific area. It would also be ideal for someone who works with ICP Mass spectrometry and wishes to get their teeth into a hands on manual that can explain everything they would ever need to know on their subject. The informative use of diagrams throughout the text manages to give the reader a better understanding of difficult principles. An excellent variety and quality of authors and references allows readers from a wide range of disciplines to focus easily on very specific techniques mentioned within the text.

Chapter 1 'Plasma Generation, Ion Sampling and Focusing'
Introductory chapter on Inductively Coupled Plasma (ICP) describing how the plasma is formed, and the variety of torches and plasmas that may be used. Good use of diagrams allows the reader to easily visualise and understand each concept. Although it covers a great deal in a short number of pages it manages to effectively get across the each of the three main elements of the chapter

Chapter 2 'Mass Spectrometers'
The chapter on mass spectrometry in any book is always going to be heavy going, this however, manages to take a complex subject and break it down into manageable pieces that can be dipped in and out of relatively painlessly

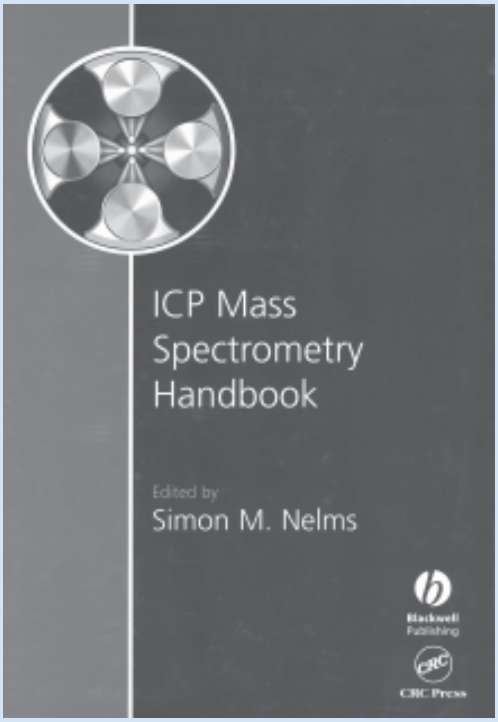
Chapter 3 'Ion Detection'
Ion detection is covered well in the chapter giving any user a fuller understanding of what can happen to background noise and detection limits when the voltage is altered and also gives a good description of a variety of detectors.

Chapter 4 'Calibration Strategies and Quality Assurance'
It was pleasing to see a glossary of terms used in Quality Assurance (QA) and easily understandable sections on calibration methods. Although the chapter is slanted at mass spectrometry large pieces could easily be used in other fields of analysis.

Chapter 5 'Liquid Sample Introduction and Electrothermal Vaporisation for ICP-MS: Fundamentals and Applications'
With good use of diagrams and photographs this chapter gives a good description of how the samples are prepared so that they can be introduced into the ICP-MS in the correct format to allow analysis. As there are already many books already written on this subject the book has successfully managed to use only the most up to date information and not go over old ground.

Continued on page 32

ICP and Mass Spectrometry Handbook



From the publisher...

Inductively Coupled Plasma Mass Spectrometry Handbook

Edited by: Simon Nelms (Thermo Elemental, Cheshire, UK)

Since the first reported linking of an Inductively Coupled Plasma (ICP) ion source with a mass spectrometer (MS) in 1983, the instrumentation and analytical techniques have been developed to a point where the technology can deliver detection limits of one part in 10^15. With this level of detection, ICP-MS is an invaluable tool in a huge range of applications. Despite widespread interest and usage, little has been written to describe the analytical techniques and instrumentation in a format accessible to both new and experienced users of the technique. The aim of this book is, therefore, to provide a thorough description of ICP-MS instrumentation and techniques, giving the reader sufficient knowledge to approach the technique with confidence.

1-4051-0916-5 504pp 2005 £109.00

Continued from page 31

Chapter 6 'Laser Ablation ICP-MS'
This brief chapter describes how Laser ablation allows direct analysis of samples without any prior preparation. It also gives some background on laser ablation, and lasers. It also describes the leap in varieties of laser ablation applications over the last few years and how quantifiable the procedures are.

Chapter 7 'Trace Metal Speciation with ICP-MS Detection'
With a current/relevant introduction on speciation with an easy to understand Mercury diagram to explain element cycling the chapter goes on to fully discuss all forms of mass spectrometry analysis not only focusing on ICP. It also identifies how trace samples can be taken in solid, liquid and gaseous states.

Chapter 8 'Collision and Reaction Cells'
Collision and Reaction Cells concisely describes the fundamentals of the process that tries to minimise the effects of isobaric interferences which can be a major problem when you are analysing at trace level amounts. It goes on to describe the various methods employed that are used to minimise these interferences.

Chapter 9 'ICP-MS Applications'
This is an excellent chapter on the huge variety of uses of ICP-MS whether you are interested in Biological, Environmental or Geological applications you will find many uses that would interest any reader. It even touches on the Semiconductor industry albeit very briefly due to the secretive nature of that Industry.

Inorganic Chemistry

Subject area
Inorganic Chemistry

Description
This book covers not only all of the core concepts of inorganic chemistry typically met in an undergraduate university degree course, but equally has a strong emphasis on descriptive inorganic chemistry and covers special topics such as inorganic kinetics, bioinorganic chemistry, catalysis and solid-state chemistry.

Authors
Catherine E Housecroft, Alan G Sharpe

Publishers/Suppliers
Pearson Education Limited (www.pearsoned.co.uk)

Date/Edition
2004/2nd Edition

ISBN
0-13-039913-2

Level
Undergraduate

Price
£39.99

Brian Murphy
Department of Chemistry
College of Science
UAE University
PO Box 17551
Al-Ain
UAE
May 2006

Summary Review

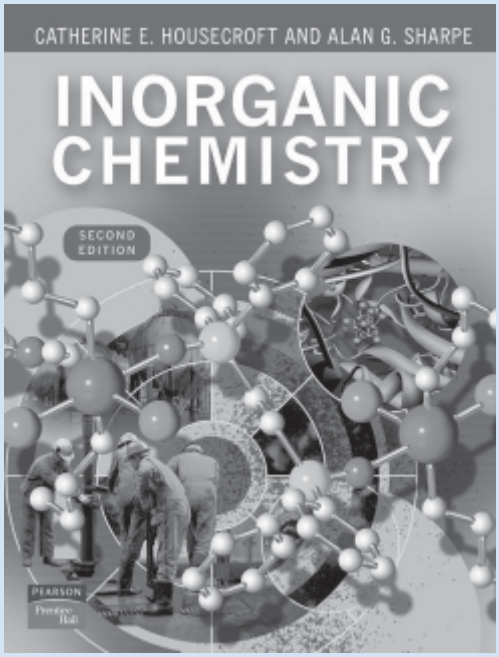
range: * poor to ***** good	
Academic content	*****
Usefulness to student	*****
Usefulness to teacher	*****
Meets objectives	*****
Accuracy	*****

For many years, in comparison to other disciplines of chemistry, the number of textbooks available on the market covering all the fundamental areas of a traditional undergraduate university inorganic chemistry course appeared somewhat limited, with four or five leading textbooks dominating this market. Although many of these books have been around for several years and are very well written, it always struck me that there was a real need for a new textbook, which not only covered all the main concepts of inorganic chemistry at the undergraduate level, but equally the production of such a book, should be of the standard, more often associated with comparable texts found in general chemistry and organic chemistry, complete with coloured graphics, clear layout, supplementary materials, inclusive of a solutions manual to textbook exercises and electronic resources. Inorganic chemistry as a subject lends itself beautifully to the three-dimensional representations of structures and orbitals, and it is incredible that inorganic chemistry textbooks have not been produced to the same level from a publishing perspective as the afore-mentioned general chemistry and organic chemistry books.

The second edition of **Inorganic Chemistry** by Housecroft and Sharpe addresses all of the above aspects. The textbook itself is refreshing, up-to-date, beautifully presented with superb coloured representations, and in my opinion is the most outstanding book to hit the undergraduate inorganic chemistry market for years. Everything about this textbook is professional and of the highest standard possible. This second edition of the text is a natural progression of the first edition, which was published in 2001. In the first edition, the aims of the authors were to give a critical introduction to modern inorganic chemistry, complete in a single volume. This objective is equally achieved in the latest edition. The book covers all of the basic fundamental principles of physical inorganic chemistry, followed by the descriptive chemistry of the elements and also includes an excellent smattering of modern special topics in inorganic chemistry such as homogeneous and heterogeneous catalysis, solid-state chemistry (including some excellent and up-to-date sections on superconductivity, CVD, inorganic fibres, ceramics etc), bioinorganic chemistry and inorganic kinetics. In the second edition, the descriptive chemistry has been completely up-dated, and the text comes complete with the latest references from the literature. Another feature which I really like in this book is that the authors often give references to either appropriate reviews from the literature (eg *Coordination Chemistry Reviews*) or cite references from chemical education journals (such as the *Journal of Chemical Education*), which cater appropriately for both the teacher, undergraduate student or even postgraduate student. However, the main difference between the first and second edition of the book is the move by the authors and publishers from two to full colour. The presentations of structures, images and energy level diagrams are amazing and the quality is so good, that inorganic chemistry as a subject is brought to life in this book. Not only this, but all the tables and figures are available on-line as power-point slides to the instructor, which is wonderful from a teaching perspective. In addition, the companion website features some excellent multiple-choice questions on each chapter and rotatable three-dimensional molecular structures.

Continued on page 34

Inorganic Chemistry



From the publisher...

Inorganic Chemistry

By Catherine Housecroft, Alan Sharpe

A leading textbook which offers a fresh and engaging approach to the teaching of modern inorganic chemistry and gives a clear, well-balanced introduction to the key principles of the subject.

The brand new full-colour text design with three-dimensional illustrations brings the subject to life. Students are able to relate the chemistry they learn to everyday life through numerous applications and topic boxes.

0-13-039913-2 992pp 2004 £39.99

Continued from page 33

Some of the individual chapters are exceptionally well written and presented. The author's treatment of molecular orbital theory is one of the best accounts I have seen in any inorganic chemistry undergraduate textbook (largely due to the professional high-standard graphics) and their introduction to molecular symmetry in Chapter 3 is also very impressive. Perhaps I am biased, but I would have liked to see a second chapter on symmetry in the book, with greater emphasis on group theory in the area of infrared and raman spectroscopy, which although covered in a small section in 3.7, could have been easily expanded, without necessarily lengthening the book. However, the descriptive chemistry in the book is excellent and even postgraduate students will love this text book as a general source of information.

Last semester all of our undergraduate students here at UAEU, started to use **Inorganic Chemistry** as the recommended text for the core courses in inorganic chemistry and elective courses in special topics and organometallic chemistry. The feedback has been excellent from the students and the exercises are just at the correct level in each chapter, with just the appropriate number. Furthermore, the self-study exercises embedded in the text are very useful, although it would be nice if the solutions to these exercises were also included in the *Solutions Manual*.

In summary, I cannot rate this book highly enough to both students and faculty. It is in one word, simply an outstanding book! The coverage is so good and so carefully crafted, that the book is suitable for both the British/European and American undergraduate inorganic chemistry curricula. With so many primers coming on the market, it is nice to have an inorganic chemistry book, which can cover a wide array of courses at the undergraduate level. Not only would I recommend this book to undergraduate students, I also believe that postgraduate inorganic chemistry students should have a copy of this book on their shelves as a primary source of general inorganic chemistry. Interestingly, a colleague of mine who is a chemical physicist one day came into my office and saw a copy of this book on my desk and asked if he could have a look at it. After browsing through the book, his reaction to the authors treatment and the high quality graphical representations of some of the theoretical concepts, summed up for me the overall standard of this book. He commented that he would love for some of his students taking basic quantum chemistry to read the related chapters in this book, as they are so well written. Bottom line - this book is in a class of its own! Students will love it and love inorganic chemistry as a discipline after using it!!

Introduction to Cosmology

Subject area
Cosmology

Description
A concise but detailed introduction to relativistic cosmology for advanced undergraduates and beginning postgraduate students.

Authors
Matts Roos

Publishers/Suppliers
John Wiley and Sons Ltd
(www.wiley.co.uk)

Date/Edition
2003/3rd edition

ISBN
0-470-84909-6 (hardback)
0-470-84910-X (paperback)

Level
Undergraduate, research

Price
£95.00 (hardback)
£34.95 (paperback)

Summary Review

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

The majority of students in UK physics departments are not taking degrees with 'cosmology', 'astrophysics' or 'astronomy' in the title but many cite cosmology as the area of science that originally caught their attention and crystallised their interest in physics to the point where they decided to study the subject at degree level. Perhaps this is because of the large canon of well written and engaging popular science books on the subject. As an admissions tutor, I have lost count of the number of UCAS forms I have received from prospective students in which they claim to have read Stephen Hawking's *A Brief History of Time* or one of the other best sellers in the field. The appearance of cosmology as a component of the undergraduate syllabus is, of course, a relatively recent event. This has been driven in large part by the wealth of new observations that have become possible as the technology available to astronomers has improved. This era of advancement is far from over and it is this fact that makes the study of this field so fascinating. However, the flip side of this is that it is almost impossible for a text book to remain 'up to the minute' for very long.

It is possible to divide the cosmology text book market into two categories; a) Heavyweight reference works aimed primarily at the postgraduate and active research market and b) Cosmology primers that may be adopted as recommended texts for advanced undergraduate modules. The former category contains books such as *Principles of Physical Cosmology* by James Peebles[1] and *Cosmological Physics* by John Peacock[2], while the latter category covers a wider range of texts such as for example *An Introduction to Modern Cosmology* by Andrew Liddle[3], *Cosmology* by Michael Rowan-Robinson[4], *Principles of Cosmology and Gravitation* by Michael Berry[5]. The book under review here falls firmly into category b.

The book opens with an historical overview of the subject matter beginning with Newton's theory of gravitation and ending with a derivation of an expanding universe cosmological model from Newtonian mechanics alone. Along the way, Roos introduces possibly the most profound of all cosmological observations, made still more poignant by the fact that it requires no large aperture telescope or satellite observatory. In fact it is an observation that practically every human that has ever existed has made yet its import was not realised until Wilhelm Olbers noted that the dark night sky is incompatible with an infinite static universe filled with stars.

The next two chapters deal with gravitation, the force that is responsible for the overall architecture of the cosmos. Chapter two begins by introducing Einstein's special theory and finishes with his general relativistic theory of gravity. This is where books of this type (including this one) run into difficulty. General relativity is hard to learn, it normally requires mathematical tools not seen by the student in previous studies and yet the short cosmology text book format requires that the whole edifice is delivered in about thirty pages. Roos acknowledges this fact when claims the central task of his second chapter is to "…derive Einstein's law of gravitation using as few mathematical tools as possible…". He then gives references to more complete works on the subject. Chapter three uses the concepts laid out in chapter two to describe some of the tests of general relativity; the binary pulsar,

Continued on page 36

Gary Mathlin
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Bath BA2 7AY
October 2004

Introduction to Cosmology

Continued from page 35

gravitational lensing, black holes and finally a short but up to date discussion on the hunt for gravity waves.

Chapter four gets into the heart of the matter by showing how general relativity is used to construct model universe. Firstly the Freidmann-Lemaitre-Robertson-Walker model is introduced along with its general solution followed by an examination of several particular solutions, the middle of the chapter focuses on dark energy and the final section introduces some observational tests that may be useful in determining which model is the best fit to reality.

Chapter five deals with the evolution of the universe from a thermal point of view, concentrating on the early radiation dominated era before finishing with a relatively detailed account of big-bang nucleosynthesis.

Chapters six and seven introduce material that may well be considered conceptually more difficult and perhaps speculative. The first of these two chapters, entitled 'Particles and Symmetries' introduces particle physics from a cosmological point of view and requires the reader to grapple with some group theory concepts. As with the chapter on relativity, this material may present a steep learning curve for students who have not taken a prior course in the mathematics of groups. The second of these chapters continues with the more speculative theme by introducing various inflationary models. After introducing the horizon and flatness problems that haunt 'standard' big-bang cosmologies possible inflationary fixes are presented.

Chapter eight returns to more observationally constrained material, focusing on the cosmic microwave background radiation. Beginning with a brief historical account of Gamow's prediction of an observable afterglow of the big-bang and its serendipitous discovery by Penzias and Wilson in 1964, the chapter follows the development of the theoretical understanding of this phenomenon driven by data generated by the COBE and WMAP missions.

The final chapter of the book looks at the need for dark matter as the driver for cosmic structure formation. Candidate dark matter particles are described before the final section of the chapter is used to argue in favour of the lambda-cold dark matter model as the current 'best-buy' option based on all of the concepts previously presented.

The book closes with an epilogue which briefly examines some of the loose ends in current cosmological thinking. Although only a few pages long, this is hopefully the section that the keen student will find the most exciting for in this section the door is held ajar and the reader is afforded a glance of the future, a future that perhaps the sort of student who has stayed the course of this text may want to become part of.

References

1. Peebles, P J E *Principles of Physical Cosmology* , Princeton University Press, Chichester, (1993) ISBN 0-691-019334-9.
2. Peacock, J A *Cosmological Physics*, Cambridge University Press, Cambridge, (1999) ISBN 0-521-42270-1.
3. Brown, T and Sinclair, B *Phys Sci Ed Rev* **5** (1) p29-30 (2004).
4. <ptolemy.uah.edu/cosmos.html>
5. Zeilik, M and Gregory, S A *Introductory Astronomy & Astrophysics* (4th edition), Thomson Learning, London (1998). ISBN 0-03-006228-4.

Introduction to Organic Chemistry

Subject area
Organic Chemistry

Description
This book is an introductory text that helps students to make the connections between organic chemistry and the world around them.

Authors
William Brown, Thomas Poon

Publishers/Suppliers
John Wiley and Sons Ltd
(www.wiley.co.uk)

Date/Edition
2004/3rd Edition

ISBN
0-471-45161-4

Level
Undergraduate

Price
£37.95

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

Summary Review

range: * poor to ***** good

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

It bodes well when both the authors of a chemistry text book have won awards for teaching and **Introduction to Organic Chemistry** does not disappoint. William Brown (twice the recipient of Teacher of the Year at Beloit College) and Thomas Poon (Winner of the Thomas Branch award for excellence in teaching) have together produced an excellent introductory text to the world of Organic Chemistry which I would highly recommend to others.

One of the reasons I liked this book so much was the structure. The authors have adopted a constructivist approach which makes sure that students have the opportunity to apply techniques learnt in previous chapters, to situations not yet encountered. For example, there are quizzes at the end of every chapter, clearly divided by topic, which are then followed by a 'looking ahead' section. This section requires students to apply aspects of their past learning to new topics or molecules. Not only does this serve as a 'gentle introduction' to the next section, but I find students do learn better when they discover new concepts for themselves. In addition, this text book does not follow the stereotypical textbook habit of placing all the 'equipment' at the end. Here, 1-H-NMR, 13-C-NMR and Infrared spectroscopy are discussed in the middle of the book - chapters 11 and 12. Both techniques are now integral parts of most chemistry courses so it makes sense to incorporate these within the main body of the text. However, they are 'free-standing' chapters and could be studied at any point, separate from the rest of the text if required.

The rest of the book proceeds fairly as expected. Chapters 1-10 cover the fundamentals of covalent bonding, the shapes of molecules and acid/base chemistry. The most important classes of organic compounds are discussed and their typical reactions are discussed. Chapters 13-17 continue onto aldehydes and ketones, carboxylic acids and their derivatives, as well as aldol, Claisen and Michael reactions. Organic polymer chemistry is briefly discussed at this stage. Chapters 18-21 provide an introduction to the organic chemistry of carbohydrates, amino acids, proteins and lipids. Then in the last chapter, the chemistry covered in the rest of the book is put into the context of metabolism. Glycolysis, beta oxidation of fatty acids and the citric acid cycle are broken down into stages and explained in depth.

Throughout, the text is easy to follow, divided into sections and chapters of just the right length. Enough to contain all the important information, but not so long that the student will get bored! The diagrams are clear and effective (particularly the use of electron density representations throughout) and any new terms are accompanied by a definition in the margin. This provides information without 'getting in the way' of the student already familiar with the term. However, there is also a glossary at the end of the book for reference. However, one of the most useful aspects of this book is not actually inside it, but is the online information provided by Wiley. For the student, there are online lectures and flashcards for those who find it hard to plough through a text book. In addition there are a series of online quizzes, one for each chapter, complete with detailed answer schemes. For the lecturer, there is an 'Image Gallery', a fully editable 'Test Bank', PowerPoint slides and a series of 3D Molecules. This online support, together with the clarity of the text makes it an ideal core text for an introductory organic chemistry course.

Introductory physics: building understanding

Subject area
General Physics

Description
This book is an introductory text for physics students.

Authors
Jerold Touger

Publishers/Suppliers
John Wiley and Sons Ltd
(www.wiley.co.uk)

Date/Edition
2005

ISBN
0-471-41873-0

Level
Undergraduate

Price
£36.95

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

Summary Review

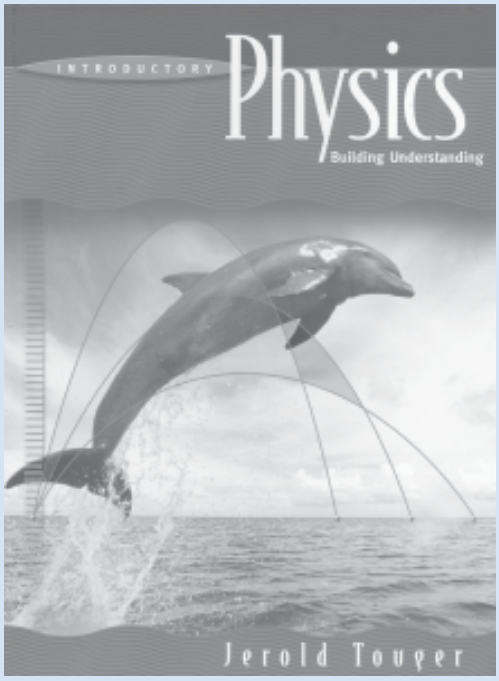
range: * poor to ***** good	
Academic content	***
Usefulness to student	****
Usefulness to teacher	*****
Meets objectives	***
Accuracy	*****

On my shelves I have 18 introductory physics textbooks. I have paid for none of them - they are all freebies from publishers who would like to persuade me that theirs is the book we should adopt for our students. Perhaps I should keep quiet about this if I want to complete my collection, but they are unlikely to succeed: the one we adopt, and give free to all our students, is the one we happened to adopt some years ago. The marginal differences between the books do not justify the cost of change. That is not to say that they are interchangeable: some are slightly more mathematical, or more conceptual, some have more emphasis on 'modern' physics (i.e. last century), some, and this is important, weigh a bit less than others. So what attracted me to read and review another introductory physics book?

It was the subtitle: **Building Understanding**. An interesting word 'understanding'. In my institution we all used to include it in our course aims - until our QAA review told us it was meaningless in this context. Nevertheless, we still cling to the hope that our students will attain something that might pass for understanding in less intellectually demanding contexts than QAA reviews. The question of course is how? The answer is (anticipate a cliché here) that there is no one right answer. Having to teach it is a good way, but you won't find yourself doing this if you can't be convincing that you already understand. However, at least some active interaction with the material helps. So there are in this book, as you might expect, lots of conceptual exercises and STOP & Think moments, with an explicit attempt to get away from physics as an exercise in substituting numbers for symbols by pattern matching. The usual range of material is covered (in as far as is possible in a text that does not use calculus) from Newtonian mechanics to relativity and quantum theory, although not to the level usually associated with first year university courses in the UK (no Lorentz transformation, no Schrödinger equation, no wave equation). There is an abundance of support material, and it is all very well done!

But where does this leave us with 'understanding'? Is this the same as the ability to solve the end-of-chapter problems? Of course it's unfair to take one example, but let's do so anyway. Students will discover how to change units by a mechanical method. (The usual 'multiply by 1=units1/units2 such that unwanted units cancel'.) Does this help one 'understand' units? I would argue that, in fact, students already have an intuitive 'understanding' of units which could instead be developed: what they seem to be being told instead appears (to me at least) to be to forget what they thought they knew and to behave mechanically. Will this not reinforce the notion that physics is only what you do in physics lessons? Another example: a problem on a swimming pool that takes 5 days to fill from which (and other relevant information) the student is asked to deduce the rate of flow of water through the filler pipe. Why? Will that lead to an understanding of what physics is for? And again, I can't help thinking that there are more interesting things about the pictures of the young ice skater than her moment of inertia. (Why would one want to concentrate on that? - because that's physics?)

Introductory physics: building understanding



From the publisher...

Introductory Physics, Building Understanding

By Jerold Touger

For over two decades, physics education research has been transforming physics teaching and learning. Now in this new algebra-based introductory physics text, Jerry Touger taps this work to support new teaching methodologies in physics. Introductory Physics: Building Understanding recognizes that students learn better in guided active learning environments, engages students in a conceptual exploration of the physical phenomena before mathematical formalisms, and offers explicit guidance in using qualitative thinking to inform quantitative problem solving.

0-471-41873-0 904pp 2005 £36.95

We have I think an issue of market forces and convergence: these books appear to be designed for students who will take one course in physics and that design has been honed over many iterations to span a limited range of successful outputs. Can one develop understanding of the whole of introductory physics once over? The head of the Cavendish laboratory used to say (I am not quoting exactly): in their first year we teach our students all we want them to know; then in their second year we teach them this again; and for the final time in the third year we expect them to begin to understand.

So I think there are two issues: if we want students to 'understand physics' then we must accept that this cannot be done with one opportunity to read one textbook however good. A more realistic expectation is that by a wide exposure, repetition, different contexts and applications students will understand introductory physics by the time they graduate. And if we want them to 'understand' why they are studying physics, textbooks must do more than explain, however well, material that has no connection to actually doing something, like providing the opportunity to solve meaningful problems, whether or not we expect our students subsequently to do this for a living. And we must probably give up the idea that all introductory books must cover the traditional syllabus in the traditional order, however diligently.

Introductory semiconductor device physics

Subject area
Electronics

Description
This is an introductory text book for semiconductor device physics, aimed to bridge the gap between high-school and undergraduate levels.

Authors
Greg Parker

Publishers/Suppliers
Institute of Physics Publishing (www.iop.org)

Date/Edition
2004

ISBN
0-7503-1021-9

Level
Undergraduate

Price
£19.99

Jonathan Goss
School of Natural Sciences
University of Newcastle upon Tyne
Newcastle upon Tyne NE1 7RU
March 2006

Summary Review

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

Greg Parker's introductory text-book aims to initiate one into the physics of semiconductor devices, avoiding over-indulgence in mathematical detail and providing an intuitive understanding of the fundamental processes involved. In the preface, the intending user is described thus: "My aim is to provide a bridging text between final year high school (A-level in the UK) and the first year of a university electronics or physics course". The material covers a range of device applications including Gunn-diodes, p-n junctions, bipolar transistors, MOSFETs and semiconductor lasers. However, the book begins with a relatively gentle and pleasingly simple introduction to the nature of how atoms interact in solids to form metals, insulators and semiconductors. It goes on to discuss a simplified picture for energy bands and effective masses, and the implications for how conduction proceeds in semiconducting materials may be used to ones advantage. Indeed, the reader is around a third of the way through the book before the first real device appears. The final chapter covers elements of quantum mechanics relevant to device physics, which may seem out of place in this book, but is presented as providing material to aid understanding rather than essential reading. I would personally have preferred to see the introduction to quantum mechanics with the other 'background' material, but I appreciate that a student may find such a chapter daunting, and then never get past the maths to the devices.

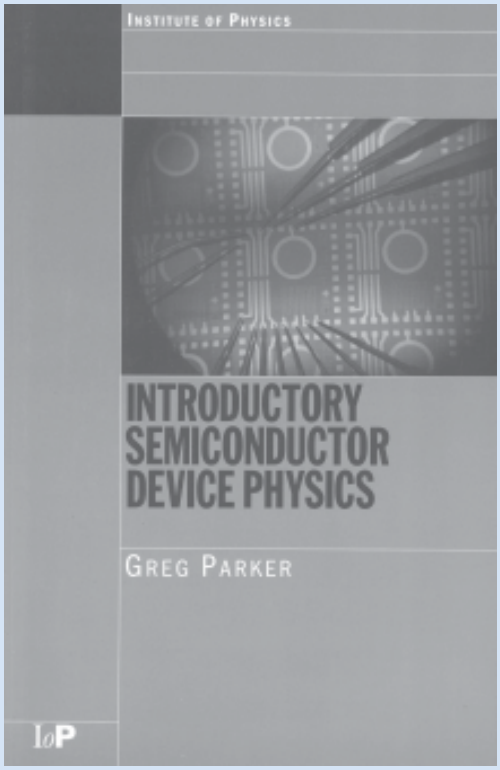
The book is written in a narrative style, making the text at once accessible and easy to read, if slightly irritating in places. I regret the author seems apologetic that maths must be included. While it may be true that a proportion of undergraduate students in physics or electronics may view the mathematical content of such courses as a necessary evil, one feels that encouraging the view that maths is to be avoided where possible may reinforce the negative and unhelpful view I hear from time to time during lectures: "That's maths, not physics!"

Despite the numerous references to the maths as a source of angst, the text retains sufficient rigour in the derivations; indeed, one requires a working knowledge of mathematical methods including basic algebra, exponentials and elements of calculus to fully follow the text.

The maths typically follows a word-based derivation of the key physical results, and one often reaches the algebra forearmed with some conceptual appreciation of what is about to be presented. Taken as a whole, the book is rather pleasing to read and is significantly more accessible that the weighty tomes that constitute the orthodoxy in semiconductor devices physics, such as those included in the "further reading" list.

In contrast to virtually every other physics text-book I have used in teaching, **Introductory semiconductor device physics** contains no exercises for the reader, but is peppered with worked examples which form a useful set of mathematical and numerical illustrations throughout the book. Indeed, one effect of these worked problems is that an attentive reader would develop an appreciation of orders of magnitudes for physically significant quantities such as diffusion lengths, device capacitances, carrier concentrations and so on, which I greatly appreciate.

Introductory semiconductor device physics



From the publisher...

Introductory Semiconductor Device Physics

By Greg Parker University of Southampton, UK

Introduction to Semiconductor Device Physics is a popular and established text that offers a thorough introduction to the underlying physics of semiconductor devices. It begins with a review of basic solid state physics, then goes on to describe the properties of semiconductors including energy bands, the concept of effective mass, carrier concentration, and conduction in more detail. Thereafter the book is concerned with the principles of operation of specific devices, beginning with the Gunn Diode and the p-n junction. The remaining chapters cover the on specific devices, including the LED, the bipolar transistor, the field-effect transistor, and the semiconductor laser. The book concludes with a chapter providing a brief introduction to quantum theory.

0-7503-1021-9 286pp 2004 £19.99

Besides a few presumably typographical slips and perhaps slightly out-of-date data to be expected in a rapidly developing field, the book appears to be essentially error free. However, a small irritation appears in the formatting of the book. First, the layout of many mathematical expressions would not please a purist, and secondly I found myself having to turn forward in order to see the figure referred to in the text, sometimes several pages ahead. Although such issues are common, this book seems to have gone out of its way to achieve a near substantial degree of separation between the text and figures. Hopefully this will be addressed in a future edition.

In conclusion, I believe that there is a place for this text book in undergraduate teaching, and the relatively maths-lite, highly conceptual flavour will certainly be appreciated by an proportion of students. The compartmentalisation of the material into discrete subjects (background, device types and so on) could easy form the basic structure for a semiconductor device course in physics and electrical/electronic engineering. The cost of the book at the time of writing is relatively modest in comparison to the more advanced text-books in the field, a further recommendation for this book as a core text.

Kitchen Chemistry

Subject area
General Chemistry

Description
A teachers' guide on incorporating aspects the culinary workplace into investigational laboratory work and student learning (mainly 11-18).

Authors
Ted Lister, Heston Blumenthal

Publishers/Suppliers
Royal Society of Chemistry (www.rsc.org)

Date/Edition
2005

ISBN
0-85404-389-6

Level
Teachers

Price
£19.50

Keith Wilkinson
Science Department
International School of Lusaka
PO Box 50121 Ridgeway
Lusaka, Zambia
May 2006

As a long standing fan of Lister's *Understanding Chemistry* co-authored with Renshaw, I was keen to see the Royal Society of Chemistry's offering of Lister's **Kitchen Chemistry**. This will number among other well used RSC resources produced in recent years in its support of education in chemistry.

Summary Review

range: * poor to ***** good

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

The emphasis is ostensibly the Kitchen, and focuses on the Kitchen at The Fat Duck Restaurant, and in particular its prize winning cook, Heston Blumenthal who is the main actor in the accompanying videos. Blumenthal is noted for his scientific approach to cooking, challenging many of the time honoured ideas in cooking, and devising experiments to bring new understanding to the field.

fig 1: Heston Blumenthal, star Chef. His restaurant, The Fat Duck, has three Michelin stars, the highest rating.

The chemistry activities on the CD and the supporting teachers' notes in the book, are all based around key questions concerning flavour, the ingredients used in cooking and the cook's choice of conditions. Through video excerpts the textual support and student activities, the seeming 'black art' of cooking is put under the spotlight of contemporary chemical understanding. Some myths suffer as a consequence, and students gain some really excellent hands-on chemistry (and cooking) experience.

The materials encompass practical laboratory activities, investigative as well as prescriptive, plus some reading and comprehension activities. These all have particular class discussion potential.

Teachers at Key Stages 3 & 4 will find useful teaching materials here to support some investigative student centred activities. However in the level of language and nature of the ideas underlying the activities, I would regard this book as aimed mainly at teachers of A-level and IB Diploma Chemistry, although there are parts that are applicable to investigative science learning at KS3 and possibly KS2. A summary and breakdown of type of activity by nature and age group is shown below:

	Written	Practical	Demonstration
Primary	1	1	1
11-16	1	2	1
16-18	10	3	2

Kitchen Chemistry

Investigative topic	Level	Areas of chemistry & focus
The use of salt in cooking (1)	11-16 (KS3, GCSE & IGCSE)	investigative skill building
The use of salt in cooking (2)	16-19 (A-level Chemistry & IB Diploma Chemistry)	Mohr Titration to determine aqueous chloride ion concentration
By how much does salt increase the boiling point of water?	11-16 (KS3, GCSE & IGCSE)	investigative skill building
Is all salt the same?	11-16 (KS3, GCSE & IGCSE) & 16-19	comprehension and critical thinking
"Low sodium" salt substitutes	16-19 (A-level Chemistry & IB Diploma Chemistry)	Mohr Titration to determine aqueous chloride ion concentration, and determination of proportion of KCl:NaCl in a solid salt sample (good outline of the calculations involved)
What affects the colour and texture of cooked vegetables?	16-19 (A-level Chemistry & IB Diploma Chemistry)	investigative skill building, good Group 4 Project work, and a springboard for some Biochemistry
Should beans be cooked with the lid on or off?	5-11 (KS 2 & IB PYP)	investigative skill building
The chemistry of baking powder	16-19 (A-level Chemistry & IB Diploma Chemistry)	Stoichiometry Acid-base equilibria
The structure of ice and water	16-19 (A-level Chemistry & IB Diploma Chemistry)	Bonding, VSEPR, and structures (there are three CHIME molecules on the CD to support this)
Why do pans stick?	16-19 (A-level Chemistry & IB Diploma Chemistry)	Organic chemistry (hydrocarbons, polymerization, bond energies and intermolecular forces)
Enzymes and jellies	5-11 (KS 2 & IB PYP)	investigative skill building
The chemistry of flavour	16-19 (A-level Chemistry & IB Diploma Chemistry)	Organic Chemistry (comprehension activity and molecular structures) Analytical Chemistry (analysis of gas chromatograms, discussion of GCMS) Bonding (intermolecular forces and solubility) Investigative research skills– experimental taste & perception investigation
Chemical changes during cooking	16-19 (A-level Chemistry & IB Diploma Chemistry)	Biochemistry (the Maillard Reaction in the context of meat browning)
The science of ice cream	KS 2 & IB PYP KS3, GCSE & IGCSE A-level Chemistry & IB Diploma Chemistry	Bonding (intermolecular forces and solubility, through practical ice cream making activities – Risk assessment for use of liquid nitrogen provided by CLEAPSS for adaptation)
'Asparagus pee'	16-19 (A-level Chemistry & IB Diploma Chemistry)	Organic Chemistry (Comprehension task)
How hot are chilli peppers?	16-19 (A-level Chemistry & IB Diploma Chemistry)	Organic Chemistry (comprehension activity) Analytical Chemistry (HPLC technique outlined and analysis of HPLC chromatograms of different types of chilli pepper)

table 1: Curriculum coverage of Kitchen Chemistry

This collection constitutes a small gold mine of resources for teachers seeking to address the need for relevance in science – using the kitchen, as the chemistry laboratory from which to investigate chemical phenomena. Lister's thorough approach supports exploration of a wide swathe of chemistry as can be seen in the table 1 above, as well as providing practical investigations for students that can be safely carried out in the school laboratory. It is also tremendous fun, and the homogeneous treatment of chemical concepts and cooking intentionally puts into the background the barriers that educational researchers suggest exist around chemistry as potentially abstract and irrelevant to the lives of the students. In the relevant and hands-on approach, (similar lines of the Salters' Advanced Chemistry course) with which Kitchen chemistry has been written, it will be a much prized resource among teachers for its wealth of practical possibilities.

For the increasing number of schools offering students the International Baccalaureate Diploma Programme (IB DP), the book not only offers fresh approaches to HPLC, and other analytical techniques (Option H:

Continued on page 44

Kitchen Chemistry

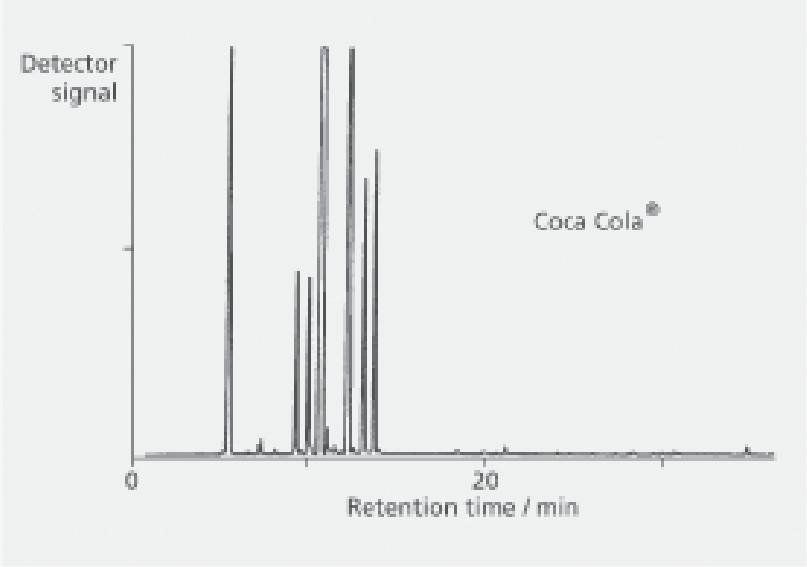


fig 2: Gas chromatogram of the volatile components from Coca Cola® - part of a student comprehension activity in the chapter 'The Chemistry of Flavour'.

Continued from page 43

Analytical techniques), where schools hampered by lack of resources frequently find it difficult to find relevant practical student activities to support the Practical Scheme of Work (PSoW), but it also offers excellent potential for the Group 4 Project (a collaborative, and completely investigative multidisciplinary exercise among all science students, along a context or theme chosen by the school, but whose exact area of interest is up to the group of students. As such, we at the International School, Lusaka are using 'The Kitchen' as a theme for this year, and will make available Lister's resources to the students to allow them to choose areas of interest to research and investigate.

There is only one gripe I have. The book and accompanying CD do not contain the video clips, but instead contain hyperlinks to the RSC's LearnNet site, from which the movies may be downloaded. I feel it would have been simpler to have provided the movies on the CD where there is plenty of room. From Lusaka with limited bandwidth, it did prove a fair headache to download! Though doubtless back in the UK, a typical broadband connection would have made light work of this. Worldwide there are many schools offering UK curriculum and assessment, and such materials as these, even with their UK bias, will be in high demand.

In summary, this is a splendid accompaniment to any sixth form chemistry course, and a valued resource in the armoury of any chemistry teacher.

Strengths

- A really exciting departure in to relevant, applied chemistry, engaging for students of all ages.
- Very clear teacher's and technician's notes, and safety guides.
- Clear student-centred worksheets
- Provides novel and engaging ways to introduce aspects of analytical chemistry (HPLC) through problem solving tasks.
- Encourages investigative learning

Weakesses

- Notable UK bias and lack of internationalism
- Need to download movies which could have been placed on the CD – difficult for teachers with low bandwidth in developing countries.
- Could have produced some supporting Flash/ Shockwave objects to support and enhance the presentation of some of the chemical ideas.

Liquid Detergents

Subject area
General Science

Description
The fundamentals of liquid detergent technology are described. Dishwashing liquids, heavy duty detergents, laundry detergents, shampoos and conditioners are discussed in detail.

Authors
Kuo-Yann Lai (editor)

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

Date/Edition
2005/2nd Edition

ISBN
0-8247-5835-8

Level
Professional

Price
£109.00

Mark Imisides
Intelligent Polymer Research Institute
Wollongong University
Wollongong NSW 2522
Australia
May 2006

Summary Review

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

Although this book is ostensibly targeted at industry professionals, it would also be of substantial use to either students or industry novices.

It gives a comprehensive overview and description of both historical and present chemical technology in four very broad and rapidly-changing fields of the surfactant industry: light duty liquid detergents; heavy duty liquid detergents; liquid automatic dishwasher detergents; shampoos and conditioners.

The details given in each of these areas is preceded by a thorough description of the general chemical and physical theory of liquid detergents: hydrotropy, rheology and phase considerations – in other words, what dissolves what in what and why.

These are particularly important considerations for liquid detergents, where an injudicious choice of surfactants may result in an ineffective product – either the lipophilic material will not be solubilised, or the solubilised matter will not washout; a particularly injudicious mixture of detergents and/or additives may even result in phase separation (sometimes as a result of a change in ambient temperature).

This section comprises about a third of the book, and although the industry professional may skip over it in favour of the details contained in the remainder of the book, it nonetheless provides a solid grounding in the suite of factors involved in formulating a liquid detergent.

The major part of the book discusses the four specific types of liquid detergent mentioned above. It successfully blends descriptions of emerging chemical technologies with other factors which are influencing the surfactant industry these days – environmental factors, emerging analytical technologies, consumer perception and patent considerations.

The specific roles of each class of detergent are discussed in detail. This entails a description of the various components of each class of detergent, along with a detailed discussion of the different chemicals available to achieve these functions.

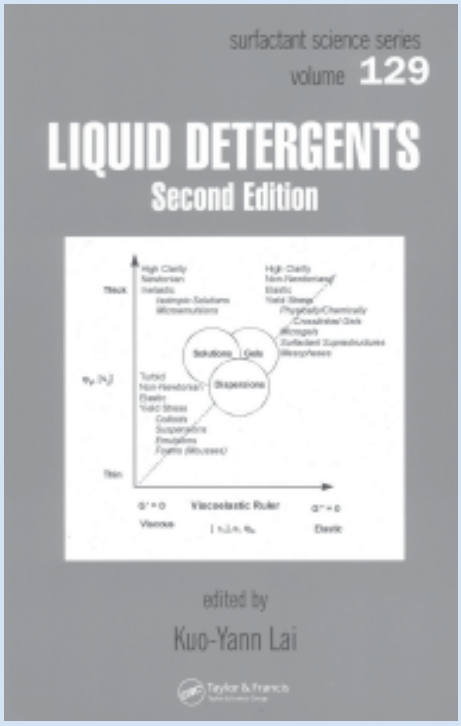
This is an area where tradition often clashes with emerging technologies, and a series of well set out tables assist the industry professional in comparing the various options available - newer chemical technologies may be compared side by side with more traditional chemistries.

A very useful addition to the book is detailed discussions of commercial products, claims and patents. In other words, who says what about their products and what have they been able to patent. This assists both the industry professional and consumer alike to distinguish chemistry from consumerism, fact from fable, and nuance from nonsense.

In this regard, it is salient that performance indicators for each class of product are given due prominence.

Continued on page 46

Liquid Detergents



From the publisher...

Liquid Detergents, Second Edition

By Kuo-Yann Lai Colgate-Palmolive Company, Piscataway, New Jersey, USA

A bestseller in its first edition, Liquid Detergents, Second Edition captures the most significant advances since 1996, maintaining its reputation as a first-stop reference in all fundamental theories, practical applications, and manufacturing aspects of liquid detergents.

0-8247-5835-8 712pp 2005 £109.00

Continued from page 45

The need for performance indicators has emerged as a direct result of the nexus between three factors – the development of advanced analytical technologies, increased competition between synthetic and petrochemical products, and higher performance expectations from the consumer sector. This recognises the fact that it is becoming increasingly difficult for household products manufacturers to make claims about their products that they can't substantiate

Industry professionals in particular will find the discussion of manufacturing processes helpful – it is one thing to know what to put in a detergent, but it is often another thing entirely to be able to actually make it.

The book is rich with highly relevant figures, graphs and tables, and its relevance is enhanced by the detail that it goes into when assessing easily recognisable off the shelf products.

The strength of this book lies in the way that it is clearly set out into the appropriate sections, and it may be easily used to obtain either a cursory or detailed knowledge of each type of detergent as required. Whether student or professional, it is very easy to find the part that you want and access the relevant information, and this book will be an outstanding resource for students or professionals at any level who are working with liquid detergents.

Mathematical Methods for Physicists

Subject area
Mathematics

Description
This text covers the mathematics necessary for advanced study in physics and engineering.

Authors
George Arken, Hans Weber

Publishers/Suppliers
Elsevier Academic Press
(www.elsevier.com)

Date/Edition
6th Edition

ISBN
0-12-059876-0

Level
Undergraduate, research

Price
£59.99

Tim Gershon
Department of Physics
University of Warwick
Coventry CV4 7AL
May 2006

Summary Review

range: * poor to ***** good

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

Now in its sixth edition, and fortieth year, it would be true to say that this book has educated generations of physicists. Set at an appropriate level for advanced undergraduate and postgraduate study, the book also serves as an essential reference for physicists in later stages of their careers. Certainly, copies in varying degrees of unkempt condition populate the shelves of academics, many of whom no doubt have become quite attached to them. The relevant questions for a new edition are then, firstly, what is new? Secondly, do the changes maintain or improve upon the high standards by which it has gained its reputation?

So, what is new? Since previous editions of the book have been so well received, one might hope the answer to be 'not much'. After all, the mathematical tools used by physicists have hardly undergone a revolution in recent years. Accordingly, the book does seem to be following a rather gentle evolution. The authors must be fighting the temptation to add more and more detail - however, if they succumbed the result would be a bloated, unwieldy volume. Therefore, it is good to find that this has not occurred, to any significant extent. By comparison with my own, tattered, version of the third edition (published 1985), the main changes are some reordering and division of chapters (for example, a chapter on 'Determinants, Matrices and Group Theory' has been split into 'Determinants and Matrices' and 'Group Theory' - as a particle physicist I welcome this), and the addition of chapters on 'Nonlinear Methods and Chaos' and 'Probability'. The latter has, according to the preface, been added in this edition "in response to persistent demands", yet the coverage of the subject seems somewhat basic, compared to the general level of the text. Certainly, there are more appropriate books for the probabilistic/ statistical issues likely to be faced by a graduate physicist.

Turning now to the important question of the standard of the book, the familiar format was unsurprisingly rather easy to dip into, and the style and notation are both well suited to efficient utilisation of the book. There has been little or no 'dumbing down' of the content. Perhaps then, it requires optimism to expect that the current generation of students will find the book equally as accessible as their predecessors, yet the book is rightly set at the level of mathematical knowledge that is needed by physicists. Many of the examples and questions also have a ring of familiarity, but this is quite acceptable as long as they are new to the students! While the preface points out that the latest edition corrects numerous typos and errors (bizarrely blamed on "scanning into LaTeX"), my own quick reading did not reveal any.

Nonetheless, I have certain minor gripes about the book - criticisms of the publishers rather than the authors. I found the cover formulaic and unattractive; a fault which is common to many academic books. It would be pleasing to find more care and attention paid to this kind of detail. Furthermore, I was surprised to find that the frontmatter included very little in the way of introduction. None of the prefaces of the earlier editions are included, for example. Since the long history of the book is surely one of its key selling points, I would have expected the publishers to play up this aspect. Perhaps they believe that the book should be judged instead purely on its merits. If so, I have to admit that they have a case. This book is likely to remain a favourite of physicists, from advanced undergraduate level onwards.

Mathematical Methods in the Physical Sciences

Subject area
Mathematics

Description
This book covers the first year of undergraduate level courses for Mathematics in Physics.

Authors
Mary L Boas

Publishers/Suppliers
J. Wiley and Sons Ltd
(www.wiley.co.uk)

Date/Edition
2006/3rd Edition

ISBN
0-471-19826-9

Level
Undergraduate

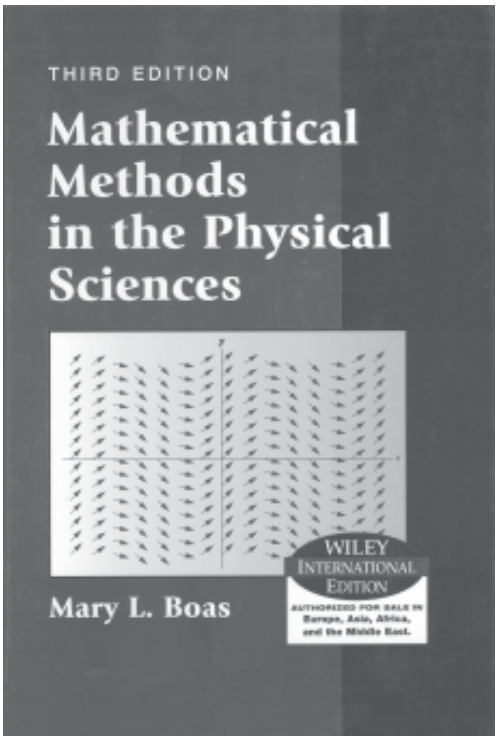
Price
£34.95

This is the third edition of a well-known and used book. It is well suited for first year of undergraduate level courses, not only Physics, but also, for instance, Chemistry or Engineering.

Summary Review

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

It is composed of fifteen chapters that cover 'Linear algebra', 'Analysis', 'Calculus', 'Ordinary and Partial Differential Equations', 'Laplace transforms', 'Fourier series', 'Probability and Statistics', just to name a few.



Each chapter is well organised, starting with an introduction and containing many examples. There is a set of problems at the end of each chapter, with answers to some selected problems at the end of the book.

In general, the book is very clear and understandable. It does not provide students with deep mathematical proofs, they must be found somewhere else, but however, it can be used as a reference book for the basic mathematical concepts needed in a first course level. Maybe it should be updated with some 'modern' concepts such as Vector Spaces or those used in Quantum Mechanics or Dynamical Systems. The employment of more graphical examples would also be an improvement .

Guadalupe Muñoz
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28045 - Madrid
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April 2006

Molecular Physical Chemistry: a concise introduction

Subject area
Physical Chemistry

Description
This book introduces statistical mechanics.

Authors
Keith A McLauchlan

Publishers/Suppliers
Royal Society of Chemistry (www.rsc.org)

Date/Edition
2004/1st Edition

ISBN
0-85404-619-4

Level
Undergraduate, research

Price
£21.00

Summary Review

range: * poor to ***** good

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

McLauchlan's book introduces statistical mechanics - the connection between molecular properties and thermodynamics. Interestingly, though, he refrains from using the term "statistical mechanics". Its intention is to describe the field based on a foundation of molecular properties with which the chemistry student should be familiar and to integrate the concepts into the other areas of physical chemistry. This is in contrast to standard physical chemistry texts which, by emphasising the historical development, tend to treat statistical mechanics as a separate and more abstract subject. Thus the book is intended as a supplement and assumes a knowledge of thermodynamics, spectroscopy and quantum mechanics as covered in standard physical chemistry texts.

Unlike the traditional introductions to statistical mechanics in probability theory, McLauchlan begins with a more applied approach describing the types of molecular energy levels, their relationship with heat capacities and spectroscopy, and how they are populated according to the Boltzmann distribution. Simple two-state examples to illustrate this are nuclear spin and the electronic states of halogen atoms and nitrogen monoxide. The partition function is then introduced summed over these energy levels and the Boltzmann distribution is derived. From the molecular partition functions are derived further relationships that connect molecular properties such as bond length with experimental measurements. The author goes on to show how the partition function is related to the main concepts taught in thermodynamics and concludes with more detailed applications including the monatomic and diatomic ideal gas, magnetism, spectral intensities, ortho and para hydrogen, chemical equilibria and transition state theory. This last application hints at the complete change of theme in the final chapter, being the molecular basis of reactions. This chapter describes how to define and measure collision diameters and discusses collision theory, activation energy, energy transfer and potential energy surfaces.

The text is clear, concise and well-written. The chosen applications are appropriate and accessible. There is less mathematics and fewer derivations than in a traditional statistical mechanics text but a sufficient amount to express the main ideas. There are very useful problems at the end of each chapter with answers provided in the back. This all makes the book highly approachable for students. My main criticism would be that the author's development of ideas could provide more indication of the direction in which they are going in order to aid the first-time student reader, lest such students feel they are reading a collection of disconnected ideas. The development, though, is clear enough for those already familiar with statistical mechanics. Including simple examples from the liquid and solid states would have also been instructive to chemistry students. The need for the last chapter on kinetics is questionable and is presumably included to supplement a second area deficient in standard texts. Presumably this chapter and the books in suggested further reading reflect the author's specialities. Overall, the book succeeds in its objectives and is a timely, original and insightful introduction to the subject of how molecular properties connect to macroscopic and measurable properties.

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April 2006

Molecular Quantum Mechanics

Subject area
Physical Chemistry, Chemical Physics

Description
This text leads us through Quantum Mechanics, unravelling the fundamental physical principles which explain how all matter behaves.

Authors
P W Atkins, R Friedman

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

Date/Edition
2005/4th Edition

ISBN
0-19-927498-3

Level
Undergraduate, research

Price
£35.99

Summary Review

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

The earlier editions of this book will be well known to most readers of my review, and in any case the title is self-explanatory. Why a new edition? According to the authors "We have added new material to a number of chapters, most notably the chapter on electronic structure techniques (Chapter 9) and the chapter on scattering theory (Chapter 14). These two chapters present material that is at the forefront of modern molecular quantum mechanics; significant advances have occurred in these two fields in the past decade and we have tried to capture their essence".

The layout of chapters has certainly changed from earlier editions, but I wonder what the authors have in mind when they claim that the "choice of words" has also changed. An unkind reviewer would read this as a MS/ Word Thesaurus- workover.

With this in mind, the chapter headings should come as no surprise. They are

0 'Introduction and orientation'
1 'The foundations of quantum mechanics'
2 'Linear motion and the harmonic oscillator'
3 'Rotational motion and the hydrogen atom'
4 'Angular momentum'
5 'Group theory'
6 'Techniques of approximation'
7 'Atomic spectra and atomic structure'
8 'An introduction to molecular structure'
9 'The calculation of electronic structure'
10 'Molecular rotations and vibrations'
11 'Molecular electronic rotations'
12 'The electric properties of molecules'
13 'The magnetic properties of molecules'
14 'Scattering theory'
15 'Further information'
16 'Further reading'

together with two 'Appendices' and a body of problems. Chapter 15 contains topics such as solution of the radial wave equation and the HF equations. There is also a web site which gives opportunity to explore equations by numerical substitution.

Book reviewing is a subjective business. The earlier editions of this book must have sold well to justify the fourth edition, and so I'm going to focus on just three topics that interested me.

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May 2006

Molecular Quantum Mechanics

Chapter 1
As the authors correctly say, there are two approaches to quantum mechanics. One is to follow the historical development of the subject and consider the work of Planck, Einstein et al. This is briefly done in the Chapter 0. The other is the postulatory approach, which forms the material for this chapter. Different texts have slightly different sets of postulates, but the present authors have made a serious omission from their own set. Their treatment is non-relativistic (indeed, the word 'relativity' doesn't appear in the Index), so where does electron spin come from? It surely has to be treated as a postulate. Electron spin doesn't actually appear until Chapter 4, when we revert to the historical approach with a discussion of Uhlenbeck and Goudsmit.
I would have liked a discussion of mixed states, and looked in vain for Schrödinger's cat. On the other hand, it was good to see a correct treatment of the uncertainty principle and I liked the introduction to matrix mechanics.

Chapter 9
The topic Electronic structure calculation was a weak point in previous editions. We now have treatment of the following topics:

'The Hartree-Fock self consistent field method'
'Electron correlation'
'Density functional theory'
'Gradient methods and molecular properties'
'Semiempirical methods'
'Molecular mechanics'

all crammed into 54 pages. Readers will have to be experts in LEA (linear expansion of the acronym), but 54 pages for such a vast subject seems a bit mean. The presentation is breakneck and I really could not give this chapter to a beginning research student and expect them to be able to do anything useful after a month of careful study. The Problems vary from the trivial to the really difficult 'Prove Brillouin's theorem' genre.
There is no mention of MC and MD, and concepts such as the gradient and Hessian are given just a few words.
So, the jury is still out. Nice try but could do better.

Chapters 12 and 13
The great strength of the early **Molecular Quantum Mechanics** was the lucid treatment of electric and magnetic molecular properties. You simply don't see this important material in many of the competitors. Chapter 12 is concerned with:

'The response to electric fields'
'Bulk electrical properties'
'Optical activity'

And everything is done very nicely.
It is always a challenge to teach the material in Chapter 13:

'The description of magnetic fields'
'Magnetic perturbations'
'Magnetic resonance parameters'

because to do it properly you need Maxwell's equations and the vector potential A. Maxwell's equations are given in an Appendix, and A is done in 4 pages flat, but good reading.
These two chapters are still the best features of the book.

I have to ask who this book is aimed at. According to the authors "advanced undergraduate students following a degree program in chemistry, physics, or chemical physics and graduate students". In my opinion, this book would slaughter 90% of my own advanced undergraduate chemists. Chemical Physics has almost disappeared from the UK universities, and most Physicists aren't remotely interested in molecules. So it's a specialist graduate text and extremely useful reference book.

The production quality leaves something to be desired, the first few pages fell out of the book as I opened the packaging.

Nanoparticle Assemblies and Superstructures

Subject area
Nanotechnology, Biology, Surface Chemistry

Description
This book is for researchers in nanoparticle assembly.

Authors
Nicholas Kotov (editor)

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

Date/Edition
2006/1st edition

ISBN
0-8247-2524-7

Level
Research

Price
£115.00

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

Nanoparticle assembly was, is and will be a hot and exciting research area. The editor intended to "draw the line at some point and present a snapshot of the work" by assembling twenty-three nanoparticle related chapters to build a superstructure settled on a rapid changing ground. The architects of this superstructure, however, failed to produce a book that will be strongly appealing to critical readers.

Firstly, this out-dated latest 2006 publication assemblies twenty-three chapters with most of them only citing references up to 2002 or 2003. Secondly, only eight out of twenty-three chapters are review articles in nature. The others are largely show-offs of their own works of the chapter authors. The readers should thus be prepared to read the review articles in latest periodicals to keep them breast of any breakthrough since 2003. Thirdly, this book is not well organised. For a book bearing this name, the readers will be expecting a structure such as preparation, characterisation, properties and application of nanoparticle assemblies and superstructures. However, the book is divided into six sectors as nanoscale superstructures current status, electronic properties, biological methods of nanoparticle organisation, assembly of magnetic particles, layered nanoparticle assemblies and self-assembly of nanoscale colloids. I thus suspect this book was assembled from papers presented on an American Chemistry Society (ACS) Symposium held in 2002 chaired by the editor.

Also I strongly disagree the usage of "nanocolloids" or "nanoscale colloids" to name the assemblies of nanoparticles: these terms just cause confusion without any true meanings.

This book is for researchers, not for undergraduate students. It may occupy a place on the shelf of a physical, chemical or biological library. But one copy purchased for individual reference is not strongly recommended after taking its content and price into account.

The twenty-three chapters are reviewed below separately.

Section one ('Nanoscale Superstructures: Current Status').
Chapter 1, 'Organization of Nanoparticles and Nanowires in Electronic Devices: Challenges, Methods, and Perspectives', by Nicholas Kotov and Zhiyong Tang. This chapter is a review article citing publications up to 2004 with 533 references. The reference style is not consistent with most other chapters: the titles of all publications are missing but full titles of periodicals are there, and three periodicals received special attention by citing in the official bureaucratic style as Nature (London), Science (Washington DC) and Advanced Materials (Weinheim, Germany)! This chapter should be expected to give an introduction to the whole field and the latter chapters, however, it disappointed my expectation. There are scale bars missing in figures 19, 27 and 30.
Chapter 2, 'Colloidal Inorganic Nanocrystal Building Blocks', by Young-wook Jun, Seung Jin Ko, and Jinwoo Cheon. It is a good review citing 53 references up to 2004. However, scale bars are missing in figures 2, 3, 12, 14, 16 and 24. Article titles are missing in references 4, 5 and 6.

Section two ('Electronic Properties of Nanoparticle Materials: From Isolated Particles to Assemblies').

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April 2006

Nanoparticle Assemblies and Superstructures

Chapter 3, 'Fluorescence Microscopy and Spectroscopy of Individual Semiconductor Nanocrystals', by Alf Mews. It covers only ZnS-covered CdSe nanocrystals - largely the author's own work. All 69 references are only up to 2003.
Chapter 4, 'Coherent Excitation of Vibrational Modes of Gold Nanorods', Gregory V Hartland, Min Hu, and Paul Mulvaney. It covers mainly the authors' own work. All 50 references are only up to 2003.
Chapter 5, 'Fabricating Nanophase Erbium-Doped Silicon into Dots, Wires, and Extended Architectures', by Jeffery L Coffer. It covers mainly the author's own work. All 22 references are only up to 2002.
Chapter 6, 'Conductance Spectroscopy of Low-Lying Electronic States of Arrays of Metallic Quantum Dots: A Computational Study', by F Remacle and R D Levine. It covers mainly the authors' own work. All 46 references are only up to 2003.
Chapter 7, 'Spectroscopy on Semiconductor Nanoparticle Assemblies', Herwig Döllefeld and Alexander Eychmüller. It covers mainly the authors' own work. All 42 references that contain no article titles are only up to 2002.
Chapter 8, 'Optical and Dynamic Properties of Gold Metal Nanomaterials: From Isolated Nanoparticles to Assemblies', Thaddeus J Norman, Jr, Christian D Grant, and Jin Z Zhang. A short review article. All 53 references are only up to 2002.
Chapter 9, 'Synthesis and Characterization of PbSe Nanocrystal Assemblies', by M Bashouti, A Sashchiuk, L Amirav, S Berger, M Eisen, M Krueger, U Sivan, and E Lishitz. It covers mainly the authors' own work. All 90 references that contain no article titles are only up to 2002. Scale bars are missing in figs 11 and 13.

Section three ('Biological Methods of Nanoparticle Organization').
Chapter 10, 'Biomolecular Functionalization and Organization of Nanoparticles', by Christof M Niemeyer. An outstanding review in this book with excellent perspective. All 172 references are only up to 2003. Scale bars are missing in figure 10.
Chapter 11, 'Nature-Inspired Templated Nanoparticle Superstructures', by Shu-Hong Yu and Helmut Cölfen. A review with many images and graphs as expected for this amazing topic. All 263 references are only up to 2003. Scale bars are missing in figures 3 and 12. The publication year of the paper cited in figure caption 30 is wrong.

Section four ('Assembly of Magnetic Particles').
Chapter 12, 'Magnetic Nanocrystals and Their Superstructures', by Elena V Shevchenko, Dmitri V Talapin, Andrey L Rogach, and Horst Weller. It covers mainly the authors' own work. All 73 references are only up to 2003.
Chapter 13, 'Synthesis, Self-Assembly, and Phase Transformation of FePt Magnetic Nanoparticles', by Shishou Kang, Xiangcheng Sun, J W Harrell, and David E Nikles. It covers mainly the authors' own work. All 23 references are only up to 2003.
Chapter 14, 'Assemblies of Magnetic Particles: Properties and Applications', by Michael Hilgendorff and Michael Giersig. A review with good introduction. All 141 references are only up to 2003. Scale bars are missing in figs 3 and 5.

Section five ('Layered Nanoparticles Assemblies') .
Chapter 15, 'Template Synthesis and Assembly of Metal Nanowires for Electronic Applications', by Sarah K St Angelo and Thomas E Mallouk. A review with poorly reproduced images and graphs. All 67 references are only up to 2003. Scale bars are missing in figs 2 and 4.
Chapter 16, 'Heteronanostructures of CdS and Pt Nanoparticles in Polyelectrolytes: Factors Governing the Self-Assembly and Light-Induced Charge Transfer and Transport Processes', by Sara Ghannoum, Jad Jaber, Mariezabel Markarian, Yan Xin, and Lara I Halaoui. A review article. All 95 references are only up to 2003.
Chapter 17, 'Layer-by-Layer Assembly Approach to Templated Synthesis of Functional Nanostructures', by Nina I Kovtyukhova. It covers mainly the author's own work. All 46 references that contain no article titles are only up to 2002.
Chapter 18, 'Coherent Plasmon Coupling and Cooperative Interactions in the Two-Dimensional Array of Silver Nanoparticles', by George Chumanov and Serhiy Z Malynych. It covers mainly the authors' own work. All 100 references are only up to 2002.

Section six ('Self-Assembly of Nanoscale Colloids').
Chapter 19, 'Self-Organization of Metallic Nanorods into Liquid Crystalline Arrays', by Catherine J Murphy, Nikhil R Jana, Latha A GearHeart, Sherine O Obare, Stephen Mann, Christopher J Johnson, and Karen J Edler. It covers mainly the authors' own work. All 23 references contain no article titles, only up to 2003.
Chapter 20, 'Tailoring the Morphology and Assembly of Silver Nanoparticles Formed in DMF', by Isabel Pastoriza-Santos and Luis M Liz-Marzán. It covers mainly the authors' own work. All 117 references are only up to 2002.
Chapter 21, 'Interparticle Structural and Spatial Properties of Molecularly Mediated Assembly of Nanoparticles', by Chuan-Jian Zhong, Li Han, Nancy Kariuki, Mathew M Maye, and Jin Luo. It covers mainly the authors' own work. All 91 references are only up to 2002. There is no excuse to wrongly abbreviate "Van der Waals" force as "VW" force, it should be "VdW" force instead.
Chapter 22, 'Langmuir-Blodgett Thin Films of Gold Nanoparticle Molecules: Fabrication of Cross-Linked Networks and Interfacial Dynamics', by Shaowei Chen. It covers only the authors' own work. All 75 references are only up to 2003.
Chapter 23, 'Self-Assembling of Gold Nanoparticles at an Air-Water Interface', Hiroshi Yao, Seiichi Sato, and Keisaku Kimura. It covers mainly the authors' own work with good background. All 21 references are only up to 2003.

Natural Products: the Secondary Metabolites

Subject area
Biochemistry

Description
This book shows several examples of natural molecules, their uses, functions, biosynthesis and structure elucidation.

Authors
J R Hanson

Publishers/Suppliers
Royal Society of Chemistry (www.rsc.org)

Date/Edition
2003

ISBN
0-85404-490-6

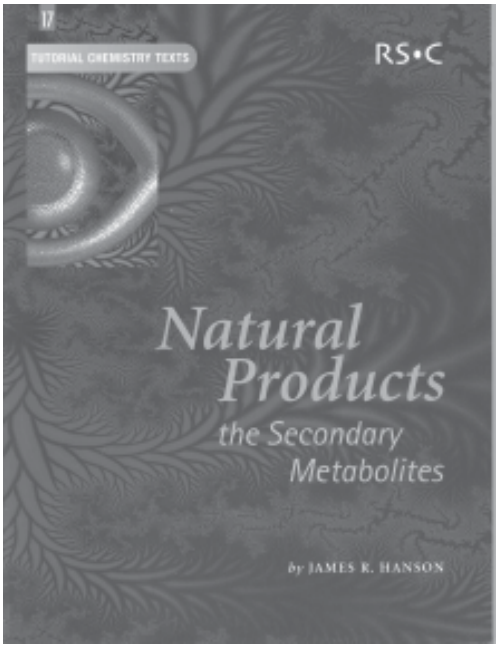
Level
Undergraduate

Price
£15.95

Summary Review

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

This book is part of the Tutorial Chemistry Series published by the Royal Society of Chemistry aimed at undergraduate students. In this book Hanson shows several examples of natural molecules, their uses, functions, biosynthesis and structure elucidation. The text clearly intends to show for the first time natural products readers the intricate processes that are necessary for the structure elucidation of complex molecules and the evolution of strategies, from degradation synthetic methods to the state-of-the-art of the modern NMR. Overall, this book brings the student the beauty of the natural products world, from vitamins, antibiotics and hormones to spectroscopic characterisation, from biosynthesis to chemical ecology. It motivates the interest of second year undergraduate students by showing the importance of these substances and how complex is their structure characterisation, a real puzzle even to the people that are looking for challenges.



This book will not give all the answers to the reader and it does not intend it. Sometimes it will introduce several concepts and expressions that cannot be fully understood by the students but will certainly encourage them to look at the further reading section more deeply. It is a great contribution to the teacher who plans to bring undergraduate students to the natural products laboratories.

It is easy to read, inexpensive, brings several solved problems, lateral notes that try to explain some of the main concepts and red marks inside the text that highlight some important keywords. Finally, it is easy to realise the considerable effort to make a different and more interesting book for undergraduate students.

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April 2006

Nucleic Acids

Subject area
Chemistry, Biochemistry

Description
This book provides a very useful overview of nucleic acids.

Authors
Shawn Doonan

Publishers/Suppliers
Royal Society of Chemistry (www.rsc.org)

Date/Edition
2004

ISBN
0-85404-481-7

Level
Undergraduate

Price
£15.95

Summary Review

range: * poor to ***** good

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

This book provides a very useful overview of nucleic acids. Although it is strongly motivated by the biological applications of nucleic acids, it is clearly written from the stand point of a chemist, and so the effect is to give a very clear account of how the chemical properties of nucleic acids - both their reactivity and physical behaviour - facilitate their biological roles. It is directed at undergraduate chemists, but is also likely to prove useful reading for PhD students and research workers who are beginning to dabble in genomics.

The book starts with a general discussion of genetics, how this is coded into DNA, and how it subsequently maps onto protein structure. This is followed by a chapter describing the chemical structure of nucleic acids and then a chapter that describes the 3-dimensional structure. The 3-D structure is discussed in considerable detail, giving a very clear account of how this varies in different contexts (in crystals and chromosomes, during replication etc) and how the variations in 3-D structure are closely associated with biological function. The fourth chapter describes the biochemistry associated with the transcription of RNA from DNA, and the subsequent translation of the code in RNA into a protein. The final chapter then describes the modern tools that have made genomics a reality, giving a very readable account of the methods that allow one to sequence, replicate and mutate DNA with the amazing specificity that is now possible. In all these discussions, the author has managed to find a good blend of information and historical narrative. Doonan has succeeded very well in using the historical developments-particularly the science that has led to the various Nobel prizes in this area-to explain the methods and concepts required. In doing this he does not lose the scientific detail, but rather succeeds in clarifying the implications of each topic. The historical discussion is separated into clearly marked text boxes, and so can be avoided if desired. However, I found that neither the text nor the concept-development flowed as smoothly when the text boxes were skipped. More importantly, many of the important bits of jargon were defined in these text boxes, so that skipping them is really only an option for those already familiar with the material.

If I were to be critical, there are two points I would like to see changed in a second edition. The first is that the book desperately needs a glossary if it is really going to fill a niche as an serious introduction to the subject. The author has been very careful to define all the jargon before he uses it, but the only way to remind oneself what a particular term means is to search back for the bold reference in the text. This is a field in which jargon has proliferated freely, and so it would be much better to have provided a second definition within a glossary. My second criticism relates to the beginning of chapter 5, where the author strikes an unremittingly positive note about modern DNA technology and the possibilities of gene therapy: a more balanced view of the ethical issues raised by modern technology would have been appropriate in a book like this.

Overall I found this to be an excellent book, that provided a very clear, comprehensive introduction to the chemistry and applications of nucleic acids in biology. It starts at a basic level, but develops to more advanced, detailed topics without making the learning curve too steep. I think this would be an excellent book to support a later undergraduate or early postgraduate course, and can recommend it strongly on that basis.

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May 2006

Orbital Motion

Subject area
Astronomy

Description
The latest edition of a well-established textbook on celestial mechanics, updated to include recent work on solar system dynamics and the Caledonian Symmetric N-body Problem.

Authors
A E Roy

Publishers/Suppliers
Institute of Physics Publishing (www.iop.org)

Date/Edition
2004/4th edition

ISBN
0-7503-1015-4

Level
Undergraduate, research

Price
£39.99

James Collett
School of Physics, Astronomy & Mathematics
University of Hertfordshire
Hatfield AL10 9AB
May 2006

Summary Review

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

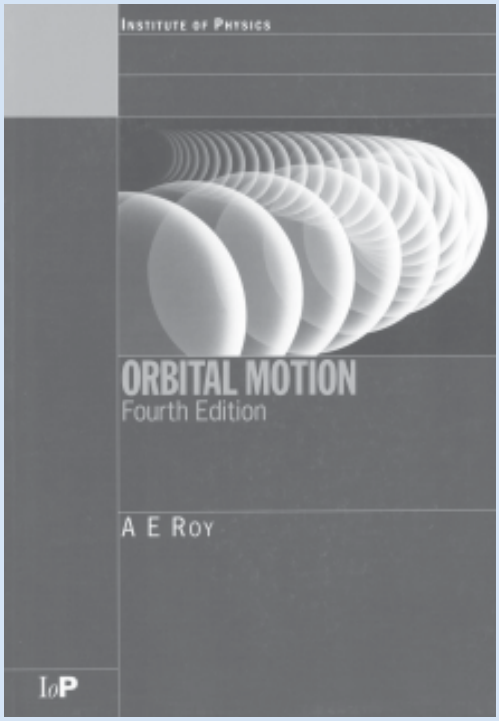
Orbital Motion was first published in 1978 and this recent fourth edition appears seventeen years after its last revision in 1988. This is a book on classical celestial mechanics, so little of the original material has dated. However, solar system dynamics has developed rapidly in that time, and - as the author generously acknowledges in his introduction - we now have a superb book by Dermott and Murray (*Solar System Dynamics* Cambridge 1999) to guide us through the fascinating dynamical problems associated with, for instance, non-spheroidal moons and eccentric rings. Dermott and Murray have also provided online software so that readers can experiment for themselves, and indeed this is an area where the results of numerical simulation can be relatively transparent to the student. I haven't used **Orbital Motion** directly in a taught course, but colleagues who have would have liked access to program listings or computer algebra routines as is increasingly common in modern textbooks.

I would imagine most readers remember **Orbital Motion** for its treatment of transfer orbits, the restricted 3-body problem, the Mirror Theorem and the like, rather than the brief sections on binary stars and galactic dynamics. Indeed, for students of the latter, the title is likely to be deceptive. Orbital motion in galactic potentials has its own rich taxonomy, stimulated by systems with subtle symmetries and the potential for large-scale collective instabilities (see eg *Order and Chaos in Dynamical Astronomy* by George Contopoulos and Binney and Merrifield's *Galactic Dynamics*), but this is not pursued in this book.

For better or worse, positional astronomy is little taught now, and it is likely that the introductory chapters on this and data reduction will appeal mainly to the advanced amateur astronomer with an interest in tracking comets or asteroids. The discussion of the Kepler problem is careful and clear and I was able to give this to a sixth form summer student as a precursor to a project without fear of confusion. The same is true of one of my favourite parts of the book, the discussion of motion in the circular restricted three-body problem. The figures tell the story beautifully and it is nice to read the gentle caution about extrapolating conclusions reached for this ideal problem to mildly eccentric binaries. However, it seems strange that a tool, as useful in investigating the phase-space structure of orbits as the surface of section, is described in two pages without an illustration!

The Caledonian Symmetric N-body Problem is a new chapter which is introduced almost apologetically as a tool to understand 'by no means a problem that is not found in nature', that of four interacting bodies subject to restrictions. There are brief introductions to Hamiltonian methods but the book can be used as a text without them: **Orbital Motion** has a potential readership in the engineering community - aerospace students pursuing an elective in spacecraft orbital dynamics - so this is probably advantageous. Results on the long-term stability of the solar system, that were only computationally accessible in the last fifteen years, are now summarised in Chapter 9. One of my favourite sections of the book is section 12.3.2, a nice problem perhaps for an undergraduate tutorial.

Orbital Motion



From the publisher...

Orbital Motion, Fourth Edition

By A E Roy University of Glasgow, Scotland

Long established as one of the premier references in the fields of astronomy, planetary science, and physics, the fourth edition of Orbital Motion continues to offer comprehensive coverage of the analytical methods of classical celestial mechanics while introducing the recent numerical experiments on the orbital evolution of gravitating masses and the astrodynamics of artificial satellites and interplanetary probes.

0-7503-1015-4 544pp 2004 £39.99

Students may be aware of, or even rediscover, the Hohmann transfer orbits as a means of getting from one planet to another under impulsive rocket burns that use as little fuel as possible, but few will guess that bi-elliptic orbits that overshoot can lead to savings in fuel.

Each chapter is accompanied by exercises (with answers and some hints) that are designed to give the student confidence. This book retains its usefulness as a comprehensive text on introductory celestial mechanics with the major themes developed using simple tools. It seems good value by modern standards, particularly compared to the wonderful (but extravagantly expensive) *Essays on the Motion of Celestial Bodies* by Beletsky.

Organic Chemistry

Subject area
Organic Chemistry

Description
An elementary organic text focusing primarily on the first and second years of undergraduate study.

Authors
G Marc Loudon

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

Date/Edition
2002/4th Edition

ISBN
0-19-511999-1

Level
Undergraduate

Price
£39.99

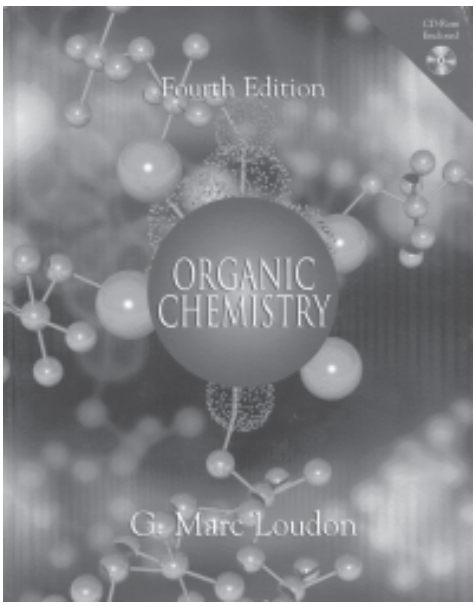
Jason Eames
Department of Chemistry
University of Hull
Hull HU6 7RX
December 2005

Summary Review

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

Organic chemistry is one of the three main branches of chemistry. By its nature, it has exceptional diversity. As new and exciting sub-branches emerge, these are underpinned by the traditional foundations and concepts of organic chemistry. As these areas develop, there is a need for updated undergraduate textbooks despite the fact that this field has a plentiful supply of standard texts available.

Loudon is an excellent elementary organic text focusing primarily on the first and second years of undergraduate study. Each chapter is based on the tried-and-tested functional group approach. There is a fair balance between general chemical knowledge, facts and more importantly, mechanistic understanding. Within each chapter, there are inserted problems aimed at promoting better comprehension of these chemical facts. For new and difficult concepts, these are supplemented by *study guide links* to the enclosed CDROM (and a separate *Study Guide and Solutions Manual to Accompany Organic Chemistry,* by G Marc Loudon and Joseph G Stowell; OUP; £19.99 ISBN 0-19-512000-0).



The fourth edition is an improvement on earlier versions. More attention has been focused on the student readability, presentation and accuracy. New and revised areas, such as organometallic processes and NMR spectroscopy, respectively, have been dealt with very well. However, this text is not without a few minor weaknesses; the lack of colour can be off-putting, and the structural nature of some of the molecules could have been better drawn. Overall, this is a near perfect undergraduate text; comprehensive, well written, with associated problems and interactive learning, and good value for money.

Organic Spectroscopic Analysis

Subject area
Organic Chemistry

Description
This book sets out to explain how the different regions of the spectrum can be used to determine the structure of organic molecules.

Authors
Rosaleen J Anderson, David J Bendell, Paul W Groundwater

Publishers/Suppliers
Royal Society of Chemistry (www.rsc.org)

Date/Edition
2004

ISBN
0-85404-476-0

Level
Undergraduate

Price
£15.95

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April 2006

This book is part of the Tutorial Chemistry Series published by the Royal Society of Chemistry. It aims to offer the first year undergraduate students with the basic information in a short and inexpensive book with a clear and accessible writing style.

Summary Review

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

Organic Spectroscopic Analysis presents the elucidation of the structure of organic molecules in a singular way, different from the most common titles. It does not include a large amount of tables and spectra but only a few essentials to illustrate every point made. Only a short 'Further Reading' final page includes a few references where the students could find deeper and extended information.

The book contains six chapters that intend to explain how the different regions of the spectra can be used to determine the structure of organic molecules, leading the reader to an appreciation of the information of each form of spectroscopy and an ability to use spectroscopic information in the identification of organic compounds. From each technique, a small introduction summarises the instrumentation and the most common way to perform the analyses and introduce the samples. The extension of each chapter depends on the importance and the amount of information that the technique can offer to the structure elucidation of organic molecules. The first chapter introduces the concepts of energy transition, frequency, wavelength and wavenumber and includes a small section with solved problems on double bond equivalents that will help to solve the problems from the subsequent chapters. It is followed by ultraviolet-visible (UV-Vis), Infrared (IR) and Nuclear magnetic Resonance (NMR) spectroscopies and Mass spectrometry (MS) chapters.

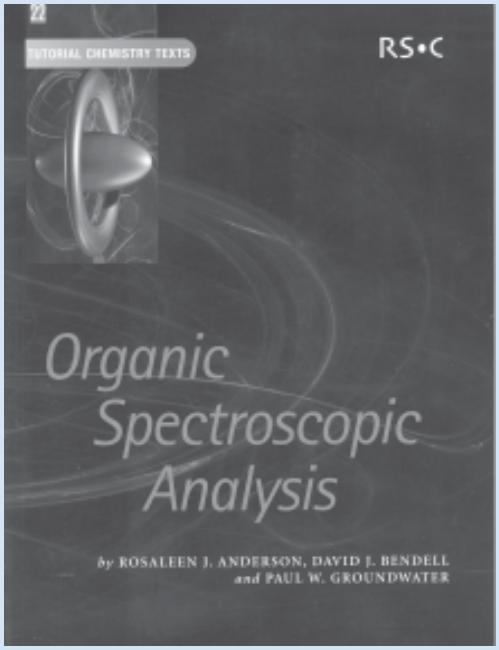
In the second chapter, the principles of the Ultraviolet instrumentation, the principles of the Woodward-Fieser's rule and Beer-Lambert's law on the UV-Vis theory and the pH and solvent effects for the absorption spectra are explained. The main applications of the UV-Vis spectroscopy as a detector in thin-layer and high performance liquid chromatographies are briefly explained, as its use in the assays in the pharmaceutical industry and British Pharmacopoeia. The absorption of some of the most common conjugated systems is presented too.

The third chapter describes the use of IR spectroscopy in organic chemistry. The vibrational frequencies are shown based on the different regions of the spectra and, inside these regions, the functional groups are correlated. Particularly in this chapter, the presence of a great amount of examples, not observed, is felt to be important to the full understanding of the use of the IR spectra.

NMR Spectroscopy is the theme of the next and biggest chapter of the book. The origin of the NMR effect complements the initial part of this chapter, which deals with instrumentation, helping students to understand the theory of chemical shifts and coupling. Together with the main concepts of the 1H NMR Spectroscopy, the interpretation of their integrals, splitting patterns and coupling constants are viewed and complemented by some decoupling and bidimensional experiments, like COSY and the Nuclear Overhauser Effect (NOE). In 13C NMR Spectroscopy, chemical

Continued on page 60

Organic Spectroscopic Analysis



From the publisher...

Organic Spectroscopic Analysis

By R J Anderson University of Sunderland UK
and D Bendell University of Sunderland UK

This introduction to organic spectroscopic analysis aims to provide the reader with a basic understanding of how nuclear magnetic resonance (NMR), infrared (IR) and ultraviolet-visible (UV-Vis) spectroscopy, and mass spectrometry (MS) give rise to spectra, and how these spectra can be used to determine the structure of organic molecules. The text aims to lead the reader to an appreciation of the information available from each form of spectroscopy and an ability to use spectroscopic information in the identification of organic compounds.
Aimed at undergraduate students, Organic Spectroscopic Analysis is a unique textbook containing large numbers of spectra, problems and marginal notes, specifically chosen to highlight the points being discussed.

0-85404-476-0 176pp 2004 £15.95

Continued from page 59

shifts and the coupling with other nuclei are observed (DEPT, HMQC and HMBC are briefly presented). The very recent application of the NMR Spectroscopy as a detector to HPLC is presented too.

Mass Spectrometry (MS) experiments are presented in the fifth chapter. Here, again, there are just a few examples of spectra but the main fragmentation processes, such as the most common cleavages and rearrangements, are well explained. The most important ionisation processes applied to mass spectrometers used as Gas Chromatography detectors (GC), Electron Impact and Chemical Ionisation, are clearly explained as those used for HPLC: Fast Atom Bombardment (FAB), Matrix Laser Desorption Ionisation (MALDI), Electrospray Ionisation (ESI) and Atmospheric Pressure Chemical Ionisation (APCI).

However, since MS is usually applied as a detector to GC and, more recently, HPLC, the hyphenated techniques should be better explored but they are only briefly viewed, together with Selective Ion Monitoring (SIM), MS-MS and MSn processes. The differences of the Quadrupole, Ion Trap, Time-of flight and Ion Cyclotron Resonance spectrometry are briefly explained.

The last chapter shows how to use the whole group of information furnished by the techniques for the structure elucidation of organic compounds.

Peptides and Proteins

Subject area
General Chemistry

Description
Peptides and Proteins is a book primarily aimed at first and second-year students. It takes a problem-based approach to the topic, setting out aims for each chapter. It has worked problems throughout and additional chapter questions with end of book answers.

Authors
Shawn Doonan

Publishers/Suppliers
Royal Society of Chemistry (www.rsc.org)

Date/Edition
2002

ISBN
0-85404-692-5

Level
Undergraduate

Price
£15.95

Paul Chin
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University of Hull
Hull HU6 7RX
May 2006

Summary Review

range: * poor to ***** good

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

The brief preface to this book says that it is primarily for "students of chemistry" although it also claims that "biological scientists" wanting to understand more of the chemistry will also find it useful. The back cover however, states that it is aimed at "first and second-year chemistry students". This is backed up by the format of the chapters, each starting with a set of aims; worked problems; and additional questions at the end (with answers at the back of the book).

Given the brief information in the preface, back cover and from the book's format, I was initially a bit confused on reading chapter one titled 'The covalent structures of peptides and proteins'. The chapter introduction gives more information about why the study of peptides and proteins is not only interesting but valid for chemistry and biology students. I felt that this would have been better as a separate introduction to clarify the relevance, interest and benefit of the book to potential student readers.

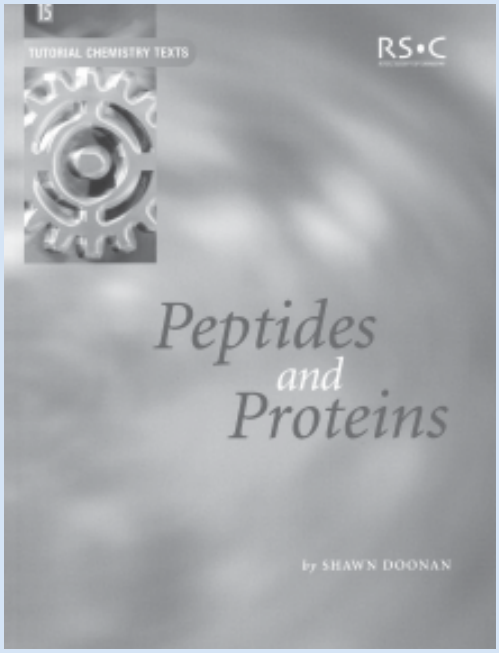
Given the title of the book I was slightly disappointed with the formal introduction to amino acids and proteins, with the generic structures being shown as small graphics in the margin rather than large representations in the main content area. I would have expected this to be a major feature. The format of the content also confused me with particular words or phrases being highlighted in red or black. Terms marked in red made me think they were referenced in some glossary but none was provided. Terms in black did have explanations in the margin but were also sometimes labelled in red in the main content, so there appeared to be no clear system to text colouring.

Whether this was intentional or not, the use of red and black terms made me feel I should be using a secondary, more detailed text as a reference to engage in further reading about the topic. This is meant as a positive point however, because if I put myself in the place of a student reading this particular text, I think I would consider it a good overview and introduction to peptides and proteins with the incentive to undertake further, more in depth reading on the subject.

The book claims to take a problem-oriented approach to the topic so one criticism I do have early on is with the first worked problem, which sets out a problem and explains the answer. The following phrase is used in the explanation: "It should be immediately obvious that..." but it is not explained why it should be obvious. From the student reader's point of view this can be very disconcerting if the author is writing the content as an introductory text yet makes assumptions about the reader's knowledge and doesn't explain the answer clearly enough. This is also evident with the level of chemistry terminology in that some terms are not fully explained. For first and second year chemistry students this may be fine but with the claim in the preface that "biological scientists" may also find this useful, I have my doubts that they would get too much out of parts of the book on this basis.

Continued on page 62

Peptides and Proteins



From the publisher...

Peptides and Proteins

By S Doonan University of East London UK

Encompassing all aspects of the structures of peptides and proteins this book adopts a uniquely problem-oriented approach to the topic. Starting with a look at the structures and properties of the twenty amino acids that occur in proteins and moving on to the synthesis of polypeptides and the isolation of proteins. Peptides and Proteins then addresses the methods of analysis of protein characteristics including the modern methods of sequence analysis by mass spectrometry. Further chapters examine the three-dimensional nature of protein structure and introduce the student to the use of computer applications (molecular graphics, databases, bioinformatics) in protein chemistry. Original research data is used in many of the problems and throughout sufficient background biology is included thus putting the subject into context for chemists.

0-85404-692-5 186pp 2002 £15.95

Continued from page 61

As you proceed through the chapters one feature of the book comes out which makes the book not only informative, but actually a palatable read. At particular points the author makes specific reference to Nobel Laureates and other key scientists and how their work informed our current scientific understanding. There are also other page margin 'footnotes' about how the science has everyday applications.

Another good feature of the book is the problem-based approach it takes discussing the laboratory and other real world issues concerned with the science. For example, in the chapter on protein purification, before the 'textbook' methods of purification are reviewed; the author explains to the reader that in reality it is sometimes difficult to purify proteins because they are fragile and may only constitute small proportions of the overall sample. However, realistic answers to the problems are also addressed. This helps get the message across to the reader that it can be very rewarding realising these issues and finding real solutions.

As the chapters move from the early discussions about the chemical make up of peptides and proteins, to their synthesis, structure and purification; the book starts to look more at biological aspects of proteins. The final chapter then focuses on how computer technology is used to study proteins, something called 'bioinformatics'. The progression of content later in the book does make it more appealing to biologists rather than certain parts of the early bits of the book.

This book gives a good overview of peptides and proteins and integrates some of the historical and technical developments which help the reader understand protein structure, function and application and put it into context. The format is well structured but certain prior knowledge is intimated by the level of terminology used and occasional lack of clarification. However, the presentation of the content, with its colour coded use of terms makes it a good reference book for student readers. Overall, this is a reasonable introductory book for students which should give them the necessary grounding and leads to further reading. The inclusion of historical developments, from early work right up to modern times with the use of computer technology makes this book more than just a technical book but also more interesting to read.

Physics of Continuous Matter: exotic and everyday phenomena in the macroscopic world

Subject area
Solid Mechanics, Fluid Mechanics

Description
This text covers classical continua for physics students.

Authors
Benny Lautrup

Publishers/Suppliers
Institute of Physics Publishing (www.iop.org)

Date/Edition
2004

ISBN
0-7503-0752-8

Level
Undergraduate, research

Price
£29.99

Tony Harker
Department of Physics and Astronomy
University College London
Gower Street
London WC1E 6BT
May 2006

Summary Review

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

Nobody would deny the necessity to keep physics courses up to date, the inclusion of more modern topics has meant that classical continuum phenomena receive quite cursory treatments in today's curriculum. There may even be a feeling that continuous systems are the province of engineers or earth scientists rather than physicists. Ironically, perhaps, the drive to smaller and smaller devices is forcing physicists to go back and learn again about fluid flow in confined geometries, and about the deformations of structures that are not just simple beams. It is also true that processes that can be described by a continuum treatment of matter play a larger part in everyday life than do many atomic and quantum processes. Furthermore, fluid flows provide us with a useful reminder that processes can be nonlinear.

There is, then, a need for a book that can revive interest in classical continua in physics students - a need that this book satisfies with great style. Although it starts from the very beginning of the subject, it also reaches advanced topics, but without discontinuities along the way. Starting from the basics of Newtonian mechanics and vector and tensor algebra, the first half of the book covers solids and fluids at rest and in motion, gravitation, buoyancy, and hydrostatics with and without surface tension. A good introductory course could be based on this material.

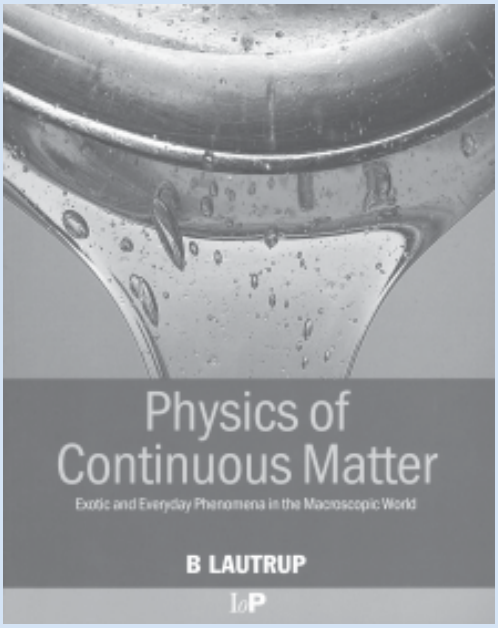
The second half of the book, labelled 'special topics', builds on what has gone before to cover a range of largely hydrodynamic problems. These include fluid surface waves, shock waves, vortices and turbulence, lubrication and boundary layers, flight, and heat transfer. This is not the place to give a detailed list: go and look at the book, but be prepared not to be able to put it down. In every case the approximations made are carefully justified, and the mathematical analysis is clearly presented. Even in this half, the materials treated are homogeneous and isotropic. It would have been nice to see the methods applied to a few modern composite materials, and this would also have made greater use of the tensor notation that was explained early in the book.

Amongst the mathematics, the author never takes his eyes off the practical issues. For example, in the midst of the treatment of linear elasticity there is an excellent explanation of the physical constraints on the elastic constants. Examples from everyday life abound: I had to break off from reading to experiment with hydraulic jumps in the kitchen sink. Other examples, one hopes, are less common, such as the instability of ferries with water on the vehicle deck. The emphasis is on understanding the problems and obtaining analytical solutions, but there are two chapters on computational methods, for static elasticity and for fluid dynamics.

The layout is attractive: it follows the pattern set by many very successful (often American) introductory physics texts, albeit in monochrome rather than colour. Wide margins are used for small explanatory diagrams, tables of physical constants, and one-paragraph biographical summaries of the major historical figures. Important points are illustrated with well chosen photographs which range from a spider walking on water to condensation round an aircraft breaking the sound barrier. There are references to original papers as well as a comprehensive general bibliography.

Continued on page 64

Physics of Continuous Matter: exotic and everyday phenomena in the macroscopic world



From the publisher...

Physics of Continuous Matter: Exotic and Everyday Phenomena in the Macroscopic World

By B Lautrup The Niels Bohr Institute, Copenhagen, Denmark

Provides a description of the macroscopic world of apparently continuous matter accessible to students of all branches of physics.
Develops the necessary mathematical tools along with the physics as needed.
Demonstrates how to reason about physics both qualitatively and quantitatively.
Includes two whole chapters on numeric simulation in elastostatics and fluid mechanics.
Contains historical comments and microbiologies of major players in the field.

0-7503-0752-8 624pp 2004 £29.99

Continued from page 63

Every chapter is followed by a good selection of problems. Some of these fill in steps from the argument in the text, whilst some of the others will remind older readers of the Cavendish Problems in Physics: clear solutions are given at the back of the book. Although it is not mentioned in the text, a web site (www.nbi.dk/~lautrup/continuum) contains additional material, including *Mathematica* notebooks.

This is an excellent text, which ought to inspire students and teachers alike with the richness of behaviour that is contained within a few continuum equations - equations that are easy to derive but often far from easy to solve. The subject may have its roots in the nineteenth century, but this book shows that it is still alive, relevant and challenging in the twenty-first.

Polymer Characterization: physical techniques

Subject area
Polymer Chemistry

Description
This book aims to give a comprehensive coverage of methods used to identify and characterise polymers. It is intended for students of Materials Science, Polymer Technology or Chemistry as well as scientists and technologists working in the polymer industry.

Authors
D Campbell, R A Pethrick, J R White

Publishers/Suppliers
Stanley Thornes
(www.crcpress.com)

Date/Edition
2000/2nd edition

ISBN
0-7487-4005-8

Level
Undergraduate, professional

Price
£34.99

Gareth Price
Department of Chemistry
University of Bath
Bath BA2 7AY
May 2006

Summary Review

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

This book contains fifteen chapters and aims to give a comprehensive coverage of methods used to identify and characterise polymers. It is intended for second and third year students of Materials Science, Polymer Technology or Chemistry as well as scientists and technologists working in the polymer industry. Although designed to be self-contained, background knowledge of thermodynamics and polymer science would be useful in using the book.

Chapter 1 gives a short introduction into the various types and molecular architectures found in polymers. The book almost exclusively deals with synthetic polymers and there is little information on, for example, protein and polypeptide structures.

The major factor that distinguishes polymers from other materials is their molecular size. As might be expected, measurement of chain length or relative molar mass, therefore is the first property considered. This chapter covers all the available techniques although it perhaps could take a rather more critical approach of which technique would be used in particular circumstances. For example, ebulliometry (the elevation of solvent boiling point) is covered in detail including the apparatus used. However, this method is rarely used nowadays. In contrast, MALDI mass spectrometry which is rapidly increasing in importance warrants only a single paragraph. This gives this chapter a rather old fashioned feel.

The next five chapters deal with spectroscopic methods. Personally, I was unconvinced that all of the background material on each spectroscopic technique was necessary but there is a wide ranging discussion of IR, NMR and ESR with some excellent examples of their usefulness to polymer scientists. The last of these is especially welcome since it is often omitted from elementary texts.

X-ray diffraction has revealed much of what we know of polymer structure and the next section of the book discusses XRD, including small and wide angle applications. Next comes a description of Electron and Optical microscopies. Here, the emphasis is on experimental aspects of the techniques and what information can be obtained in polymer systems.

Thermal methods are important in studying the mechanical properties of polymers and these are discussed, again stressing the information that can be obtained. The book finishes with a rather eclectic mix of other methods including surface analysis as well as some case studies to show how multiple techniques can be applied to a single problem. There is a short section on neutron scattering (rather confusingly called neutron diffraction in the chapter title) although given the increasing importance of the method, a longer discussion, including (for example isotopic substitution) might have brought book up to date.

A number of chapters have problems to allow the reader to test their understanding. The level of the material is entirely appropriate to the target audience and the writing is clear and well constructed. Some of the diagrams would benefit from redrawing to modernise their appearance. Overall, this is a very good collection of materials which should allow students to generate the necessary background knowledge before proceeding to the laboratory.

Polymer Science and Technology

Subject area
Polymer Science

Description
Reference text book covering Polymer Science and Technology at an introductory level.

Authors
Robert O Ebewele

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

Date/Edition
2000/1st edition

ISBN
0-8493-8939-9

Level
Undergraduate

Price
£41.99

Marie Walsh
Department of Applied Science
Limerick Institute of Technology
Moylish
Limerick
ROI
May 2006

Summary Review

range: * poor to ***** good

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

This book aims to provide all the fundamentals of polymer science and technology in one volume, concentrating on how the various stages involved in the production of the finished polymer product influence its properties. The author's approach is to avoid laborious descriptions of the procedures for characterisation of polymers, with the caveat that he is aiming for a streamlined introduction into what is becoming an increasingly important and rapidly growing field.

The author put together the framework for the text when he was a student himself and then developed it through his own teaching and learning and this is evident in the style which is extremely student-friendly - without resorting to colour or gimmicks. Even though it claims to be no more than introductory it also gives the impression of being a 'serious' reference text.

The book is divided into three parts:

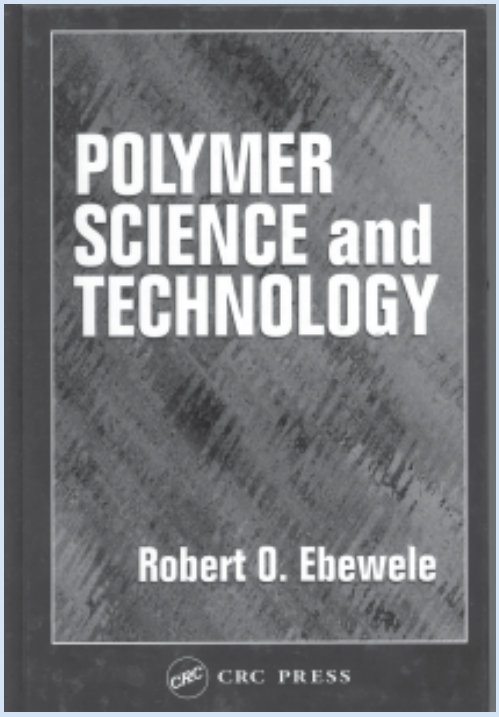
1. 'Polymer Fundamentals'
This part includes a brief discussion of the historical development of polymers, basic definitions and concepts, and a presentation of the rationale for the system used to classify polymers. It continues with a review of the mechanisms for polymer formation before looking at bonding and the primary, secondary and tertiary structures of polymers. The next chapter considers thermal transitions in polymers and part one ends with a discussion of polymer modification techniques, including copolymerisation, post-polymerisation reactions, and development of functional polymers. Throughout the first section there is an emphasis on structure-property relationships and several examples are used to illustrate the concepts.

2. 'Polymer Preparation and Processing Methods'
Here the author surveys the different methods of preparing polymers from monomers and the transformation of the polymeric materials into useful everyday articles. This section brings together the marriage of chemistry, physics, engineering and polymer processing technology in the production of useful substances, finishing with a discussion on polymer additives and reinforcements, and emphasising the importance of processing conditions.

3. 'Properties and Applications of Polymers'
The third part of the book looks at the properties and applications of polymers, beginning with a discussion of polymer solution properties, continuing with mechanical properties and then considering viscoelasticity. The final chapter considers polymer properties and applications, including a summary of the structure of the polymer industry and plant.

The author has tried to provide the elementary information which an introductory level student might otherwise have to consult several textbooks to find, with an emphasis on qualitative understanding of the concepts. It would not satisfy the more advanced student or lecturer needs but it does give a good basic grounding in both the science and technology of polymers.

Polymer Science and Technology



From the publisher...

Polymer Science and Technology

By Robert O Ebewele University of Benin, Benin City, Nigeria

Eliminates the need for several textbooks.
Includes hundreds of well-chosen worked examples designed to illustrate the principles discussed.
Presents the various aspects of polymer science and technology in a readily understandable way.
Emphasizes conceptual learning.
Contains helpful end-of-chapter review problems.
Solutions manual available with qualifying course adoption.

0-8493-8939-9 502pp 2000 £41.99

Throughout the text the author has included examples and worked answers to illustrate the principles in each section of theory. Each chapter of the book ends with a number of review problems and a solutions manual for these is available. One of the appendices includes answers to selected problems, but not to all. The overall aim of the worked examples and problems is to instil deeper understanding and confidence in the student.

The chapters also include a list of references, the dates of which indicate that this has indeed been a long-term project for the author. The fact that the references are so dated would also imply that this is not cutting-edge in terms of new technologies and applications, for example the most recent reference in the chapter dealing with polymer modification is dated 1990. The chapter includes a section on polymers in drug administration, so while one can be assured that the basic principles are covered, the material is far from state of the art!

I would recommend this as a reference text from the point of view of covering the principles but I think it is unfortunate that it is not a revised edition with more recent examples. The cover does allude to the notion that polymer science and technology is a 'rapidly growing field'. In that case the pedantic student might wonder how much of that rapid growth has been missed by using few, if any, references post - 1990!

Sol-Gel Materials Chemistry and Applications

Subject area
General Chemistry

Description
The aim of the book is to provide an introductory text covering the major areas of Sol-Gel chemistry.

Authors
John D Wright, Nico A J M Sommerdijk

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

Date/Edition
2001

ISBN
90-5699-326-7

Level
Undergraduate, research

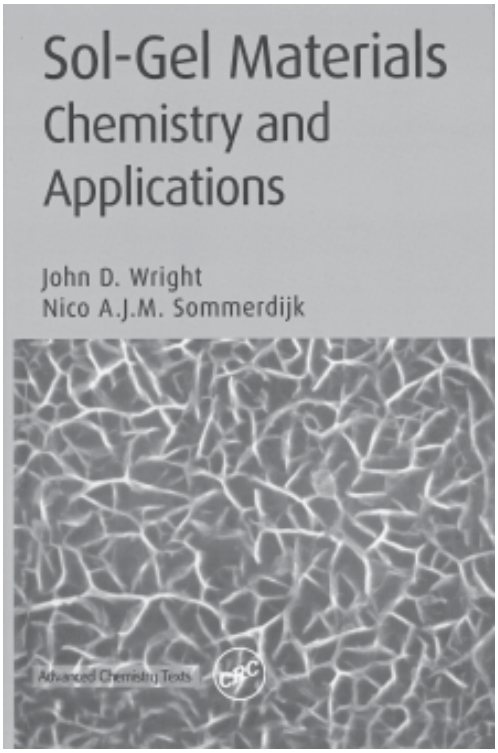
Price
£24.99

The aim of the book is to provide an introductory text covering the major areas of Sol-Gel chemistry. In this area it easily achieves the aim and provides the reader with the feeling that they can get all the information required from the text.

Summary Review

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

After beginning with a brief history of the technique (with references included, an addition that is useful), the text introduces applications of silica based sol-gels materials in the first instance. This provides the reader with information about both base and acid catalysed reactions, and shows pictorially the differing microstructures of both gels.



The information introduced is then applied to the application of sol-gels to the synthesis of metal-oxide materials. This is only a brief introduction to the area, and provides background on partial charges, counter ion effects and particle growth/ aggregation.

The means by which sol-gel materials can be characterised is only covered briefly but, then it would be hoped that some of the techniques discussed would be covered during lecture courses in more depth. One area that is explained clearly is the application of small-angle scattering to determine the size of the gels, this is a powerful technique and can be explained in a manner that confuses the reader.

Finally modern applications and the future of sol-gel materials is discussed, there are good examples of how sol-gel synthesis can be used to prepare modern materials cheaply and efficiently.

Overall a good text that can be used to aid students in their final year studies.

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University of Sheffield
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Mappin Street
Sheffield S1 3JD
May 2006

Solid State Chemistry: an introduction

Subject area
General Chemistry

Description
This introduction covers most of the basic teaching material on solid state chemistry and includes many practical examples of applications and modern technological developments to offer students the opportunity to apply their knowledge in real-life situations.

Authors
Lesley E Smart, Elaine A Moore

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

Date/Edition
2005/3rd Edition

ISBN
0-7487-7516-1

Level
Undergraduate

Price
£26.99

Tom Halstead
Department of Chemistry
University of York
York YO10 5DD
April 2006

Summary Review

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

This is an excellent, interesting and stimulating book, whose modest length is appropriate to the length of time most undergraduate chemistry courses nowadays allocate to a study of solid state chemistry. The book begins by giving students a thorough description of crystal structures: lattices, unit cells, close packing, octahedral and tetrahedral holes and their occupation by various ions in the well-known crystal structure types, including inorganic aristotypes and the rock-forming aluminosilicate mineral families. The rest of the book builds on these structural concepts. Two chapters present a wide range of the physical and synthetic techniques used to characterise and prepare solids. In addition to diffraction methods, room has been made for a wide range of techniques, including SEM, EXAFS, MAS NMR, DTA, STM and AFM.

A basic knowledge of the electronic structure of solids, as well as their crystal structure, is needed in order to explain the physical properties of solids, which are not only interesting scientifically but also of crucial importance for understanding the function of many modern technological devices. This is succinctly covered in a traditional fashion in one chapter that assumes at least some prior exposure to the ideas of elementary quantum theory, eg, Schrödinger's equation. The band theory of simple metals is approached via the free electron model. The tight binding model, an extension of molecular orbital theory familiar to chemists, is used to account for the existence of the band gap for semiconductors but, disappointingly, these ideas are not developed further when, later, carbon-based, low dimensional solids are described.

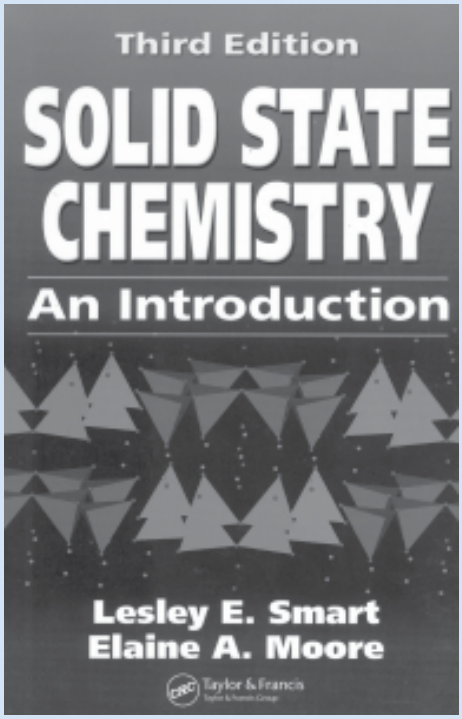
A chapter on defects and non-stoichiometry includes an account of ionic conduction in terms of the classical motion of ions through an imperfect lattice, and particular reference is made to the technologically important fast-ion conductors.

The remaining chapters each deal with a property, e.g., superconductivity, magnetic, dielectric and optical properties; or special class of solid, eg, zeolites, conducting organic polymers, fullerenes, electrochromic materials, mesoporous solids and photonics. The book concludes with a current *hot* topic - nanoscience. This chapter explains how and why the properties of nanoscale materials can be very different from those of the bulk material and describes some techniques for manipulating single atoms or molecules.

This third edition is written in a clear, approachable style and is generously illustrated, albeit with variable quality. The approach adopted is deliberately non-mathematical, and assumes only the chemical ideas that a first year undergraduate is expected to have. The book contains an extensive up-to-date bibliography as well as suggestions for further reading. On average ten quite demanding questions, of the kind likely to be met in an end of course examination, are given at the end of each chapter. Full answers to the odd-numbered questions are provided at the end of the book whereas answers to the even-numbered ones can be found in an accompanying solutions manual.

Continued on page 70

Solid State Chemistry: an introduction



From the publisher...

Solid State Chemistry: An Introduction, 3rd Edition

By Lesley E Smart The Open University, Milton Keynes and Elaine A Moore The Open University, Milton Keynes

Intended for first- and second-year undergraduates, this introduction to solid state chemistry includes practical examples of applications and modern developments to offer students the opportunity to apply their knowledge in real-life situations.

The third edition of Solid State Chemistry: An Introduction has been comprehensively revised and updated. Building a foundation with a thorough description of crystalline structures, the book presents a wide range of the synthetic and physical techniques used to prepare and characterize solids.

0-7487-7516-1 432pp 2005 £26.99

Continued from page 69

Between the second and third editions a new publisher has been found and, possibly as a result, text has been reset, this time in a smaller typeface. These changes have not always resulted in an improvement. For example, the line drawings are now not as clear and the reproduction of the many new half-tone photographs is poor. Furthermore, the choice of subjects for some of the photographs, eg, a selection of crucibles, a London bus powered by a fuel-cell engine and a building with self-cleaning glass windows, is difficult to understand. On the other hand, the separate four-colour sections are of excellent quality and will help understanding of crystal structures, although students may be disappointed that there is no accompanying multimedia support, either in the form of a CDROM or a web site, as this seem to be the trend elsewhere. In particular, some of the more complex structures could be better visualised with the aid of computer graphics, including movies.

The book covers most of the basic undergraduate teaching material on solid state chemistry and for several courses for second and third year students that I have given with titles such as crystal chemistry, physical properties of solids, and materials chemistry I have recommended earlier editions. Adding more real-life applications may serve to keep the book up to date and help to retain student interest, but it may not significantly contribute to the student's understanding of the subject. Nevertheless, by producing a new edition, without significantly increasing its size or cost, the authors have ensured that this previously successful text it will continue to be frequently recommended by many lecturers.

The Chemistry of Radical Polymerization

Subject area
Polymer Chemistry

Description
This book gives a comprehensive survey and data collection of methods and results in radical polymerisation. It is not an introductory text but an excellent resource for research workers in polymer science.

Authors
Graeme Mood, David Soloman

Publishers/Suppliers
Elsevier (www.elsevier.com)

Date/Edition
2005

ISBN
0-08-044286-2

Level
Research, professional

Price
£55.00

Gareth Price
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University of Bath
Bath BA2 7AY
May 2006

Take a look around you. The chances are that you can see the results of radical polymerisation, for example in paints, inks, coatings. You are probably wearing something made by this process and may even be reading this review through a radical polymer if you are wearing contact lenses or spectacles with 'plastic' lenses.

Summary Review

range: * poor to ***** good

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

The first edition of this book appeared around a decade ago and rapidly became *the* text on radical polymerisation. The second edition covers the same material with updated references to interpretations and experimental data. There is a new section covering the extensive advances in Living Radical Polymerisation (LRP) in its various guises.

The book will be immensely useful to postgraduate students and those starting out on their industrial careers in polymer chemistry. It will also be of interest to senior undergraduates studying or researching in the area, albeit that it contains more information than they could ever need.

Radical polymerisation is an example of a chain reaction and, after a discussion of fundamental radical chemistry, the book follows the pattern of discussing successively initiation, propagation and termination. A wealth of data is included and the tables of rate constants and related data are one of the most useful features of the book.

The book gives a comprehensive treatment; the chapter on initiation alone runs to 118 pages and 609 references. The references to the primary literature are extremely useful as a data source. Experimental methods and techniques are described as necessary. Similarly comprehensive treatments of propagation and termination follow as well as chapters devoted to chain transfer and copolymerisation. The writing style is clear and well laid out although some familiarity with introductory chemistry, polymer science and spectroscopy is needed. However, the style is at the right level for the intended audience.

The major difference from the previous edition is the addition of the chapter on living radical methods. These have led to a resurgence of interest in radical polymerisation and, while the literature contains many review articles, this chapter serves a useful purpose in bringing together the various methods and summarising their applicability. Again, there are liberal references to primary journals and sources.

In summary, this book gives a comprehensive survey and data collection of methods and results in radical polymerisation. It is not an introductory text but an excellent resource for research workers in polymer science.

The Electronics Companion

Subject area
Physical Sciences

Description
This book is an electronics companion for undergraduate students of the Physical Sciences.

Authors
A C Fischer-Cripps

Publishers/Suppliers
Institute of Physics Publishing (www.iop.org)

Date/Edition
2005/1st Edition

ISBN
0-7503-1012-X

Level
Undergraduate

Price
£12.99

Summary Review

range: * poor to ***** good

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

The stated aim of the **Electronics Companion** is for it to be used as "…a handy and informative resource, ideally used in conjunction with a more traditional teaching text". I am therefore reviewing this book on this basis.

The book covers basic AC and DC circuits, the behaviour of passive components (resistance, capacitors and inductors) and most of the important active devices including: diodes, bipolar transistors, field effect transistors and operational amplifiers. It also covers the principal bipolar and field effect transistor amplifier circuits as well as sections on operational amplifier circuits and power supplies. Although the book covers digital electronics, this is rather basic and there is no discussion of one important modern application of electronics in the laboratory, namely the interface between electronics and computers. For example, no mention is made of analogue to digital or digital to analogue conversion techniques or methods, or the importance of signal timing and conditioning in digital circuits.

Given the stated aim of the book I found the choice of content rather strange. For example, mentioning historical developments and attempting to give descriptions of the operation of semiconductor devices in terms of simple solid state physics would, to me, seem best left to the traditional text. As a handy reference in the laboratory I would think this level of detail is unnecessary. However, despite this detail there are some notable omissions, for example, there is strangely no discussion of PNP transistors although a circuit is later shown that uses a PNP transistor! Similarly there is little description of power amplifier circuits. Overall, as a laboratory companion I felt the book could have used the space available to include more useful and practical circuits.

The style of book seems to alternate rapidly between a textbook style to a notebook style in which key points are simply stated. In some sections it reduces to a set of text boxes with a confusing set of arrows annotating the logical flow, in other cases important points are stressed by statements in capital letters or bold text. A wide variety of font sizes and styles are used which further adds to this confusion. The quality of the diagrams varies from excellent to poor. In some cases, for example the diode rectifier circuit, the diagrams are cluttered and poorly explained. The indexing is rather poor, for example, Kirchhoff's laws, although used in the text are not indexed. Similarly, the only index entry for 'transistor' indicates a page in the workshop examples! This limits the book as a quick and handy reference.

In summary, I would personally not rely on this book as a primary text for teaching electronics, a traditional, more thorough and logical textbook is more appropriate. As a laboratory companion its size is a virtue but I don't think I would find it useful as a quick and accurate reference.

Adrian C Barnes
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Bristol BS8 1TL
April 2006

The Magnetic Universe

Subject area
Astronomy

Description
A review of contemporary research activity in astrophysical dynamo theory covering a very broad range of scales.

Authors
Gunther Rudiger, Rainer Hollerbach

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

Date/Edition
2004

ISBN
3-527-40409-0

Level
Research

Price
£95.00

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

The Magnetic Universe sets out to review current work on astrophysical dynamo theory on scales from planets to galaxies. This is a fascinating subject that contains some of the most delicate computational problems in modern astrophysics. Statistical averaging of small-scale motions and turbulence in these systems under the action of gravity, rotation and magnetic fields is a crucial element in a mean-field theory of these dynamos. One of the aims - and most interesting features of this book - appears to be the presentation of the outcome of magnetohydrodynamic simulations (from diverse sources) and observations alongside developments in these averaging techniques.

However, the reader is expected to be fluent in the basics of this approach; and the books that do cover the foundations recommended by the authors in their introduction are sadly out of print and unlikely to be found outside university libraries. Also out of print, but worth adding to their list, is *Magnetic Fields in Astrophysics* by Zeldovich, Ruzmaikin and Sokoloff - a beautiful book with a similar title to the present one but a complementary interest in the physical mechanisms that structure cosmic plasma.

The lack of a review of introductory material will probably make this book most useful to practitioners who perhaps want to 'dip their feet in a neighbouring pond'. It is decidedly not a graduate textbook. To give a simple example, when winds launched from discs are discussed in the context of jets, the effective potential for particles tied to the field lines is written down, but readers are left to find the Blandford-Payne criterion (that describes the critical inclination for the lines with respect to the disc) for themselves or consult the cited reference. I found this to be a common experience in other sections, although there was enough in the pocket descriptions to tempt one to consult the original papers.

Overall, this is a useful compendium of contemporary work. The book opens with a discussion of planetary fields but themes are introduced that recur throughout the book: the importance of viscosity, buoyant magnetoconvection, oscillations, Stewartson Layers, the influence of finite conductivity. One of the interesting features of several problems discussed in the book is the separation of temporal and spatial scales. A classic example of the former is the solar cycle with a couple of orders of magnitude separating the Sun's rotation period and the cycle period of the field. A nice example of the latter is the galactic dynamo with localised supernova explosions and a well-defined global field, with, as is nicely emphasised here, sometimes very interesting coherent structure above and below the plane of the disc. The magnetorotational instability is discussed in the context of global galactic fields where there is little star formation, but is accorded a substantial chapter to itself to reflect its importance in stellar discs. Finite conductivity effects are important in the final two chapters. The first deals with neutron stars and magnetic white dwarfs; the latter concerns the magnetic Taylor-Couette flow and contains a fascinating discussion of the potential difficulties caused by rigid end-plates in this differentially rotating flow. This is a good example of the virtue and limitation of this book: I would defy any reader not to find a generous handful of interesting reflections and remarks in each chapter, but they will probably have to consult the original papers to fully satisfy this interest.

James Collett
School of Physics, Astronomy & Mathematics
University of Hertfordshire
Hatfield AL10 9AB
May 2006

The Structure and Evolution of Galaxies

Subject area
Astronomy, Physics, Cosmology

Description
A text for undergraduate students reading astronomy or astronomy with physics.

Authors
Steven Phillipps

Publishers/Suppliers
John Wiley and Sons Ltd
(www.wiley.co.uk)

Date/Edition
2005/1st edition

ISBN
0-470-85507-X (paperback)
0-470-85506-1 (hardback)

Level
Undergraduate

Price
£22.50 (paperback)
£65.00 (hardback)

Colin D Kennedy
5, Putsham Mead
Kilve, Bridgwater
Somerset TA5 1DZ
March 2006

Summary Review

range: * poor to ***** good

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

This textbook is written mainly for astronomy or astrophysics undergraduate students in the middle to late years of their course. It appears to be the most up to date text at this level, containing published work up to 2004. Students should have completed preliminary courses in astronomy, physics and mathematics before commencing this material. Also the full appreciation of Chapter 8 would benefit from some introductory cosmology.

The style and general approach are relaxed but quite rigorous. The absence of citations in the text could make it difficult for students to refer to original work. However, this problem is eased by including many Figures from refereed publications together with a list of referenced Figure credits. The book would benefit from a summary at the end of each chapter.

Unlike some earlier texts, eg, *Galactic Astronomy* (Binney and Merrifield, 1998) and *Galaxies in the Universe* (Sparke and Gallagher, 2000), there are no student assignments, so tutors would need to set their own. In spite of these reservations, I commend this book to tutors as a lucid and up to date account of galactic astronomy at this level.

The book has eight chapters, an ‘Appendix on the magnitude system’, a list of figure credits, and a brief but organised ‘Bibliography’. The comprehensive nature of the book necessitates mentioning only a selection of the topics covered.

Chapter 1: ‘Galaxies in the universe’. This is a relaxed historical introduction to galactic astronomy, including the development of distance measurements and the realisation of the Hubble expansion.

Chapter 2: ‘A galaxy menagerie’. Extensions to the original Hubble classification of the galaxies are outlined. A summary table would be useful here. Surface brightness profiles are discussed and related to the apparent sizes of galaxies. The luminosity function is introduced. Redshift surveys are described and the calculation of rest frame wavelengths from the observed spectra of galaxies explained. Much of the material here is essential for understanding later chapters.

Chapter 3: ‘Elliptical and lenticular galaxies’. The distribution, surface brightness laws and morphology of these galaxy types are all well covered. Stellar populations, particularly in the giant ellipticals, are described and their evolution assessed by methods similar to those used for globular clusters. The concept of metallicity is explained and applied to these galaxies. Reasoning from the colour-magnitude relation, it is inferred that the stars in giant elliptical galaxies were formed during a single epoch in the history of the universe. The X-ray emission due to associated hot ionised gas is explained. How the dynamics of these galaxies are assessed is carefully and rigorously given. The fascinating topic of gravitational interactions between galaxies is included. The estimation of the masses of these galaxies is described and the high mass to luminosity ratios discussed.

The Structure and Evolution of Galaxies

Chapter 4: ‘Spiral galaxies’. By far the longest chapter, this is a comprehensive, rigorous but stimulating account of spiral galaxies. Shapes and sizes are discussed in relation to bulge/disc ratios and the spiral arms. Vertical structure within the disc and the measurement of rotational and polar component motions of stars examined. The different stellar populations are discussed and the concept of initial mass function introduced. The detection and distribution of HI and HII regions and the mapping of magnetic field structure are described. The nature, distribution and observational implications of dust in the ISM are well covered, both for our own and for external galaxies. The origin and maintenance of spiral structures and the explanation in terms of density waves is explored.
Mechanisms of star formation are considered and ways of assessing the global star formation rate in whole galaxies comprehensively covered. Ways of modelling chemical evolution within spirals are discussed and the limitations of some models pointed out. HI rotation curves for various spiral galaxies are discussed. Among other topics, the section on galactic centres includes the recent exciting work on the centre of our Galaxy.

Chapter 5: ‘Irregulars, dwarfs and low surface brightness galaxies’. This is a much shorter chapter on this difficult to categorise group. Because of their low luminosity, most of the galaxies studied are Local Group members or satellite galaxies. Low surface brightness disc galaxies, with radii comparable to the more numerous spirals, are also covered. An apposite consideration of the role of selection effects is included.

Chapter 6: ‘Active galaxies’. While whole textbooks have been written on AGNs and their host galaxies, eg, by Krolik (1999), Peterson (1997), and Robson (1999), the author does an excellent job of presenting an up to date account of this topic. In a historical introduction, he progresses through the discovery and characteristics of Seyfert galaxies, quasars and BL Lac objects and describes the evidence for the extreme small size of the central engine. AGN structure and physics is well presented. Radio galaxies are introduced and the mechanism of the synchrotron emission leading to visibility at radio and X-ray wavelengths explained. There is a short account of unification models for AGN.

Chapter 7: ‘Clusters and clustering’. The distribution and characteristics of galaxies within local groups and clusters is described. Various classifications of cluster types are outlined. Cluster mass determinations, eg, by use of the virial theorem or gravitational lensing, are explained and reasons for the high mass/luminosity ratios considered. Information derived from intergalactic X-ray emission from hot ionised gas is discussed. The large scale structure of galactic space as revealed by different sky surveys is presented.

Chapter 8: ‘Galaxy evolution’. The first part of this chapter addresses the problem of relating distance, suitably defined, to the observed redshift, assuming general relativity and isotropy of the expanding universe. It is explained how this relationship depends on the determination of the deceleration parameter using various types of standard candle. The problem is compounded by evolutionary trends in the sampled galaxies. However the author shows that notwithstanding the uncertainties, it is possible to study the evolution of galaxies back to high cosmological redshifts. The remainder and bulk of this chapter is a fascinating account of the methods used and results revealed in this study.

Transition Metal Carbonyl Cluster Chemistry

Subject area
Organometallic Chemistry

Description
This book is aimed at final year BSc/MChem students studying a course in advanced organometallic chemistry or new PhD students who need a crash course in the subject of carbonyl cluster chemistry.

Authors
Paul J Dyson, J Scott McIndoe

Publishers/Suppliers
Gordon and Breach Science Publishers (www.crcpress.com)

Date/Edition
2000

ISBN
90-5699-289-9

Level
Undergraduate, research

Price
£26.99

Tina Overton
Department of Chemistry
University of Hull
Hull HU6 7RX
March 2006

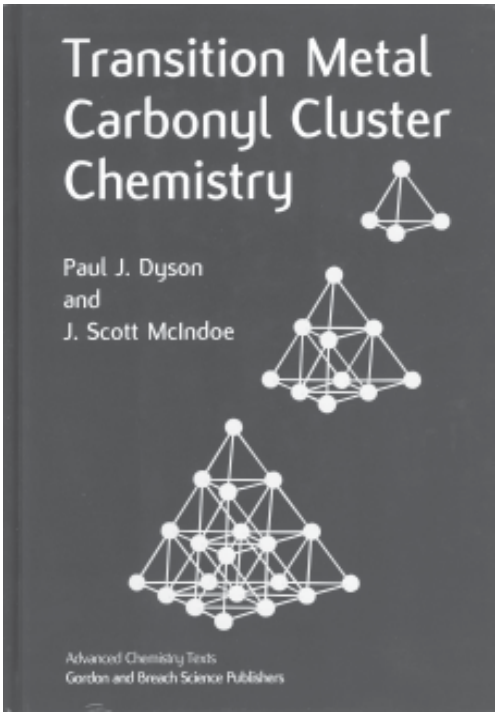
This excellent book is aimed at final year BSc/MChem students studying a course in advanced organometallic chemistry or new PhD students who need a crash course in the subject of carbonyl cluster chemistry. It is the worthy second volume in the Advanced Chemistry Texts series.

Summary Review

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

The book is very well organised and is broadly divided into two parts; the first dealing with bonding, structure, ligands, characterisation and the second dealing with synthesis, reactivity and applications in catalysis and synthesis.

Whilst the book assumes that the reader has completed an introductory organometallic course all the basics are revisited in the early chapters. The authors start simply by defining a cluster and move on to revise electron counting (using the radical convention), nomenclature, the eighteen electron rule, Wade's rule, the isolobal principle, and CO bonding to metals. These early chapters are illustrated by plenty of worked examples to make sure the basics are properly in place. I thought the chapter on characterisation techniques was particularly useful, bringing information on all the common instrumental techniques together in one place.



All these basics are exploited in the second half of the book where the authors discuss methods of synthesis, the range and scope of reactions, reaction mechanisms, heteronuclear clusters and applications in organic transformations and industrial catalytic processes.

The language used throughout the book should be accessible to undergraduates. The explanations are clear and the emphasis is on understanding of the subject rather than encyclopaedic content, and the book is better for this approach. The text is illustrated with clear and helpful illustrations and the authors have done well to convey complex structures with clarity.

If I was planning to teach a course on carbonyl cluster chemistry this is the book that I would reach for first and I would have no difficulty recommending it to my students. It presents academics, postgraduates and undergraduates with a clear, concise, well written overview of the area.

University Physics

Subject area
General Physics

Description
This is a general physics text book.

Authors
Harris Benson

Publishers/Suppliers
John Wiley and Sons Ltd
(www.wiley.co.uk)

Date/Edition
1996 (revised edition)

ISBN
0-471-00689-0 (paperback)
0-471-15264-1 (hardback)

Level
Undergraduate

Price
£36.95 (paperback)
£93.95 (hardback)

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

Summary Review

range: * poor to ***** good

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

I got this lovely book for review, unpacked it and read bits every night going home on the train (as reviewers do).
Started to write my Review, noticed the 1996 publication date, and wondered why the publisher wanted us to review such an old volume. Perhaps things haven't changed much in elementary Physics teaching since 1996. I taught electromagnetism for the Open University for a number of years, and one of my (very) elderly students told me that he had been to lectures by Arthur Eddington. According to my student, Eddington had offered the following advice to his class: "Many things will change in Physics, but there is one unifying concept that will never change and that is the luminiferous ether". The ether does indeed appear in Chapter 39 (Special Relativity) of this text, but we have moved on a little from Eddington's alleged remarks.

The chapter headings should come as no surprise. They are:

1	'Introduction'
2	'Vectors'
3	'One-dimensional kinematics'
4	'Inertia and two-dimensional motion'
5 & 6	'Particle dynamics'
7	'Work and energy'
8	'Conservation of mechanical energy'
9	'Linear momentum'
10	'Systems of particles'
11	'Rotation of a rigid body about a fixed axis'
12	'Angular momentum and statics'
13	'Gravitation'
14	'Solids and Fluids'
15	'Oscillations'
16	'Mechanical waves'
17	'Sound'
18	'Temperature, thermal expansion and the ideal gas law'
19	'The first law of thermodynamics'
20	'Kinetic theory'
21	'Entropy and the second law'
22 - 26	'Electrostatics'
27 - 28	'Direct currents'
29 - 32	'The magnetic field'
33	'Alternating currents'
34	'Maxwell's equations'
35 - 38	'Light'
39	'Special relativity'
40 - 42	'Elementary quantum theory'
43	'Nuclear physics'
44	'Elementary particles'

'Appendices'

It's a bit dated in that there is no supporting website, but I loved the historical notes and pictures of famous scientists. I would have thought the text to be fine for beginning Physics students, with the not unreasonable assumption that they know some calculus. The phrases 'traditional', 'solid', 'error-free' and 'beautifully produced' spring to mind with this text, but it is very similar to many such texts for the introductory Physics market. A Google search produced very few reviews, but I noticed a lot of activity on Amazon. A snip at $10.

Mathematica CalcCenter

Subject area
Mathematics

Description
A symbolic and numerical algebra, calculus and graphics package.

Authors
Wolfram Research
(www.wolfram.com)

Suppliers/Distributors
Wolfram Research

Date/Version
Version 3.0.0

Level
Undergraduate, research

Type of package
Mathematical manipulations

Price
Contact supplier

Hardware required
A PC running Windows or a Mac running OS X

Software required
None

Tony Harker
Department of Physics and Astronomy
University College London
Gower Street
London WC1E 6BT
December 2005

Summary Review

range: * poor to ***** good

Ease of use	***
Ease of learning	***
Documentation quality	*****
Academic content	***
Usefulness to student	***
Usefulness to teacher	**
Portability	*****
Meets objectives	***
Accuracy	*****

Mathematica CalcCenter 3 arrives on one's desk as a box containing a CD, a registration card, a six-page installation leaflet, a 37-page 'Getting Started' booklet, and a good deal of air. Installation goes smoothly under Windows XP (the program also runs under Windows 98, Me, NT and 2000, and Mac OS X) and one is soon looking at a white page, a side-bar offering a slide show and the 'Home Controller', and a top bar with eleven pull-down menus. For a long-time user of the parent program, *Mathematica*, one of the first things to look at is how much of the mathematical richness is present in **CalcCenter**: it is a little disappointing to find, under 'Special Functions', only the J and K Bessel functions, the error function, the inverse error function, and the gamma function. So this is clearly 'Mathematica Lite': to what extent is it 'Mathematica Lite-n-Easy'?

CalcCenter uses the same notebook-and-cell paradigm as the full *Mathematica* program. It also functions in the same way, in that it really consists of two programs: a front end which handles the input and output, including graphics, and a kernel which carries out the mathematics. The user types instructions into the notebook; one or more instruction may be placed in one input region ('cell'), but the instructions will not be carried out until the user presses SHIFT+ENTER. At that point the cell is given a number, which appears in the cell on the screen as *In[n]*, and a corresponding output cell appears immediately below, labelled *Out[n]*. Each cell spreads across the whole of the notebook page. The difficulty for the novice user is that this behaviour is totally different from that of a spreadsheet, in the cell is not automatically executed as soon as it is completed, and no record is kept of cell interdependencies, so that the user must recalculate dependent cells individually or force recalculation of the entire notebook. Even more confusing for the beginner is the two-program structure: it is easy to create a notebook in which the cells are displayed by the front end in an order that is different from the order in which they were executed by the kernel. In both these respects **CalcCenter** is less easy to get to grips with than, for example, *Mathcad* with more flexible notebook layout.

When building up complex expressions in mathematical notation it is often necessary to skip between several different 'controllers' (similar to what *Mathematica* calls 'palettes'): for example, one to display an integral in standard mathematical notation and another to display Greek characters. These controllers take up more screen space than they need to and easily get hidden behind an open notebook. The contrast in the character buttons, orange of orange-brown, makes them hard to read.

Functions are quite easy to use: following the menus allows one to pop function definitions over expressions, which appear as coloured menu boxes in cells: these can be reduced to text-like input cells with a single click. Unlike *Mathematica*, **CalcCenter** returns numerical rather than exact solutions by default: thus $\int_0^\infty \exp(-x^2)\,dx$ is returned as 0.8862269255 rather than as $\frac{1}{2}\sqrt{\pi}$. Similarly, surds in the solutions of polynomial equations are converted to floating-point numbers. This tends to obscure the basic mathematics.

Mathematica CalcCenter

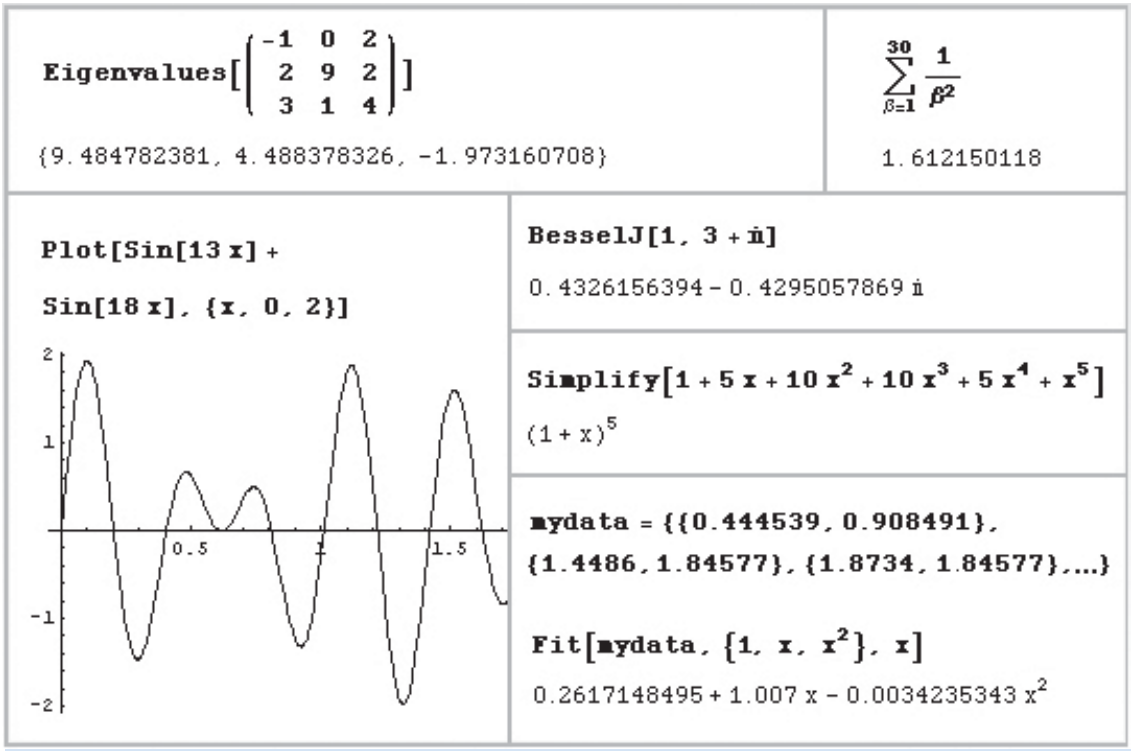


fig 1: Example output from CalcCenter (from Mathematica website)

Graphics can be generated quickly using the menu system, but control over graph formats is restricted to a number of predefined styles. Some important features of graphs cannot be controlled through the menus, but have to be entered into the text versions of the commands. An important example is the vertical axis range of a two-dimensional plot: if one plots a function such as tan(x), which is infinite for certain values of its argument, **CalcCenter** will decide how much of the infinite vertical scale to display. Often one wants to reduce the vertical range to focus on some aspect of the function, and this cannot be done through the menus.

File import and export are supported by **CalcCenter**. Simple text-based files are handled successfully, but a reasonably-sized image (100 by 160 pixels) was reported as being too large to display. Actually, what was too large to display was the matrix of values making up the image, not the image itself. A seasoned user of *Mathematica* will realise that what is necessary is to suppress the output when the image is imported by putting a semicolon on the end of the line: a beginner is likely to give up.

It is unfortunate that the default file name for saving **CalcCenter** notebooks is the same (.nb) as for *Mathematica*. *Mathematica* version 5.1 cannot open and correctly execute all the commands in **CalcCenter**. In part this is because it cannot handle the in-cell menus, but some commands in **CalcCenter**, for example 'ImportData', do not occur in *Mathematica*.

This is a disappointing product from the company that brought us the wonderful *Mathematica*. The reduced capability of **CalcCenter** compared with the full product is not adequately compensated by increased ease of use. Anyone looking for an intuitive mathematics program with a notebook style of interface should look elsewhere, whilst the serious user should save up for the full *Mathematica* product.

mathtutor - algebra

Subject area
Mathematics

Description
Video maths tutorial on algebra.

Authors
The mathtutor team
(www.mathtutor.ac.uk)

Suppliers/Distributors
The EBS Trust (www.ebst.co.uk)

Date/Version
2005

Level
Undergraduate

Type of package
Computer assisted learning, tutorial

Price
Free for online version, DVD available at cost (contact supplier)

Hardware required
A PC running Windows 95 or later, with a DVD drive and sound with Internet Explorer

Software required
Windows Media Player, Adobe Reader (for Summary text)

Paul Yates
Centre for Professional Staff Development
Hornbeam Building
Keele University
Keele
Staffordshire ST5 5BG
May 2006

This software falls firmly into the remedial mathematics category of university teaching. As chemists we are all aware of the mathematical shortcomings of new students, and this material provides another resource which could be used to address this problem.

Summary Review

range: * poor to ***** good

Ease of use	****
Ease of learning	****
Documentation quality	**
Academic content	*****
Usefulness to student	*****
Usefulness to teacher	*****
Portability	*****
Meets objectives	*****
Accuracy	*****

It is essentially a web based program, which is good, but is restricted to Internet Explorer 5.5 and above, which is less good. Attempts to open files in Firefox produced an invitation to download Explorer. Windows Media Player version 9 is also required, further frustrating those who have an aversion to Microsoft products. No installation instructions are provided, either in written format or on the disk (*see editor's note, p81*). While the program does start without difficulty, I did frequently receive messages about blocked content, and some readily accessible instructions on how to turn such messages off would have been very welcome. This would help to overcome the frustration experienced when clicking on a link and not noticing the message about blocked content. It would also be useful for the opening screen to provide an overview of the material so that users know what to expect when clicking each link.

Once the program is running, the user is invited to choose from 'Topics', 'Animations' and 'Extensions'.

Selecting 'Topics' produces a list of eighteen categories; some of the most useful for chemists include logarithms, transposition of formulae and linear equations in one variable. The precise number of options within a topic varies, but typically will consist of a 'Diagnostic test', a 'Video Tutorial', 'Summary text' and 'Exercises'. The 'Diagnostic test' usually consists of five questions, with answers to be provided in free format. Again, more information on the style of input would have been helpful; I was able to guess that x^3 would represent x^3, but the average student might not. The 'Video Tutorials' are a great strength of the package; effectively they are lectures delivered by an expert on each subject. They were all of high quality, but one downside is that some are rather long; for example, that on quadratic equations lasts for fifty minutes although it is split into sections which can be accessed individually. They can be played in full screen mode using the Media Player, which makes them quite suitable for viewing in a classroom situation. Lecturers may well not wish to incorporate other than video clips into a session, while students working alone might wish to break up the sections with some hands on activity. The 'Summary text' for each topic provides a reasonable set of notes on the material and is provided as an alternative to the video. The final 'Exercises' provide a way of testing the taught material. All the questions are presented together, but any one can be attempted individually and submitted. Each is marked with a tick or a cross, and clicking on a cross will show the correct answer. However, this didn't work in the case of solving quadratic equations where only the first root was shown in both cases. It would also be helpful if students could obtain brief outline solutions to questions they have got wrong.

mathtutor - algebra

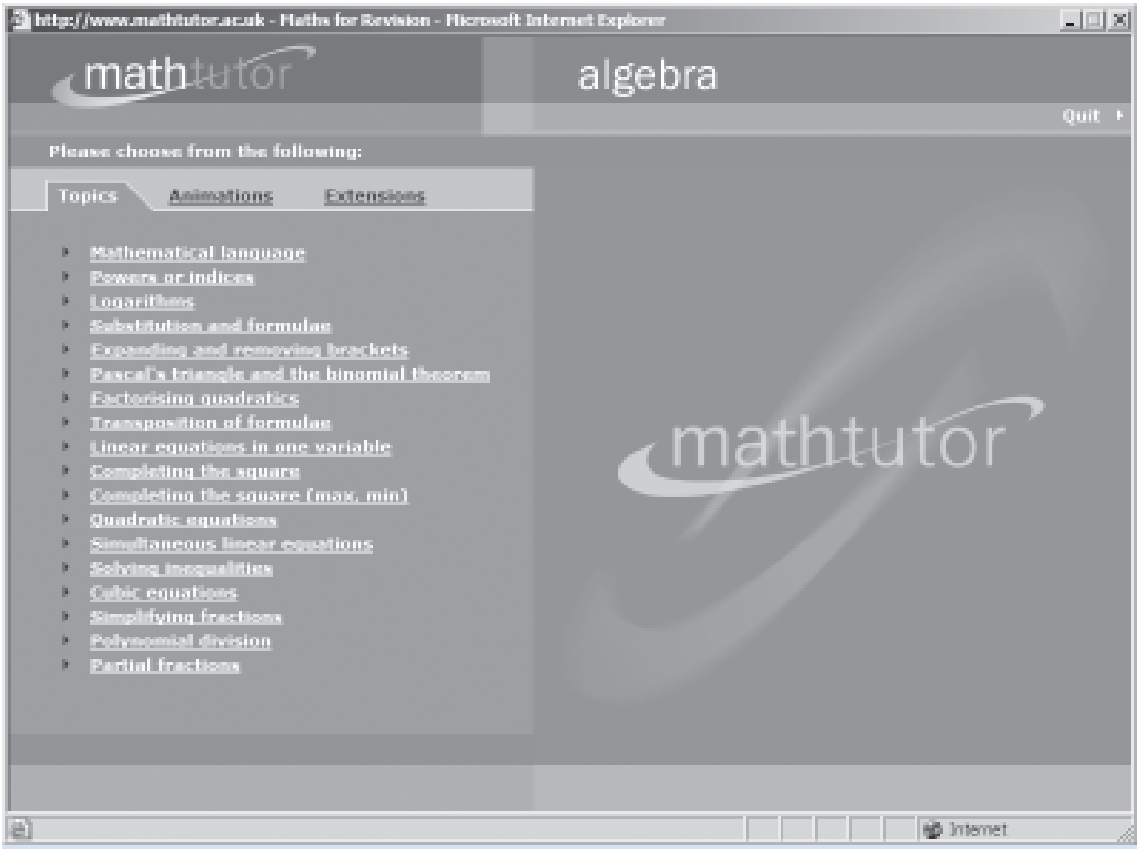


fig 1: Contents of mathtutor - algebra

Some of the topics also have links to 'Animations', but these are also collected into a section in their own right which can be accessed directly. The animations available are on completing the square and simultaneous linear equations. Both of these make extensive used of dynamic graphs and are accompanied by an informative commentary.

Naturally, the use of software such as this with chemists does not allow any of the material to be placed in the wider context we might wish for. However, the 'Extensions' menu does allow some of the more interesting aspects of the mathematical topics to be explored. Examples include the exponential number and quadratic equations. Most of the topics here are addressed by means of lectures displayed in Media Player, but one does consist of a written document. I felt that some of this material could be used to liven up some of these less glamorous parts of mathematics.

Overall I found the quality of these materials to be very good. The topics addressed were well chosen and most would fit into a course on mathematics for chemists. The chemical context for the mathematics still needs to be provided by an instructor, but nevertheless the software would still be of use as a self study resource if the student were given some direction. I would certainly consider using some of the video clips and animations to liven up a lecture on mathematics for chemistry.

Editor's note.
A booklet meeting mathtutor *is available, with an installation and troubleshooting section. This was not supplied to most reviewers.*

mathtutor - arithmetic

Subject area
Mathematics

Description
A mathematics DVD tutorial system covering arithmetic.

Authors
The mathtutor team (www.mathtutor.ac.uk)

Suppliers/Distributors
The EBS Trust (www.ebst.co.uk)

Date/Version
2005

Level
A-level, access, foundation

Type of package
Computer assisted learning, tutorial

Price
Free for online version, DVD available at cost (contact supplier)

Hardware required
A PC running Windows 95 or later, with a DVD drive and sound with Internet Explorer

Software required
Windows Media Player, Adobe Reader (for Summary text)

Roger Gladwin
Physical Sciences Centre
Chemistry Dept
Liverpool University
Liverpool L69 7ZD
May 2006

Summary Review

range: * poor to ***** good

Ease of use	*****
Ease of learning	*****
Documentation quality	*****
Academic content	***
Usefulness to student	***
Usefulness to teacher	***
Portability	**
Meets objectives	****
Accuracy	*****

The mathtutor series is designed to support mathematics at the transition to advanced and university study. There are seven areas covered (see other reviews in this issue) including this one; arithmetic. The **mathtutor - arithmetic** DVD covers: fractions (basic ideas, adding/subtracting, multiplying/dividing), decimals, percentages, ratios, rules of arithmetic and surds (and other roots). The materials are also available as streaming videos from the mathcentre web site (www.mathcentre.ac.uk). I tried using this site from home with a 1MB broadband connection and it worked acceptably well. The DVD system also has nine 'Extensions' with titles such as; 'the need for maths', 'triangular numbers' and 'fractals' again all delivered as videos of talks by experts.
On inserting the DVD into the PC an ActiveX control file is loaded onto the hard drive, all other files run directly from the DVD under Internet Explorer (depending on your security settings you may get warnings/error messages at this stage and these are documented in the booklet *meeting mathtutor*).

Each of the subject areas is covered by a teacher, mainly as a 'talking head' or by working through examples on a writing pad. There are also for each topic: a 'Diagnostic test' (of 5 questions with only a correct/incorrect response), a 'Summary text' of the content (in Acrobat's pdf format) and some 'Exercises' as drill & practice to reinforce the learning (again with the only feedback being a tick or a cross). The videos last from 22 to 44 minutes and a split into 2, 3 or 4 sections which are all independently selectable.

The whole package is professionally presented and I found no difficulty in working with the software and resources (I did have to allow active content on my home PC due to security settings in force). Topics were introduced in a logical sequence, building from that which had gone before and the interface was sufficiently intuitive to facilitate ease of use.

I thought the content was somewhat elementary for the proposed academic level. At best I would have thought the coverage of these topics would be as 'refreshers' for advanced level or university students. The 'Diagnostic tests' were useful. I assume that if a suitable score was obtained by a student then the tutorial could be skipped. The video tutorials were well delivered but passive and, I felt, a bit long despite being able to 'dip-in' at the separate sections, there just was not enough interaction to maintain sufficient attention. The 'Exercises' would be useful practice for those students needing reinforcement of the learning but I found the lack of any real feedback for these exercises a disappointment. I enjoyed some of the 'Extensions', particularly 'fractals' and 'animal surface areas' as these gave an insight to the applications of mathematics.

For physical sciences students the section on significant figures in 'the accuracy of decimals' and the section covering powers in 'surds, and other roots' would most likely be the most useful.

mathtutor - differentiation and integration

Subject area
Mathematics

Description
Two DVD's providing tuition on calculus.

Authors
The mathtutor team (www.mathtutor.ac.uk)

Suppliers/Distributors
The EBS Trust (www.ebst.co.uk)

Date/Version
2005

Level
A-level, access, foundation

Type of package
Computer assisted learning, tutorial

Price
Free for online version, DVD available at cost (contact supplier)

Hardware required
A PC running Windows 95 or later, with a DVD drive and sound with Internet Explorer

Software required
Windows Media Player, Adobe Reader (for Summary text)

Keith Wilkinson
Science Department
International School of Lusaka
PO Box 50121 Ridgeway
Lusaka, Zambia
May 2006

Summary Review

range: * poor to ***** good

Ease of use	*****
Ease of learning	***
Documentation quality	***
Academic content	*****
Usefulness to student	***
Usefulness to teacher	**
Portability	*****
Meets objectives	***
Accuracy	*****

In teaching both IB Diploma Chemistry and Physics, whether it be discussing rates of chemical reaction, rate of radioactive decay, simple harmonic motion or the rate of discharge of a capacitor, we need to explore ideas using calculus. The easy access to ICT resources through the Net means that visual presentations of ideas in calculus are readily within the reach of both students and teachers, and that visual approaches hitherto scarcely possible, are now commonplace. The technologically savvy students no longer simply relish high quality computational presentations. Instead, they expect them.

This set of DVDs is a collaboration between the Universities of Leeds, Loughborough and Coventry, together with EBS Trust, supported by HEFCE and the Gatsby foundation. The software is rather picky over which platform it is running on, and worse still, which browser is being used. It didn't like Opera (my default and preferred browser), demanding Microsoft Internet Explorer version 5.5 or above.

The material presented is well paced and clearly explained centring around a set of video presentations, and employing question and answer testing both preceding and following each video. The computer response is simply whether each answer is correct or incorrect. It does not generate a student progress chart, or maintain any scoring. The accessibility of the material is good, and the interface design is excellent.

The software is self-installing once you insert the DVD. What the installation does is to copy and register an ActiveX object onto the computer's hard disk, although it never requests permission to do so. On a secure PC, with autoPlay disabled, the installation was manual using an executable provided in the root folder called start.exe.

Whilst the presentation and quality of software and the videos is first class, it does remind me of the early days of CDs accompanying textbooks where publishers feeling under market pressure to demonstrate their ICT strength would resort to a variety of recipes such as reproducing the text of the book on CD. Watching the movies, I note that maths instruction doesn't appear to have changed since I was at school 25 years ago, and that 25 years of computer technology has now enabled the same chalk-and-talk classes to be ported through DVD onto your computer screen. As students at 16-19 are now familiar with the student centred investigations made possible with software such as *TI-Derive*, *MathCAD* and *Scientific Workplace*, not to mention the investigations they can perform on a standard issue TI-84+ graphical calculator, the lack of student investigational exploratory mathematics is disappointing. Surely getting inside the maths - allowing students to explore cause and effect - change the function slightly, visualise the effect on graph shape and features - symmetry, skew, maxima, minima, asymptotic aspects has replaced so much of the didacticism of my childhood.

In placing the instructor, and not the learner at the centre of the construction of new ideas in these two DVDs, I fear the producers have lost an opportunity software has the potential to offer.

mathtutor - functions & graphs/sequences & series

Subject area
Mathematics

Description
A DVD providing tuition on mathematics in functions & graphs, sequences & series.

Authors
The mathtutor team (www.mathtutor.ac.uk)

Suppliers/Distributors
The EBS Trust (www.ebst.co.uk)

Date/Version
2005

Level
A-level, access, foundation

Type of package
Computer assisted learning, tutorial

Price
Free for online version, DVD available at cost (contact supplier)

Hardware required
A PC running Windows 95 or later, with a DVD drive and sound with Internet Explorer

Software required
Windows Media Player, Adobe Reader (for Summary text)

Guadalupe Muñoz
Calle de las Delicias 35 4 B
28045 - Madrid
Spain
May 2006

mathtutor - functions & graphs, sequences & series is a DVDROM for individual study that incorporates video tutorials and tests to check whether the student has assimilated the knowledge or not. It is intended for high school level.

Summary Review

range: * poor to ***** good

Ease of use	****
Ease of learning	****
Documentation quality	**
Academic content	****
Usefulness to student	****
Usefulness to teacher	****
Portability	****
Meets objectives	****
Accuracy	*****

The topics are:

'Functions and graphs'
- Introduction to functions
- Linear functions
- Polynomial functions
- Exponential and logarithm functions
- Trigonometric functions
- Hyperbolic functions
- Composition of functions
- Inverse functions

'Sequences and series'
- Sigma notation
- Arithmetic and geometric progression
- Limits of sequences
- The sum of an infinite series
- Limits of function

It also presents some extensions:

'Functions and graphs'
- The number 'e' - Trevor Hawkes
- Hyperbolic functions - David Saunders

'Sequences and series'
- Fibonacci - Tony Croft
- Fractals - Stuart Price

The interface is presented as an html web page, and the topics can be navigated by clicking the hyperlinks (see figs 1 and 2). The program does not present any help, and although the student could be used to managing web pages, a user manual should be provided. Another disadvantage is that the package does not provide any documentation or tutorial related to the program itself. The installation is easy because there is not a real installation, which is a disadvantage: the DVD must be all the time inside the DVD player (*see editor's note, p85*).

mathtutor - functions & graphs/sequences & series

The minimum required specifications are provided for a PC: Pentium III, 1 GHz, DVDROM drive. Internet Explorer v 5.5+ and Window Media Player v.9+. Users also need Adobe Acrobat Reader because the summary texts are provided in pdf format. Checked on a laptop, Pentium mobile 2GHz, 1GB RAM, the speed is good, even for the video tutorials.

Although a user manual should be provided, the idea of using video tutorials is good and, also, the interactive tests can help students to learn faster than using a paper book. The information is in general well presented, and the answers are correct.

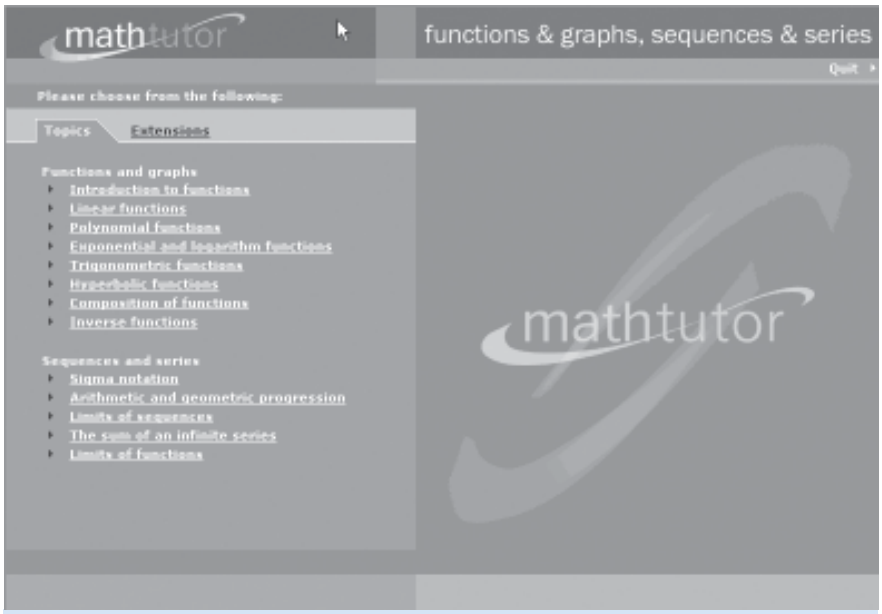


fig 1: Presentation screen

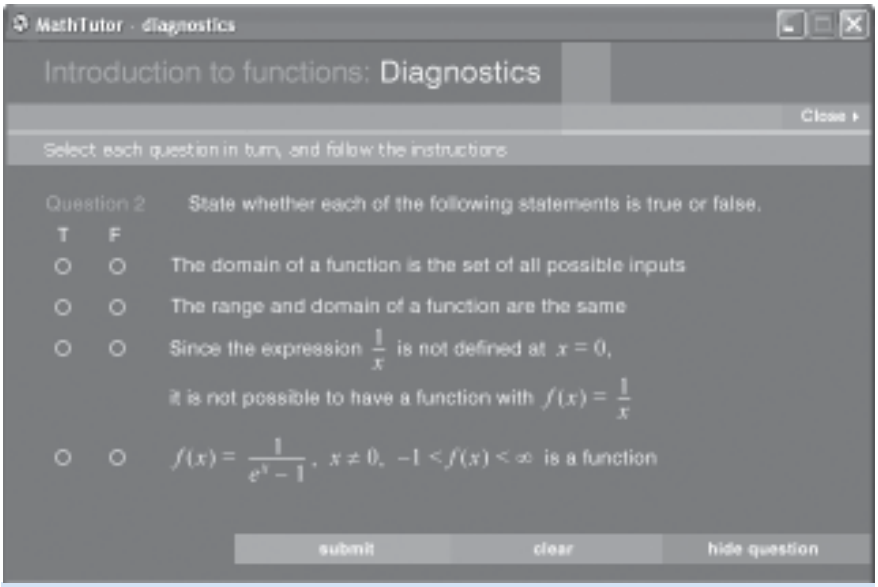


fig 2: Question in diagnostic test

Editor's note.
A booklet meeting mathtutor *is available, with an installation and troubleshooting section. This was not supplied to most reviewers.*

mathtutor - geometry, vectors

Subject area
Mathematics

Description
Software in the mathtutor series for mathematics revision. Aimed at transition from school to University.

Authors
The mathtutor team (www.mathtutor.ac.uk)

Suppliers/Distributors
The EBS Trust (www.ebst.co.uk)

Date/Version
2005

Level
Undergraduate

Type of package
Computer assisted learning, tutorial

Price
Free for online version, DVD available at cost (contact supplier)

Hardware required
A PC running Windows 95 or later, with a DVD drive and sound with Internet Explorer

Software required
Windows Media Player, Adobe Reader (for Summary text)

Steve Walker
Physical Sciences Centre
Chemistry Dept
Liverpool University
Liverpool L69 7ZD
May 2006

Summary Review

range: * poor to ***** good

Ease of use	****
Ease of learning	****
Documentation quality	*****
Academic content	***
Usefulness to student	***
Usefulness to teacher	***
Portability	*****
Meets objectives	***
Accuracy	*****

This DVDROM is part of a series covering arithmetic, algebra, trigonometry, functions and graphs, differentiation and integration. Other titles in this series are being reviewed in this issue.
EBS is The Educational Broadcasting Services Trust, a charitable trust company set up by the BBC in 1987. Their expertise lies in programme production and the management of projects, in partnership with other organisations. They use a network of professional people throughout Britain working in education, training, television, radio and telecommunications, both inside the BBC and in the independent sector. The mathtutor project is one such venture and the website at www.mathtutor.ac.uk has all seven disks uploaded so you can make full use of them online.
The contents of this disk are:

Topics	Extensions
'Geometry'	
Properties of straight line segments	Animal movement
The gradient of a straight line segment	Graphic designer
Equations of straight lines	Parabolas
The geometry of a circle	
Conic sections	
Polar co-ordinates	
'Vectors'	
Introduction to vectors	Force and motion
Cartesian components of vectors	
The scalar product	
The vector product	

Topics
The format of each topic is the same and comprises a one paragraph summary plus a 'Diagnostic test', a 'Video Tutorial', 'Summary text' and 'Exercises'

Overall I was disappointed with this DVD, although parts are very good. Let's look at each section in a little detail.

'Diagnostic Tests'
There are five short questions which are probably intended to give you a quick insight into your initial understanding of the subject. I found that the complete lack of feedback caused me some difficulty. For example, in the 'straight line segments' topic, the question was – "What are the coordinates of the mid-point of the line segment joining (2,7) and (8,-5)?" My answer was 5,1 which was simply marked wrong with no hint as to why this had occurred. After much confusion I discovered that I should be using the bracket format – (5,1) was then marked as correct. I really think that software design has moved on from this level which I would expect to see in material from the 90s. Also, isn't this strict insistence on apparently arbitrary formatting one of the reasons that students find mathematics intimidating?

mathtutor - geometry, vectors

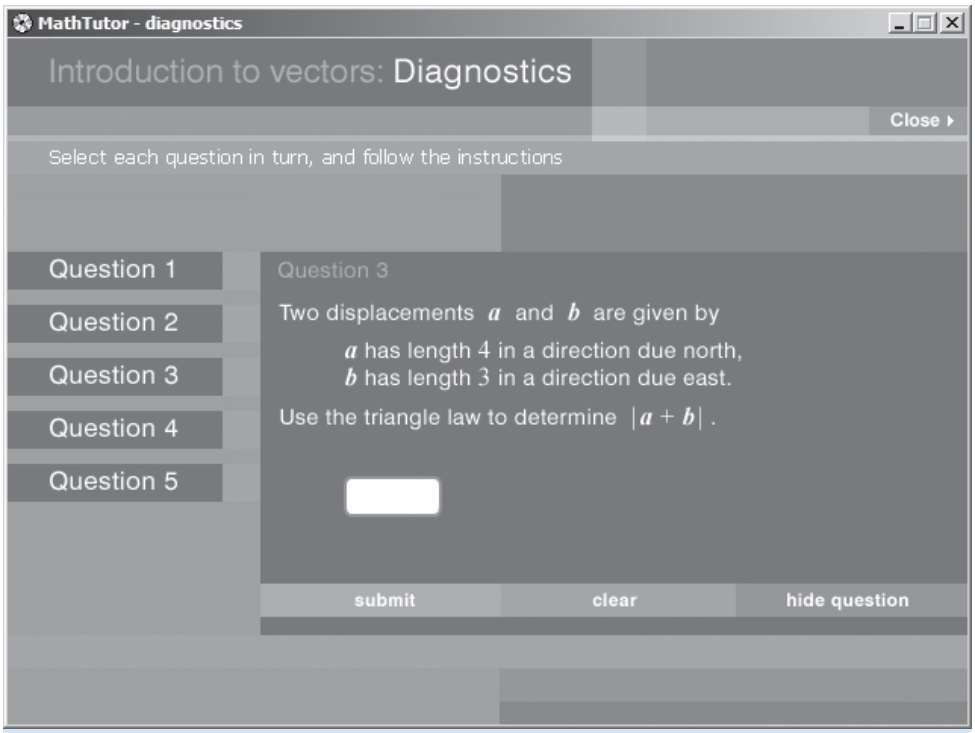


fig 1: An example of the diagnostic tests

'Video Tutorials'
A substantial fraction of the disk is devoted to these, with nearly 6 hours of material included. Frankly they are not very useful as they consist of 'talking heads' with the lecturer illustrating the work by writing on paper. I cannot see what purpose they serve.

'Summary Text'
This is a ".pdf" version of the material covered by the lecturer in the video section. As such it is much more useful, and effectively serves as an 'eTextbook'. The format is well-designed, concise and emphasises important items by 'Key Text' boxes. I found them to be an admirable précis of each topic. Many may well prefer it to a paper-based version, but that is a matter of personal choice.

'Exercises'
There are between two and five questions for each topic, each with multiple component parts. I was disappointed that more had not been added. Although the coverage is pretty thorough, I have always felt that practice is the only way to master any maths topic and a DVD is the ideal delivery vehicle for this.

Extensions
It is worth installing the DVD for this section alone and downloading only these from the web may be the best way to work with this material. I would quite happily have ditched all the other videos in favour of substantially expanding this section – although I realise what a lot of work this would have required. There is still far too much emphasis on close-ups of the lecturers face, but you can't have everything.

'Animal Movement'
Research into the patterns exhibited by the mass movements of ants, fish and birds shows that they follow very simple rules that have evolved over long periods of time. The analysis of the avoidance of congestion shown by ants is extrapolated to suggest solutions that can be applied to human behaviour-traffic easement, building evacuation and so on.

'Graphic Designer'
A graphic designer explains how he relies on three-dimensional geometry when creating a children's space cartoon.

'Parabolas'
This describes the construction of a satellite aerial and why it needs to have a parabolic shape. This was disappointingly short and seems to have been extracted from a much longer film.

'Force and Motion'
This is another 'talking head' and, as such, by far the least interesting video.

mathtutor - trigonometry

Subject area
Mathematics

Description
A DVD of tutorial film and exercises covering basic trigonometry.

Authors
The mathtutor team (www.mathtutor.ac.uk)

Suppliers/Distributors
The EBS Trust (www.ebst.co.uk)

Date/Version
2005

Level
Undergraduate

Type of package
Computer assisted learning, tutorial

Price
Free for online version, DVD available at cost (contact supplier)

Hardware required
A PC running Windows 95 or later, with a DVD drive and sound with Internet Explorer

Software required
Windows Media Player, Adobe Reader (for Summary text)

Tina Overton
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May 2006

This DVD covers the topics of Pythagoras' theorem, trig ratios in a right angled triangle, trig ratios of an angle of any size, radian measure, trig equations, trig identities, triangle formulae, cosec, sec and cot, the addition formulae, the double angle formulae, a cos x + b sin x = R cos(x - ?)

Summary Review

range: * poor to ***** good	
Ease of use	*****
Ease of learning	*****
Documentation quality	***
Academic content	*****
Usefulness to student	****
Usefulness to teacher	***
Portability	*****
Meets objectives	*****
Accuracy	*****

Each section of the tutorial is delivered is several parts. The 'Diagnostic test' gives five short question for the student to answer. The answers are marked with a cross or a tick but no further feedback is given as to what the diagnosis is. The main part of the tutorial is a talking head type video of a tutor giving a mini-lecture of the topic and carrying out calculations with a paper and pen. The tutor was very personable and his explanations were very clear and lucid but I am just not sure what the typical student would make of this style of delivery. It really reminded me of those Open University films from the 70s when earnest bearded men gave very serious explanations of very worthy topics. Maybe the typical undergraduate who is too young to remember such televisual treats will be more forgiving but I just have a feeling that it is all a little too dry.

For those who drifted off half way though the film a very useful summary of the topic is provided with all the worked examples in full. As a set of well written lecture notes students will find these very useful. There are also a large number of 'Exercises' to practice on after each section which don't give feedback but the correct answers are available to view. The most interesting snippet in this package was the final 'Extension' section which demonstrated Pythagoras using pizzas!

In many ways I didn't feel very qualified to be reviewing this package. The content is excellent, the notes and exercises will be very useful to staff and students. But I would really like an undergraduate's opinion of the talking head style of tutorial delivery as I have no idea whether they will love it or hate it.

Principles of Physics

Subject area
Physics

Description
A new, comprehensive digital physics textbook.

Authors
Kinetic Books
(www.kineticbooks.com/index.html)

Suppliers/Distributors
Kinetic Books
(www.kineticbooks.com/index.html)

Date/Version
2001-2005

Level
A-level, undergraduate

Type of package
Computer assisted learning, tutorial

Price
Contact supplier

Hardware required
A PC running Windows 98 or later or Mac OS X version 10.2 or later; screen resolution: at least 800x600; 128MB RAM; disk space: textbook 400MB, labs 120MB

Software required
For PC: IE version 6.0 or later or Firefox version 1.0 or later; for Mac: Safari version 1.0.2 or later. Java: version 1.4.2_01 or later, Flash: version 7.0 or later, QuickTime: version 6.1 or later

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Napier University
Educational Development
Craighouse Campus
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Edinburgh EH10 4PL
May 2006

Summary Review

range: * poor to ***** good	
Ease of use	***
Ease of learning	*****
Documentation quality	****
Academic content	*****
Usefulness to student	*****
Usefulness to teacher	*****
Portability	*****
Meets objectives	*****
Accuracy	*****

Principles of Physics by Kinetic Books is a digital physics textbook delivered on a DVD, in which introductory physics concepts are explained in written text supported by a plethora of educational multimedia elements such as narrated simulations, images, semi-interactive animations, and quizzes. In a total of 43 chapters the topics mechanics, mechanical waves, thermodynamics, electricity and magnetism, light and optics, and modern physics (special relativity and quantum and nuclear physics) are explored. Anywhere between 15 and 35 sections per chapter are dedicated to the explanation and demonstration of new concepts in text, graphics and sound.

Extensive thought has been given to stimulate student interest and support student learning throughout. A deliberate, step by step approach is taken to introduce every concept anew. First, a text-based overview of the chapter content is provided in an introduction, meaningfully enhanced by a simple semi-interactive simulation (labelled 'whiteboard') to support visualisation or initial understanding of an often abstract physics concept or idea. In subsequent sections concepts then deliberately unfold to increasing complexity at a pace and depth that the student controls. Written text is closely aligned to simulations, interactive animations, examples and checkpoints. Complex problems that require quantitative reasoning and precise answers or for which the application of formulae or concepts to new situations as expected appear last, followed by the so-called 'Gotcha' section and chapter summary. The 'Gotcha' sections seemingly address common student misunderstandings, although this is never made explicit.

The end of chapter, fully interactive quizzes are learning experiences in themselves, where reminders of main concepts, constructive feedback to all questions, useful hints and tips to prompt better understanding are available throughout. The quizzes are followed by a more challenging set of conceptual problems to support deeper levels of understanding. An optional online assessment feature is available as well.

There is seemingly no end to the imagination of the authors in creating novel interactive learning scenarios and case study narratives to meaningfully enhance the learning experience. In section 2.16 students are challenged to identify the "constant acceleration rabbits", section 17.17 sees horseshoe bats catching moths assisted by students' working knowledge of the Doppler Effect and in section 28.9 students slip into the role of Zeus in order to light the Olympic flame with a lightning bolt (ie a capacitor). Photos such as of a rhino and egret give the product an added human touch. Shooting at professors with banana bazookas does as well.

At the bottom of each webpage a number of helpful features are available, such as an electronic text marker, note taking tool, text-size adjustment feature, search engine, Physics Factbook and help facility. These ensure an even more satisfactory learning experience.

Continued on page 90

Principles of Physics

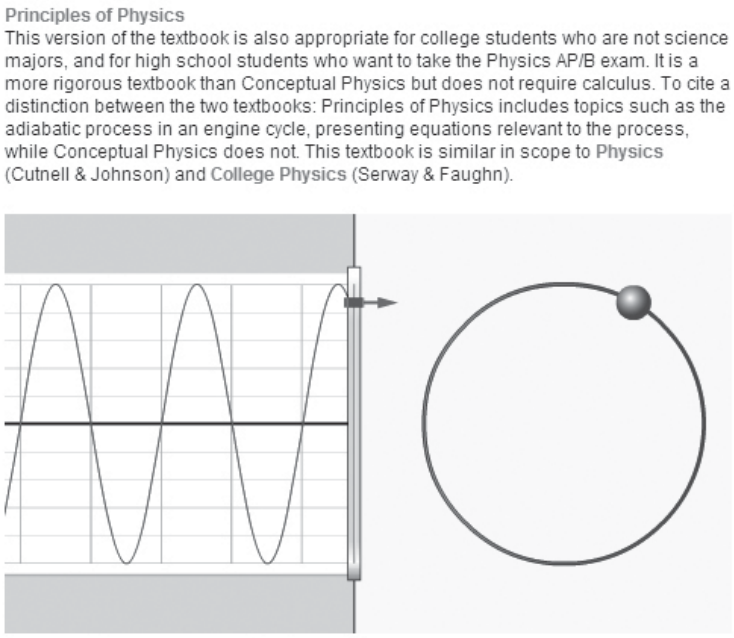


fig 1: Example from Principles of Physics (from Kinetic Books website)

Continued from page 89

One is strained to find the negatives - and in fact there are only a few, which seem insignificant in the light of the underlying pedagogically robust learning model. Occasionally, due to the length of section texts, page scrolling becomes necessary which can see accompanying multimedia disappear off the screen. In addition the writers fail to explicitly highlight new concepts and supporting multimedia within each section, which frequently leaves the reader guessing at their significance. A sections compile feature is missing which would have provided the instructor with a useful and quick means of assessing available texts and multimedia interactivities for classroom lesson planning.

There is no study time recommendation given for any of the sections or accompanying activities. Selected interactivities could not be launched properly and while the response rate of software support was impressive (< 1 hr on a Friday), after 3 days a JAVA software problem had not been resolved reliably. This would impede a satisfactory learning experience as nearly each section makes reference to a JAVA supported feature. Section hyperlinks didn't always respond well.

In conclusion, **Principles of Physics** is truly a comprehensive, student-centred, activity-driven digital learning resource which allows students significant control of their learning. This mirrors current recommended teaching practice in which active and authentic learning experiences are said to promote the more desirable deeper levels of understanding.

Given the introductory level of study, however, the resource is aimed at students who may not have the independent study skills to take full advantage of the self-directed learning enabled here. Furthermore, the sheer quantity of multimedia and text, despite educationally sound applications, will overwhelm the novice science student, especially without guidance from a mentor or tutor. The creators themselves boast of 600,000 words, 150 simulations, 1000 animations, 5000 illustrations, 15 hrs of audio narration! For secondary school level students it is therefore recommended to evaluate and carefully select activities and questions for the student to do independently, but also to engage with as a class or in smaller study groups for supporting collaborative learning experiences. Undergraduate physical science students, on the other hand, will embrace this resource as an efficient and comprehensive means of reviewing and consolidating fundamental physics concepts at their own pace. Any science teacher is sure to find the sheer number of interactivities invaluable for captivating even the most disinterested and unengaged student audience with physics.

Virtual Physics Labs

Subject area
Physics

Description
Multimedia physics lab and tutorial tool for self instruction in a number of areas within the physics curriculum.

Authors
Kinetic Books (www.kineticbooks.com/index.html)

Suppliers/Distributors
Kinetic Books (www.kineticbooks.com/index.html)

Date/Version
Version 1.10

Level
A-level, undergraduate

Type of package
Computer assisted learning, tutorial

Price
Contact supplier

Hardware required
A PC running Windows 98 or later or Mac OS X version 10.2 or later; screen resolution: at least 800x600; 128MB RAM; disk space: textbook 400MB, labs 120MB

Software required
For PC: IE version 6.0 or later or Firefox version 1.0 or later; for Mac: Safari version 1.0.2 or later. Java: version 1.4.2_01 or later, Flash: version 7.0 or later, QuickTime: version 6.1 or later

Mark Robertson
39 Langdykes Drive
Aberdeen AB12 3HW
May 2006

Summary Review

range: * poor to ***** good

Ease of use	*****
Ease of learning	*****
Documentation quality	***
Academic content	*****
Usefulness to student	*****
Usefulness to teacher	*****
Portability	*****
Meets objectives	*****
Accuracy	*****

Kinetic Books **Virtual Physics Labs** (VPL) is a multimedia package with the capability of being used throughout secondary and lower tertiary physics courses. It attempts to illustrate some of the important concepts of modern physics via the use of 16 Flash based labs split into 6 main areas: 'Mechanics', 'Oscillations and Waves', 'Kinetic Theory of Gases', 'Electricity and Magnetism', 'Optics', and 'Special Relativity'. Each lab comprises of a small amount of reading and theory with questions to answer. The answer to these questions can be found by carrying out mouse controlled Flash experiments, many of which are of a game style almost guaranteed to engage lower ability students and to help them learn almost without them realising it.

Within the mechanics topic, students can learn about one and two dimensional motion by playing 'skee ball' (where they must propel a ball onto a suitable target and by navigating a car around a racetrack respectively. They can also learn about projectiles by firing cannonballs at castles and learning to juggle and discover Newton's Laws while flying a helicopter. For more advanced students, there are opportunities to learn about centripetal motion with the car navigation simulation and gravitational theory looking at orbiting satellites and planning a mission to Mars (useful if the department budget cannot stretch to its own spaceship)

With the 'Oscillations and Waves' section, students can learn the basic wave definitions and ideas while sending waves along a wire pylon and watching the birds hang on - a different approach to pieces of string tied to a slinky - and some basic theory about the physics of music by trying to recreate the beginning to Beethoven's Fifth Symphony. More senior students can take this further and examine the creation of harmonics and standing waves.

The lab concerned with the 'Kinetic Theory of Gases' provides a useful way to illustrate the ideas behind the Ideal Gas law, showing clearly what happens to particles when the temperature and volume of the gas are changed.

The section on 'Electricity and Magnetism' covers such topics as Coulombs Law (and ends up playing a game of charge golf), electric fields and field diagrams and electromagnetic induction with a demonstration of Faraday's Law. For the advanced students, the opportunity exists to use their knowledge of resistors, capacitors and inductors to build themselves an AM radio tuner circuit.

The 'Optics' section allows for a different approach in the learning of Snell's Law and refraction by allowing the student to hunt down submarines from a helicopter and shoot them with a laser beam. Of course it is not all plain sailing as the submarines shoot back.

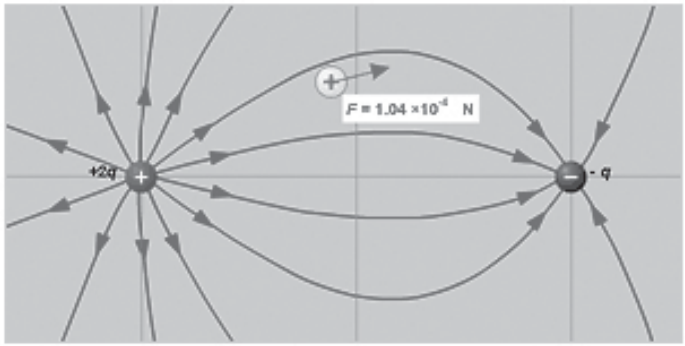
The final lab set, 'Special Relativity', deals with the often confusing topics of frames of reference, time dilation and length contraction - all difficult topics for students to visualise.

Continued on page 92

Virtual Physics Labs

Investigating electric fields

This lab covers the basics of electric fields and more. Students start by using a test charge to explore an electric field. They can change the amount and the sign of the charge and the simulation displays the force exerted on it by the field. They then place a test charge in an electric field depicted with a field diagram to see the relationship between the direction of the force on the charge and the field lines, including curved field lines, and how the "density" of field lines indicates field strength. An exercise then asks them to draw field diagrams for a single charge and for a dipole; they can use a simulation to confirm the accuracy of their diagrams.



The lab then progresses to topics that can be considered optional. Students explore the field created by a multi-charge configuration. In another exercise, they are asked to determine what happens when two fields are combined; they use the simulation to confirm their hypothesis. In the final exercise, the students determine the strength of the field required to cause a charge to arrive at a particular location. This provides both a review of projectile motion and a chance to recreate part of a famous Curie experiment.

fig 1: Example from Virtual Physics Labs (from Kinetic Books website)

Continued from page 91

The program is available on a variety of licences from single user to one for a computer lab (up to 35 computers).

Overall I would thoroughly recommend this program. The style of presentation used is very effective at holding the interest of the user and the game like experiments to provide answers to very targeted questions in the text provide a very positive and fun learning environment. I have used this program with low ability S3 (age 14-15) and Advanced Higher S6 (age 18) classes and can report positive results with both groups. The low ability classes were studying projectile motion and spent the lesson working through the cannon game. Afterwards, many could not believe that they had learned so much without doing any obvious work. The senior class also enjoyed working through the program, working though the text and using the program to help them visualise such abstract ideas as special relativity and Coulomb's Law - even to the point of organising a competition within the group to see who has the best at charge golf.

The labs themselves are all full screen and this allows them to be used effectively with multimedia projector (and interactive whiteboard). The program is lacking in a menu option to select a specific Flash lab without having to look through the associated lesson to find the correct one. This is, however, a minor omission and my only complaint about an otherwise excellent resource.

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