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Physical Sciences Educational Reviews

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Reviewed in this issue:

5 videos
1 web site
25 books

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Physical Sciences Educational Reviews

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Editorial

This issue is unusual in that it contains five reviews of video materials from Educational Media OnLine (EMOL), part of the JISC EDINA project based at Edinburgh University. As the videos are located on the EMOL web site (http://www.emol.ac.uk) they have been reviewed to our web resources guidelines and format. To view the video materials an ATHENS account is required (and most UK HE institutions have such an account - your library or computer support staff should be able to help if required). Otherwise we have our normal set of book reviews and one e-book (web review).

Roger Gladwin
Editor

In this issue...

Chemistry and Complexity

Subject area
General Chemistry.

Description
This is an e-book which aims to raise awareness for the non-linear regions of chemistry.

Authors
Mark R Leach.

Last updated
2005.

Level
A wide range of users.

Plugins required
Adobe Reader.

Other features used
Real Player or Java for linked data.

Reviewed using
Toshiba Laptop Satellite P35-S611, Windows XP, Internet Explorer, Comcast network.

Web address
http://www.meta-synthesis.com/webbook/24_complexity/complexity.html

Christina Mainka
Academic Development Adviser
TurnitinUK Administrator
Napier University
Edinburgh EH10 5LG
October 2005

Chemistry and Complexity is a new addition to Mark R Leach's *The Chemogenesis Web Book* available at http://www.meta-synthesis.com/webbook/24_complexity/complexity.html previous reviews of which can be found at http://www.meta-synthesis.com/reviews.html.

Summary Review

range: * poor to ***** good

Ease of navigation	**
Speed of response	***
Ease of learning	****
Content	****
Relevance	***
Accuracy	****
Usefulness to student	***
Usefulness to teacher	*****

Overall Leach's new chapter aims to raise awareness for the non-linear regions of chemistry, regions which he suggests are commonly ignored by scientists, engineers and teachers due to the practical and theoretical significance of linear relationships. He insists that this has promoted a skewed and idealistic view of the world as being predictable and linear when in fact it is complex and chaotic. Leach begins by giving the reader an overview of chemistry in terms of systems thinking, describing systems theory and providing vivid examples of catastrophe theory, fractal geometry, complexity ideas and computer generated complex images. The author continues with a short overview of the basic science of chemistry and goes on to describe in detail examples of linear chemistry systems such as ideal solutions, equilibrium thermodynamics and elemental periodicity. In his last section he explores the complexity of systems such as found for allotropes, compounds, phase interaction matrices, molecular geometric variation, reaction mechanism pathways and non-equilibrium thermodynamics. Somewhat surprisingly, no mention was made of fuzzy logic in chemistry, but perhaps this would only have had limited appeal to the intended audience.

Leach's lively and personal style of writing is captivating and he convincingly challenges commonly accepted definitions and theories throughout the text, prompting the reader to take a more critical look, for example, before distinguishing between chemical and physical changes or attempting to map electronic configurations quantum mechanically. He goes to great lengths to explain, document and visualise accepted terms, theories and interrelationships first, however, which adds to the usefulness of the first three sections, especially, to a bright high school or undergraduate science major who, however, would still struggle with the material presented, especially in the last section, without guidance.

The author's frequent reference to tangible examples, graphical representations and historically relevant scenarios throughout adds value to the book for all readers, of which even the academic may be surprised by links to a meaningful animation or online discussion forum. Readers find themselves bounced from quotes about dead cats to the coastline of Wales in the name of chaos theory in the first section 'Systems Thinking', where Leach begins by describing a system as a chemical reaction but also as a hive of bees. He takes a more rigorous approach in the next sections always intent, however, to demystify scientific theory and terminology. In 'Chemistry Systems' he extends chemistry's generational nature to languages, literature and even motorcars, and then proceeds to compare bonding theory to Conway's Game of Life. Finally, in the concluding section, 'Chemical Systems prone to Complexity', Leach compares the term synthesis to the children's game 'Snakes and Ladders', before choosing the chemical reactions inherent to Fe and Ti oxide ore extractions for the more scientific example.

Chemistry and Complexity

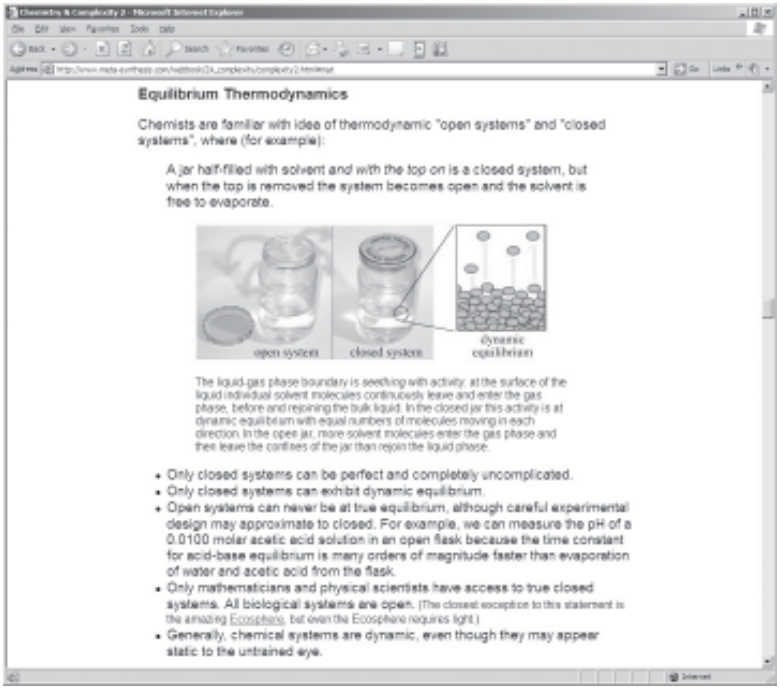

Figure 1: An example screen from Chemistry and Complexity

While the impressively wide range of web resources that the author refers the reader to usually prompt and support further exploration, links to commercial sites, search engines and password protected databases distract from the subject matter rather than deepen understanding. Some broken links, links to pages that require updated Java software or the Adobe Acrobat Reader, and grammatical flaws (eg, in subsection 'Chemical Potential' under 'Experimental Design') also slightly dampen the enthusiasm for an otherwise undeniably unique discussion of chemistry. Most links do add to understanding and are drawn from a refreshingly wide range of interdisciplinary web resources that include general science ejournal articles, digital repositories, interactive web pages and video clips. Gravely problematic, however, are the ubiquitous hyperlinks inappropriately labelled "here", "made" or "click" for example, which the reader will find hard to navigate back to. Furthermore, as screen readers commonly pull out links of web pages to provide visually impaired users with a way to navigate quickly, this text will prove disappointingly confusing to the affected user. Similarly, the book's images and tables offer no alternative text and as such are of limited accessibility. More explicitly described images would also have served to improve understanding to the student and non-academic readership.

In conclusion, while of limited usefulness in its entirety for a single science course simply due to the wide range of topics the author touches upon, the interested science student will be intrigued by Leach's attempt to account for the "large quantities of ill defined black gunk" (quote from 'Mechanistic Pathways') more common than the low-yield product, but disregarded and unexplained in the traditional chemistry lesson. The author encourages the student and tutor to think 'outside the box' and specific sections of the book can easily be incorporated into an undergraduate chemistry lesson to promote critical thought and improve relevance of subject matter. A mundane lesson on the periodic table is sure to become more interesting by challenging students to find non-periodic behaviour within element groups-never discussed in school textbooks. Similarly, the demise of Napoleon's troops at the hands of freezing tin trouser buttons is a lesson on allotropes students are less likely to forget.

Chemistry and Complexity is not merely a lesson on the complexity of the real world and the limited applicability of linear chemistry systems, but also on ways in which to meaningfully employ a range of relevant web resources to enhance and enrich the learning experience in the traditional, blended and online undergraduate science classroom. It is recommended to carefully review and select only specific sections and resources for the student, however, as the complexity and uniqueness of thought will otherwise overwhelm and potentially discourage the science novice.

An Introduction to Symmetry

Subject area
Chemistry.

Description
An introduction to the concepts of symmetry and its importance to chemical reactivity.

Authors
Sheffield University Learning Media Unit.

Last updated
1997.

Level
Undergraduate.

Plugins required
Windows Media Player (or equivalent).

Other features used
ATHENS login required.

Reviewed using
PC with 127MB RAM, Windows XP, Internet Explorer version 6, LAN.

Web address
http://www.emol.ac.uk

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Jordanstown
Newtownabbey
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October 2005

The video is available from Education Media Online, (EMOL).,
The Web site, http://www.emol.ac.uk, was easily navigated and provided all the information necessary for the download of the video.
It can be downloaded complete or as four segments. The full running time is approx. 14 minutes.

Summary Review

range: * poor to ***** good

Ease of navigation	*****
Speed of response	*****
Ease of learning	*****
Content	*****
Relevance	*****
Accuracy	*****
Usefulness to student	*****
Usefulness to teacher	*****

The four separate segments are as follows:
Segment 1: Introduction to symmetry.
Segment 2: Rotations.
Segment 3: Inversions.
Segment 4: The Effects of Successive Operations.

The aim of the programme is to introduce symmetry and explain the concept and terminology. To do this it uses a wide range of diagrams and animations synchronized with the voiceover. The initial frames explain that symmetry is everywhere in the world around us, in the things that we use and the things we do.

Figure 1: Butterfly painting

The painting of a butterfly (figure 1) is symmetrical because it has a mirror plane. Further everyday examples are shown to illustrate the different concepts and the terminology used to explain symmetry before introducing it importance in chemistry.

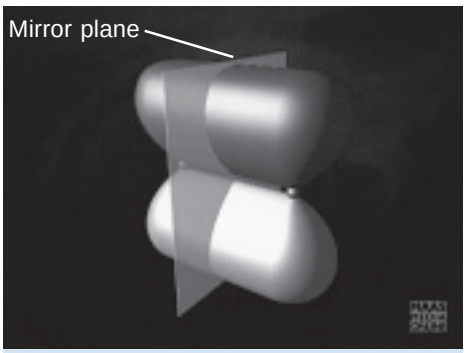


Figure 2: Chemistry example

In Chemistry:
Bonding is the key to reactivity and the example of the necessary symmetry of p orbitals for overlap and bond formation is discussed (Figure 2). Further examples of ‘mirror planes’ and ‘axis of symmetry’ are shown in figure 3.

An Introduction to Symmetry

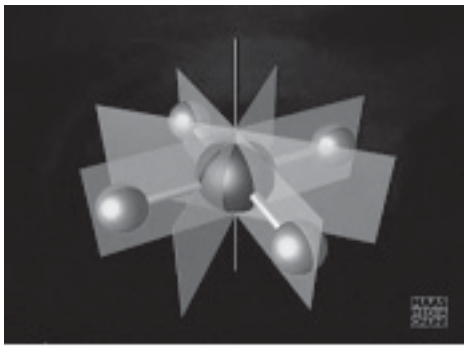
The four segments, individually or within the complete video cover:

- The explanations of symmetry operations.
- Symmetry elements.
- Identify operations.
- Rotations.
- Reflections.
- Inversions.
- Improper rotary reflection.
- Closed groups.

Once again each concept is explained by the use of everyday examples followed by chemical examples.

The voiceover is very clear and the explanations coordinated very well with diagrams and animations to provide a very easily followed explanation for each of the topics.

Mirror Planes



Axis of Symmetry

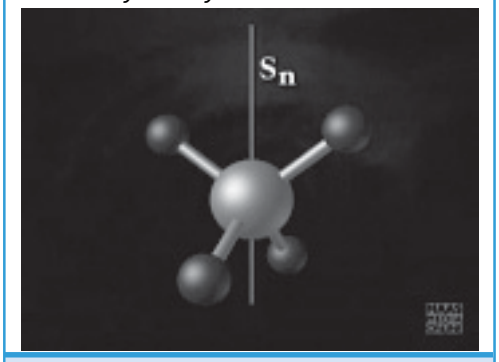


Figure 3: Further examples for chemistry

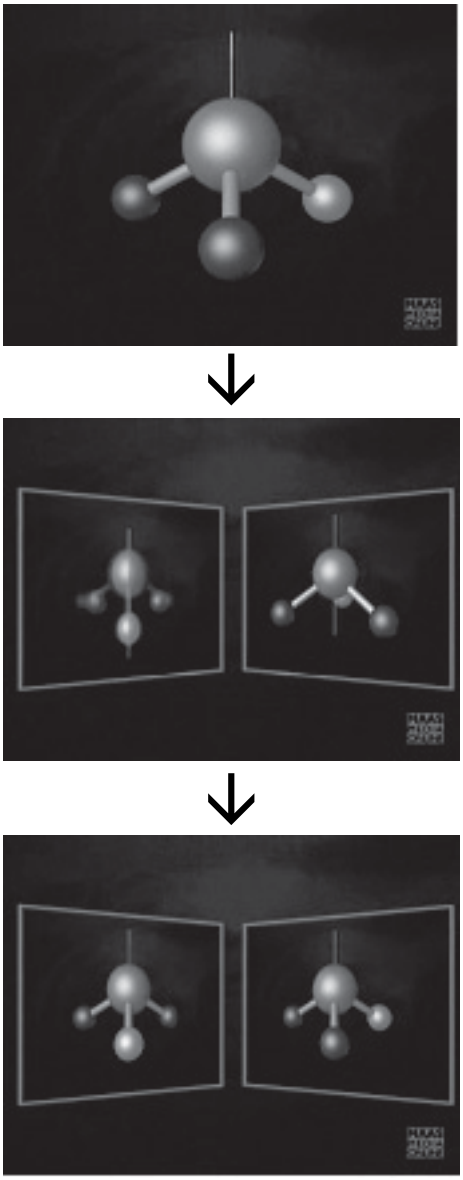


Figure 4: The Effect of Successive Operations

The only area, for which greater information might be provided, is the consideration of 'The Effect of Successive Operations' (figure 4). The clip starts with a single model and then shows two identical models on which the successive operations are seen to occur in different orders (without comment) and then the final result. If you are familiar with the topic this will cause no problems. But for those not completely familiar with the topic or seeing the clip for the first time, the intermediate sequences showing the operations would benefit from a more detailed step by step explanation.

As it stands a repeat of the clip would soon clarify any points missed in the first viewing.

The video ends with a recap of all the topics considered within the video by reference to $PtCl_4^{2-}$ and a comment on the importance of the understanding of symmetry for an understanding of, reactivity, bonding and spectroscopic properties.
Overall it is an excellent video, providing an introduction to the concept of symmetry in a very clear and understandable way.

Cavitation: Dynamics of Laser Produced Cavitation Bubbles in Water and Silicon Oil

Subject area
Physical Sciences.

Description
A short video clip with guiding notes (in German) from IWF Knowledge and Media GmbH.

Authors
W Lauterbord, H Bolle & R Tilke (film technician).

Last updated
1972/1973.

Level
Undergraduate, research.

Plugins required
Windows Media Player or Quicktime.

Other features used
ATHENS login required.

Reviewed using
Windows-based PC, Janet network, Mozilla Firefox/Internet Explorer.

Web address
http://www.emol.ac.uk

Dipak K Sarker
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Brighton BN2 4GJ
September 2005

Summary Review

range: * poor to ***** good

Ease of navigation	*****
Speed of response	****
Ease of learning	****
Content	*****
Relevance	*****
Accuracy	*****
Usefulness to student	****
Usefulness to teacher	****

The web site and files are easily navigated and obvious in what is needed for students' navigation through the EMOL website. The material is structured and presented in a logical manner starting with high viscosity silicone liquids and moving on to report on a low viscosity liquid, water. I opened the website up through *Windows Media Player* and used the HTTP format of the footage. The online media page asks for a search and this is simply the word "cavitation" from the clip title. The instructions that follow are rudimentary, obvious and self-explanatory. The seven minute silent clip takes approximately a minute to download on a networked contemporary PC. The format of the footage is acceptable but may need to be paused and re-run in places for those unfamiliar with German. The German used is simple, scientific and easily understood.

Academic content is good as Dr Lauterbord et al show rarely seen cavitation processes in a range of low viscosity silicone oils ranging from 4-10 poise and in water. The several millimetre-sized bubbles have very short lifetimes (of the order of microseconds) that could not be observed with conventional university-laboratory grade camera equipment. The footage also, strikingly shows a series of unexpected interfacial effects from the bubbles themselves. One of these is a jet developed at the wall of near-planar bubble interfaces. The footage also shows formation and collapse of the nucleated bubbles. Although the footage is short, lasting only seven minutes, it is more than sufficient to give the onlooker a good taste of such rarely observed phenomena and consequently this is neither too long nor short. The novelty in the footage captured in the 1970s is the nature of the high-speed photography and the idea of nucleated cavitation as a consequence of the high energy laser apparatus. The footage is largely self-explanatory, although the explanatory text is in German. Unfortunately, for today's 'teaching market' the video clip is black and white footage and may seem rather old and dated to some. However, for those with patience I think they would find the footage interesting and I would hope inspiring.

The footage is of particular direct relevance and no doubt interest to engineers and physicists with lectures or research programmes and a curiosity in fluid mechanics, interfacial processes and tribology[1]. This is of course particularly interesting and relevant to courses dealing with processes involving processing liquids at high temperatures and pressures, such as a climbing film evaporator or contemporary interest subjects such as micro-fluidics. All material in the footage could also be considered to be relevant to chemical engineers and synthetic chemists. Its value lies in the film clip being both accurate and detailed (although in German text). Some basic knowledge of German would be ideal although the text is self-explanatory and there is the possibility to pause the image to read the dialogue or go back and repeat playback.

Cavitation: Dynamics of Laser Produced Cavitation Bubbles in Water and Silicon Oil

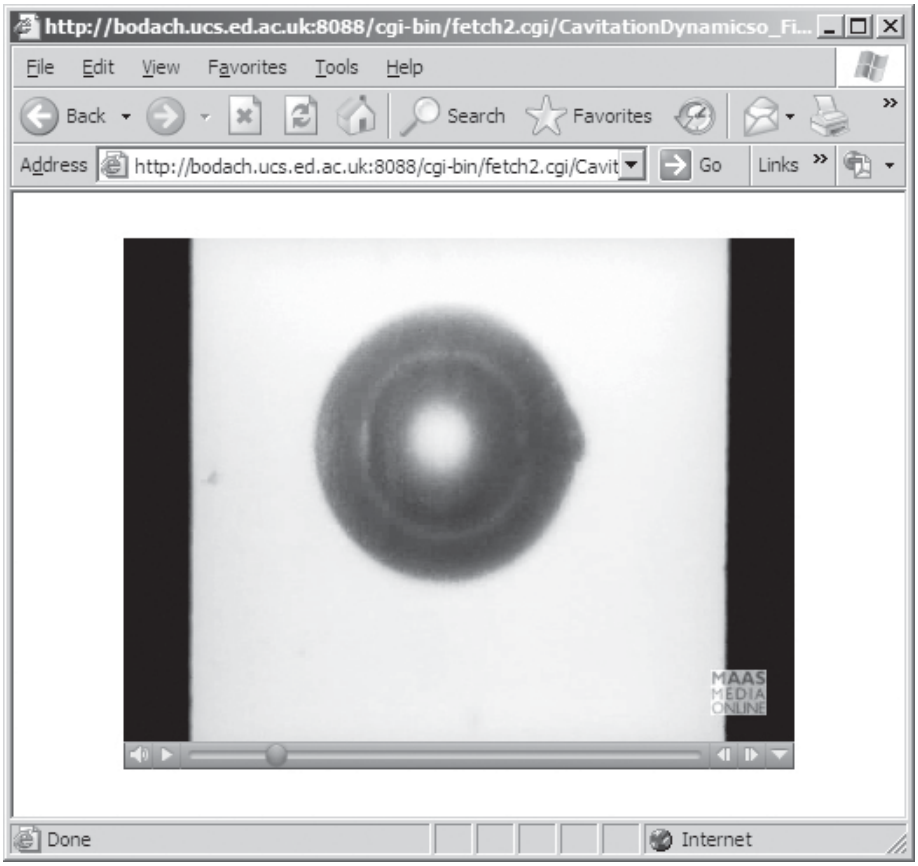


Figure 1: An example screen from Cavitation

The video clip is novel although made in 1970s but no doubt cutting-edge when made and still not in any sense routine[2,3] for undergraduate practical or project work. The images would be ideal for independent study and unlikely to be superseded by demonstrations involving static images or verbal descriptions. The tutor would find the images particularly useful to indicate both the time and scale of such dynamic processes.

References

1. McCabe, W L, Smith, J C and Harriott, P 'Unit Operations in Chemical Engineering', McGraw-Hill, 181-235 (1993) .
2. Gogate, P R and Pandit, A B *Ultrason Sonochem*, **12**, 21-27 (2005).
3. Chen, X, Xu, R Q, Shen, Z H, Lu, J and Ni, X W *Optics Laser Technol*, **36**, 197-203 (2004).

Do It Yourself

Subject area
General.

Description
A splendid video of students telling their own stories about getting university life in balance; academic and extra-mural activities and the need they discovered in themselves to take responsibility for their own undergraduate studies (and their obvious enjoyment at having done so and helping others to do the same).

Authors
University of Sheffield Television.

Last updated
1997.

Level
Undergraduate.

Plugins required
Video player.

Other features used
ATHENS login required.

Reviewed using
High Spec PC, LAN, Windows XP, Internet Explorer.

Web address
http://www.emol.ac.uk

David Harwood
Institute for Science Education
University of Plymouth
Plymouth PL4 8AA
September 2005

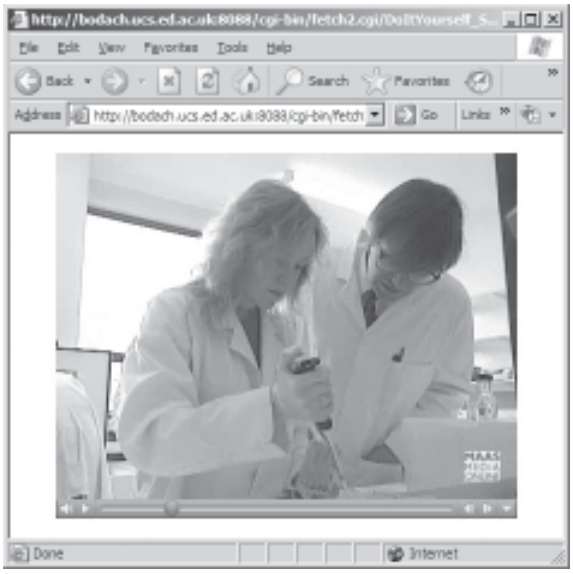
Audience and Use
This is clearly aimed at new undergraduates or school/ college students who are contemplating university. I would recommend any aspiring university student to see it. It is entirely self explanatory and although it could be a part of an induction event at university or an open day it could just as easily be sent out to new students in advance of their first term at university.

Summary Review

range: * poor to ***** good

Ease of navigation	*****
Speed of response	*****
Ease of learning	*****
Content	*****
Relevance	*****
Accuracy	*****
Usefulness to student	*****
Usefulness to teacher	*****

Content
This short film, constructed as a series of interview out-takes with some lecture theatre scenes portrays extremely well and powerfully something of real undergraduate student life at university. It deals with the things a new student has to consider and learn, the responsibility a student must take for their own learning, issues around balancing work and social life, part time work, finance and time management.



Although filmed in 1997, the feel is contemporary and its most powerful tool is that it uses the student voice throughout; even in voice-overs. The effect is a relaxed and readily accessible film of about the right length which conveys a strong message about the need to get hold of one's own study, to take responsibility for it, to manage ones' time well and to have a very good time at university in the process: made possible by getting the right balance between academic study, social life and societies and the need to do part-time work.

The filming is of a good standard and very well produced. It is well structured, suitably paced and powerful in that it is not at all 'preachy', almost matter-of-fact: "we all need to do this and this is how it worked for me". By interspersing clips of interviews with various students and using various locations the film is interesting and very watchable. The vox-pops are not too short so that they convey appropriate depth and engage the audience well.

I would recommend the use of this film with new or prospective undergraduates. Mine enjoyed it very much indeed and some suggested that it might be a useful reminder to students to see it again at the end of their first year!

Liquid Crystals

Subject area
General Chemistry.

Description
A specialised experiment in the affect of electric fields on nematic liquid crystalline phases; very useful as part of a specialised course or undergraduate option.

Authors
IWF Knowledge and Media GmbH.

Last updated
No data.

Level
Undergraduate.

Plugins required
Video player.

Other features used
ATHENS login required.

Reviewed using
High Spec PC, LAN, Windows XP, Internet Explorer.

Web address
http://www.emol.ac.uk

David Harwood
Institute for Science Education
University of Plymouth
Plymouth PL4 8AA
September 2005

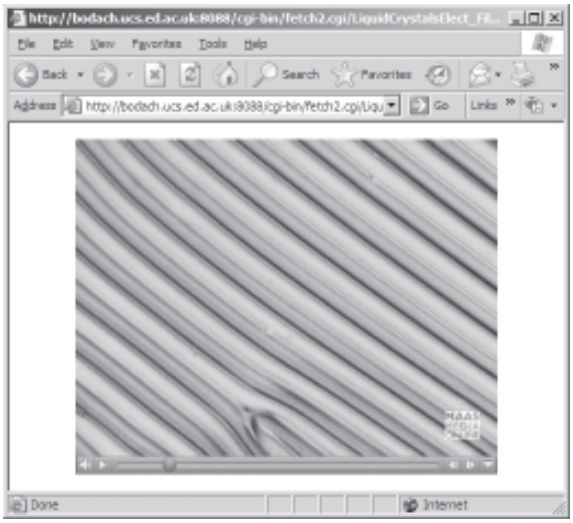
This is a short clip of a German film with an English voiceover commentary. The experiments concern a nematic phase, pictured throughout of an undisclosed substance and is, presumably, intended to illustrate the affects of applied voltages and electrical fields to a liquid crystalline nematic mesophase. The intended audience might be undergraduates taking a liquid crystal option as part of a chemistry, physics or materials science degree, or post graduate students.

Summary Review

range: * poor to ***** good

Ease of navigation	*****
Speed of response	*****
Ease of learning	***
Content	*****
Relevance	*****
Accuracy	*****
Usefulness to student	**
Usefulness to teacher	***

The experiments shown are without prior explanation of the nature of the apparatus and equipment used, nor of the substance, or liquid crystalline mixture, in question. However they do cover in some detail the affects of applied voltages and fields to a nematic melt. The results are viewed throughout the clip as if one were looking down a polarising microscope, although the audience is at no point told that this is actually what they are seeing.



The experiments portrayed are difficult to set up and view in a satisfactory manner in an undergraduate situation and hence this clip is a very useful one. The commentary is specialised and minimalist but absolutely correct, if somewhat dispassionate. The quality of the images shown is very good and the fact that it is shown in real time and very well focussed is impressive.

However, the clip would only be of value to a reasonably expert postgraduate or advanced undergraduate on an appropriately specialised course. It would require qualification for use in teaching and would probably be most useful as part of a lecture. The video might be improved by the addition of a pre-amble showing the apparatus being used, the substance or mixture under test and some background as to the significance of the experiments performed.

Understanding Materials: Polymers

Subject area
General Science.

Description
This video is one of a series of 5 films about the structure and properties of different classes of materials. This one covers the topic of organic polymers using many everyday and industrial examples, with a variety of useful demonstrations.

Authors
Sheffield University Learning Media Unit.

Last updated
1982.

Level
Undergraduate.

Plugins required
None.

Other features used
ATHENS login required.

Reviewed using
Pentium 4 PC, 2.99GHz, 504MB RAM, Windows XP, Mozilla Firefox version 1.0, T1.

Web address
http://www.emol.ac.uk

Alison Voice
School of Physics & Astronomy
University of Leeds
Leeds
LS2 9JT
November 2005

This video gives a very comprehensive overview of organic polymers, their polymerisation, structure and properties. It can be viewed in its entirety (lasting 42 mins) or in ten separately downloadable segments (each lasting 3-5 mins), thus allowing flexibility in the use of the broad range of topics covered. In particular chemistry students may find the first 5 segments of more relevance to their studies and physics students may prefer the latter 5 segments.

Summary Review

range: * poor to ***** good

Ease of navigation	*****
Speed of response	*****
Ease of learning	*****
Content	*****
Relevance	*****
Accuracy	*****
Usefulness to student	***
Usefulness to teacher	*****

Segment 1 introduces the idea that polymers are everywhere and starts from the perspective of natural biopolymers. Segment 2 continues this theme by saying how synthetic polymers are made in an attempt to emulate natural polymers. Some details of polymerisation are given and good molecular models are used.

Segment 3 shows a very detailed demonstration of the 'Nylon Rope Trick' producing nylon from the interface of the polymerising liquids. Segment 4 shows examples of the earliest synthetic polymers known as thermosets, eg Bakelite. The formation of their densely crosslinked molecules is shown in animation. Some footage of an early Apollo space craft is shown since this rocket used thermosetting polymers as heat shields

Segment 5 briefly discusses epoxy resins before going into a more detailed presentation about thermoplastic materials. A good animation is used to show the entangled molecules. The weak intermolecular bonds are demonstrated by showing polyethylene dissolving in acetone and melting over a Bunsen flame.

Segment 6 initiates the idea of polymer crystallisation with good visuals of polymer lamellae and spherulites. A clear presentation about the glass transition then follows and this theme is continued in segment 7. Segment 8 extols the advantages of thermoplastics with good demonstrations and film footage. Segment 9 is devoted mainly to the elasticity of rubbery polymers, where the topic is well presented and clear demonstrations are used to enhance the discussion.

Up to this point the video presents a very clear account of the chemistry and physics of polymers. The animations are helpful, if a little lacking in presentation compared to what can be achieved nowadays. Segment 10 however, which presents the 'Shape of Things to Come' clearly reveals the age of the video, and whilst not all of the things predicted have come into being yet, there is also much more that could be presented in such a slot.

Overall the video presents ideas clearly and interestingly and I feel as such is a valuable resource for teachers unfamiliar with the topic, or wanting a good overview on which to base their teaching. However the presentation style clearly dates the video (at 23 years old) and I feel that today's students, although able to learn much from the video, would not be inspired to engage with the topic as fully as they could. It should however be said that there is very little similar materials available, and this video definitely fills a gap.

Atomic Structure and Periodicity

Subject area
Inorganic Chemistry.

Description
This book presents basic atomic theory as given in first and second year courses at university. It demonstrates that the structure of the Periodic Table as we know it is based on sound principles. Throughout the book, theoretical concepts are presented, along with the experimental evidence for them.

Authors
Jack Barrett.

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

Date/Edition
2002.

ISBN
0-85404-657-7.

Level
Undergraduate.

Price
£14.95.

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Sackville Street
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November 2005

The RSC 'Tutorial Chemistry Texts' have been going for some time, and there are (in my humble opinion) a small number of good volumes in the Series. For example, I recently reviewed Graham Doggett's two *Maths for Chemists* volumes, and thought them fine [*Physical Sciences Educational Reviews* **5** (2) 17-19 (2004)].

Summary Review

range: * poor to ***** good

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

Where better to start a Book Review than the 'Preface'. In this case we learn that "This book deals with the fundamental basis of the modern periodic classification of the elements and includes a discussion of the periodicities of some atomic properties and the nature of the fluorides and oxides of the elements" … "A brief overview of chemical bonding is included".

Sounds like a good idea, but who is it written for? The nearest we come to an intended audience is that "...it should be suitable for an introductory course on the subject…" Where, I wonder; GCSE, UK Year 1, Year 2, US Freshman, Sophomore?

Let's imagine a beginning MChem student from the University of Mars trying to use the text.

The 177 pages are divided out into Chapters as follows.

1. 'Atomic Particles, Photons and the Quantization of Electron Energies: Heisenberg's Uncertainty Principle'.
2. 'Atomic Orbitals'
3. 'The Electronic Configuration of Atoms; the Periodic Classification of the Elements'
4. 'Periodicity I; Some Atomic Properties; Relativistic Effects'
5. 'Periodicity II: Valencies and Oxidation States'
6. 'Periodicity III: Standard Enthalpies of Atomization of the Elements'
7. 'Periodicity IV: Fluorides and Oxides'

P 168 'Answers to Problems'

That sets the scene.

Chapter 1 runs from breathtakingly obvious statements about mass number through breathtaking statements about Einstein's equation, quanta, photons, the Planck (or Plank as my students irritatingly call him) equation, the photoelectron effect, wave-particle duality, the Bohr model, the H atom, Heisenberg all in 19 pages.

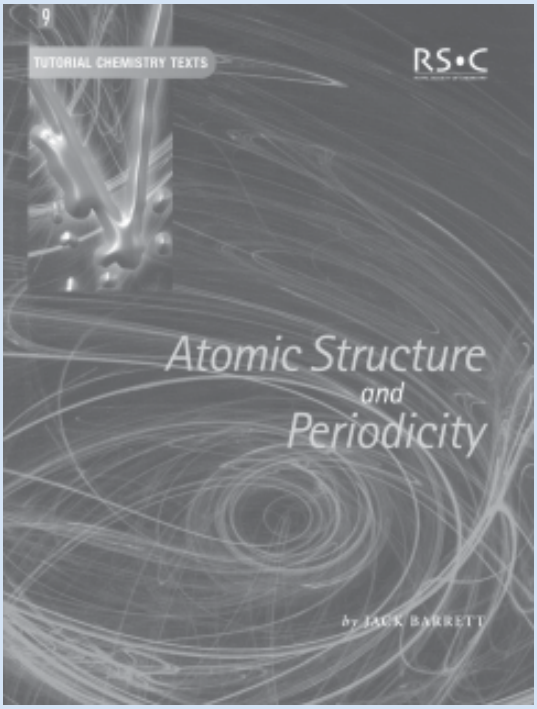
Gosh, even my Martian MChem student would have to pause here.

It reminds me of the phenomenon of a dog walking on hind legs. Very clever, but you wonder why bother since it has all been done better elsewhere.

Chapter 2 opens with Schrödinger, Hamiltonians, wave functions and probability density, all in two pages. No attempt at rigour, but amazing attention to trivial detail (such as the reduced mass of the H atom). The rest of the Chapter is sound.

Continued on page 12

Atomic Structure and Periodicity



From the publisher...

Atomic Structure and Periodicity

By J Barrett; Visiting Lecturer at Birkbeck College, London

This book presents basic atomic theory as given in first and second year courses at university. It demonstrates that the structure of the Periodic Table as we know it is based on sound principles. Throughout the book, theoretical concepts are presented, along with the experimental evidence for them.
Foundations are laid in the introductory chapter, which deals with fundamental particles, electro-magnetic radiation and Heisenberg's uncertainty principle. Atomic orbitals are then described, using a minimum of mathematics, followed by a discussion of the electron configurations of the elements. Further chapters reveal the relationships between the electronic configurations of the elements and some properties of their atoms; and the variations in the properties of their fluorides and oxides across the periods and down the groups of the Periodic Table.

0-85404-657-7 178pp 2002 £14.95

Continued from page 11

Parts of Chapter 3 are fine, but on page 52 my Martian MChem student was perplexed to find some curious 'J's and 'K's, which aren't actually defined, and was even more perplexed by the explanation of the exchange phenomenon. In fact, the lack of real explanation ruins the rest of the discussion, since 'J' and 'K' are widely used throughout the remainder of the Chapter. To be fair, there is a hand-waving way of calculating the number of exchange terms, but no real explanation of what they mean or how they can be calculated (or measured).

At the University of Mars, students are taught that the correct symbol for pressure is 'p' and not 'P'. Just a small point.

Chapter 4. My Martian student might have understood the arguments if 'J' and 'K' had been defined in Chapter 3.

Chapter 5. Now the fun starts, with covalent bonding described in a single page. MO diagrams come out of the air (from Mars?), metallic bonding, van der Waals forces etc. A real collector's item this Chapter.

The 'Problems' are OK, but the 'Answers' are not. For example, 1.5 (iii) tells us that the first Lyman line in the H atom spectrum is (and I quote)

$$\frac{1}{\lambda} = \frac{36}{5 \times 656.3}\left(\frac{1}{1^2} - \frac{1}{2^2}\right)$$

which gives the wavelength as 83.3nm.

My Martian MChem student pointed out that this formula as written gives $\lambda = 83.3 \times 10^{-9}$. Some Universities obviously train their students better than others.

I have to confess that I put the book down at this point. It is the worst text I have reviewed in a long time.

Beyond Measure: modern physics, philosophy and the meaning of quantum theory

Subject area
Quantum Physics.

Description
This book gives a non-technical account of quantum theory.

Authors
Jim Baggott.

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

Date/Edition
2003.

ISBN
0-19-852536-2.

Level
Undergraduate.

Price
£20.00.

Summary Review

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

I was taught quantum mechanics by Dirac. In those days one didn't question what it meant. Yet I recall quite vividly failing to understand beyond the first few pages of Dirac's book. I realised that I would have to move on and accept 'the mysterious black top hat from which white rabbits continue to be pulled.' I too, when lecturing on quantum theory, advise students not to ask how this particular conjuring trick is done, at least not until they can themselves perform the trick. The original version of the book under review, *The meaning of quantum theory*, was published 11 years ago in an attempt to show how, on the Copenhagen interpretation, quantum theory is, "quite simply, not meant to be understood".

The current book is a rewriting of that earlier book in an attempt to let the quantum weirdness shine through the much simplified mathematical formalism, and make the problem of quantum theory more accessible to undergraduate students. The mathematics in this new book is now relegated to 27 appendices. Whether one believes that this makes it any easier to read is probably a matter of taste.

The book begins with a historical introduction to quantum theory with some interesting original asides. Readers new to the subject will find this a leisurely introduction; others may find it an annoying delay. The formal treatment of quantum theory begins with chapter 4 and again follows a historical route through measurement theory via the Copenhagen interpretation to Bell's theorem. Bell's inequality is treated in an adaptation of one of Bell's own analogies through the washing of socks. The discussion here is exceptionally complete and authoritative. No reader can be left in any doubt that Bell's inequality gets to the core of the problem of a realistic account of quantum theory.

Chapters 9 and 10 treat relatively recent experimental tests of quantum theory in some detail including a brief foray into quantum computing.

The final chapters look at possible approaches to solutions, starting with de Broglie's pilot waves. The treatment of the Bohr theory is an example that makes the case for mathematics as a source of understanding: I was unable to follow the wordy account (even though I know the theory) but the mathematical appendix is a model of clarity!

The author touches briefly on more recent approaches including decoherence, many worlds, consistent histories and, finally, quantum gravity, and closes with Smolin's prediction of a quantum gravity theory by 2015, that will be taught in high school by the end of the century. Well, let's make a start: anyone who is still teaching the garbled nonsense of the Copenhagen interpretation in schools or anywhere else should read this book.

Derek Raine
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Leicester LE1 7RH
November 2005

Chemical Calculations at a Glance

Subject area
Mathematics.

Description
In this book the student is shown how to apply maths to familiar concepts in chemistry. By including problems (with answers) on each presentation, the student is encouraged to practise both mathematical manipulations and to apply them to problems in chemistry.

Authors
Paul C Yates.

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

Date/Edition
2005.

ISBN
1-4051-1871-7.

Level
Undergraduate.

Price
£14.99.

Elizabeth Barron
Science Dept
Inverness College
Midmills Campus
Crown Ave
Inverness
IV2 3NF
October 2005

Chemical Calculations at a Glance by Paul C Yates, is aimed at students that have embarked upon a degree in chemistry but only have GCSE mathematics. Although mainly designed to help students through their first year, if this textbook ever appears on the second-hand bookshelf, it will most certainly be grubby from constant referrals.

Summary Review

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

However, be warned. This is not a pretty book. There are no illustrations and the first chapter throws students straight into rules of indices. Not difficult in itself, but to cast students (who probably haven't looked at mathematics for at least two years), into:

$$x^{\frac{1}{n}} = \sqrt[n]{x}$$

could possibly result in several falling at the first hurdle. For this book to really be used as a 'standalone' student text book it would perhaps have been more advisable to ease them into the maths by beginning with what is actually the second chapter on scientific notation, but then, what student actually reads mathematical text books all the way through? If they persevere with this one however, they will be very glad they did!

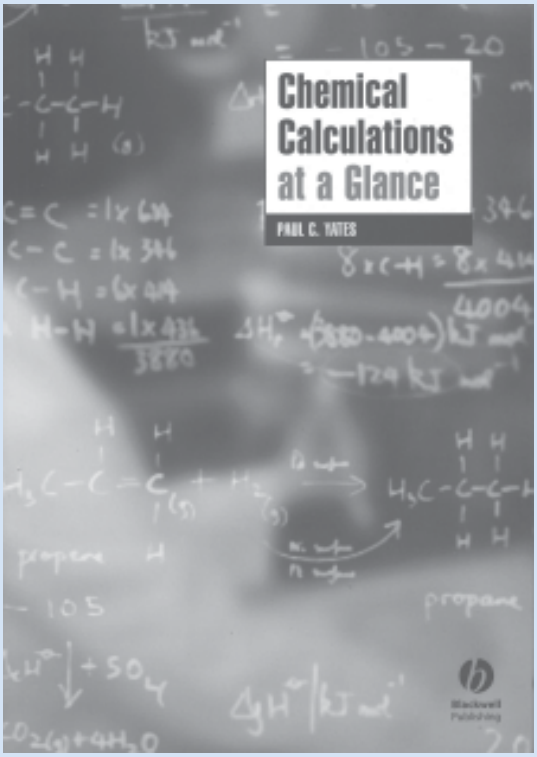
Throughout, the author adheres to the principle of using chemical examples to present the mathematics. The traditional 'x' and 'y' examples are included, but these are mixed in with, or serve as an introduction to, practical chemistry calculations. There are questions at the end of the chapters with worked examples at the end of the book, considerably more useful than just a list of final answers.

Chemical Calculations at a Glance consists of 49 (short, only 2 to 4 page), chapters divided into 6 main sections (A-F). Each short chapter and subsequent questions can easily be worked through in an evening, which makes this an ideal reference book. (ie the students should still have time to do the actual set work without feeling too pressurised) whilst retaining the flexibility required by a text book.

The introductory skills section starts off with rules of indices and scientific notation, followed by units and significant figures and decimal places. The latter chapters are particularly well explained and provide good grounding for the subsequent topics. The next section covers the handling of data and begins by explaining how to calculate quantities and to deal with uncertainties. It then goes on to look at maximum possible error, maximum probable error, some simple statistics and then the T-statistic. I would probably have expected the statistics section to be slightly more detailed than it is, but then there are lots of pure statistics books out there.

Section C focuses on algebra, introducing precedence, fractions and inequalities. Then follow chapters on rearranging equations, ratios and proportionality and factorials. Section D, one of the largest sections, looks at functions beginning with single variable functions and then functions of many variables. This is followed by natural logarithms and logarithms to the base 10, then the exponential and inverse functions. The equation of a straight line is a useful chapter, as is the section on quadratic equations and sequences and series.

Chemical Calculations at a Glance



From the publisher...

Chemical Calculations at a Glance

By Paul Yates, Staff Development and Training Centre, Keele University

Based on the successful at a Glance approach, with integrated double page presentations explaining the mathematics required by undergraduate students of chemistry, set in context by detailed chemical examples, this book will be indispensable to all students of chemistry. By bringing the material together in this way the student is shown how to apply the maths and how it relates to familiar concepts in chemistry. By including problems (with answers) on each presentation, the student is encouraged to practice both the mathematical manipulations and the application to problems in chemistry. More detailed chemical problems at the end of each topic illustrate the range of chemistry to which the maths is relevant and help the student acquire sufficient confidence to apply it when necessary.

1-4051-1871-7 208pp 2005 £14.99

The next section investigates spatial mathematics. Trigonometry, inverse trigonomic functions and coordinate geometry are covered; as are vectors, vector multiplication and complex numbers. Calculus is explained in Section F by first looking at the derivative, then differentiation, differentiation of functions and differentiating combinations of functions. High order differentiation and stationary points are followed by partial differentiation and integration, then integration of functions and integration techniques. There is also a useful appendix of SI prefixes, SI unit conversions, Non-SI units, values of physical constants and a table of t values. This is followed by the extensive list of worked solutions to the set questions.

Most chemistry lecturers will be familiar with students that have either convinced themselves that ‘maths is too hard for them’, or that their maths is fine despite considerable evidence to the contrary. I think that this book could help, but that it will be most effective when integrated into a chemistry course. The material is presented at a good pace, and the numerous examples should quickly build up their confidence in the basics as they move to the more complex topics. However, for the students already terrified of mathematics, some gentle guidance/enforcement may be required!

Concise Chemistry of the Elements

Subject area
Inorganic Chemistry.

Description
This short textbook shows how fundamental properties of atoms influence chemical and selected physical properties of elements and how and why such properties vary as one traverses the systematic grouping of the elements in the Periodic Table of Elements.

Authors
Stawomir Siekierski and John Burgess.

Publishers/Suppliers
Horwood Publishing Ltd (http://www.horwood.net/publish).

Date/Edition
2002.

ISBN
1-898563-71-3.

Level
Undergraduate, research.

Price
£9.95 (http://www.amazon.co.uk).

Brian Murphy
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College of Science
UAE University
PO Box 17551, Al-Ain
United Arab Emirates
November 2005

Concise Chemistry of the Elements is a short inorganic chemistry textbook, consisting of approximately 200 pages. According to the authors in the 'Preface' the book is suitable for both undergraduate and postgraduate students, and can serve as a guide and introduction to more comprehensive textbooks in this area. In this sense, the book itself largely achieves its objective. The book consists of 20 individual chapters, and shows the reader how the fundamental properties of atoms can influence chemical and selected physical properties of the elements and in particular how and why such properties vary as one traverses the systematic grouping of the elements in the Periodic Table.

Summary Review

range: * poor to ***** good

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

The book consists of two sections. In part 1, the variations in the fundamental properties of atoms across the groups and periods are discussed, whereas the second half of the book gives the reader a concise description of the chemical properties of the elements. The first part of the text covers many of the traditional topics in this area which are typical components of inorganic chemistry textbooks, such as shell-filling in many-electron atoms, radii, ionization energies, electronegativities, electron affinities, oxidation states and one full chapter on catenation and the formation of condensed phases. Only a rudimentary knowledge of quantum chemistry is necessary. This section of the text certainly is a nice summary on how the fundamental properties of atoms vary across the individual groups and periods of the Periodic Table. However, this reviewer did find that there was a lack of depth in places, and the partial treatment of some core topics was at times noticeable. Most of the material can be found in any good inorganic chemistry textbook and although it is nice to see the authors trying to draw connections between the various properties, this is often lost in the overall poor production of the book. The textbook does not contain any coloured graphics, and many of the diagrams and figures are very poorly presented. In addition, no worked examples or exercises are included in the text, making the book really only useful as a supplementary book to a more comprehensive textbook on the subject. For this reason, I would recommend the text as a good reference book for any student or instructor, who may wish to read around the subject. However, I certainly would not recommend this book as a standard flag-ship textbook for an inorganic chemistry course. Having said that, the text certainly would be useful to have in a University library.

In the second part of the book, the authors take the reader through some descriptive chemistry of the elements, covering groups 1, 2, 3, 11-18 and the transition metals. There are also two individual chapters on the lanthanides and actinides and the transactinide elements. The short accounts of the descriptive chemistry of the elements may appeal to some students looking for a useful summary. However, even here, the poor production makes this difficult, and greater use of tables, spider diagrams etc would make the text far more appealing.

In summary, this book does have its good points, but the authors efforts in trying to deliver their important message is lost in the overall poor production of the book, which is a pity!

Cosmology

Subject area
Astronomy/Cosmology.

Description
This book is an introductory text for cosmology.

Authors
Michael Rowan-Robinson.

Publishers/Suppliers
Oxford University Press (http://www.oup.com).

Date/Edition
2004/4th Edition.

ISBN
0-19-852747-0.

Level
Undergraduate.

Price
£23.95.

Garry Pilkington
Physical Sciences Centre
Liverpool University
Liverpool
L69 7ZD
May 2005

Summary Review

range: * poor to ***** good

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

This is the fourth edition of this book on cosmology, the first being printed in 1977, so it has obviously had to change somewhat over the years. That said it is as up to date as you would want for a cosmology introductory text.

The author first explains how the universe is observed by astronomers in both the visible and invisible areas of the electromagnetic spectrum. Once this foundation has been dealt with, the topic of our galaxy and those of our neighbours are tackled. This section covers the structure and evolution of galaxies and their constituent stars. Chapter three is where the core of the book really starts; exploring the basis for cosmological theories and how they came to be. This chapter comprises the distance scale and the various methods used to determine the distance to particular objects. Red shift, the blackbody radiation and isotropy are also introduced and referred to in a minor way. The author then goes in to the different big-bang models in chapter four and how the Newtonian cosmology differs from relativistic cosmology. It is this chapter where the cosmological constant is first introduced and reference made to how it helps to produce the different models such as Milne and Einstein-de Sitter. The numerous cosmological parameters such as the Hubble, deceleration, density and lambda are defined and used to calculate the age of the universe for both a zero and non-zero cosmological constant. Chapter five describes the early stages of the big bang from the fireball stage to the production of helium. The black body radiation mentioned in an earlier chapter is given quite a good coverage. Using data from space missions such as COBE and WMAP, the author then delves in to the isotropy of the cosmic background radiation and the density fluctuations discovered only a few years ago. The later history of the universe is covered in chapter six; exploring how galaxies were formed and the discrepancy between galactic rotation and the visible matter causing it. The topic of missing matter is then introduced to help explain away this discrepancy. This missing matter includes both baryonic and non-baryonic such as dwarf galaxies, quasars, black holes, neutrinos and gravitational radiation amongst others. The methods and techniques of observational cosmology are then covered in chapter seven. Finally in chapter eight, other theories on cosmology are given an airing. One area covered here is a solution to the flatness, horizon and monopole problems; inflation. The steady state theory and a model where the gravitational constant is changing with time are also considered.

At the rear of the book is a section quickly explaining twenty controversies in modern cosmology and the theories being researched to explain them. This I thought was a nice touch and may give the student the impression that not everything in cosmology is a closed case and so could perhaps get them thinking more about how to tackle such issues. The flow of the text is well written and does include quite a fair number of mathematical derivations which the student may have problems with, although it is aimed at second and third year students. There are the question and answers you typically get with a book of this level and a further reading and glossary at the rear of the book. There are a few typographic errors throughout the book, but one blunder is the statement about M31 being a nebula on page 3 when in fact it is the Andromeda galaxy. Also a reference to a binary pulsar on page 72 does not give any name for the said pulsar.

In all I think this book is well suited to undergraduate physics/astronomy students just getting in to the field of cosmology.

Environmental Chemistry: a global perspective

Subject area
Environmental Chemistry.

Description
This book describes those chemical principles which underpin the natural processes occurring within and between the air, water, and soil, and explores how human activities impact on these processes, giving rise to environmental issues of global concern.

Authors
Gary W vanLoon and Stephen J Duffy.

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

Date/Edition
2005/2nd edition.

ISBN
0-19-927499-1 (Pbk).

Level
Undergraduate.

Price
£29.99.

Martin R Preston
Department of Earth and Ocean Sciences
University of Liverpool
4 Brownlow Street
Liverpool L69 3GP
October 2005

Summary Review

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

A quick search of my office shelves produces half a dozen books with titles on the theme of 'Environmental Chemistry' so is this one significantly different or better than what is already available? In this case neither of these questions is entirely easy to answer. The book is substantial (500+ pp) and divided along historically conventional lines of atmospheric, hydrospheric and terrestrial systems. I have to say that I find this sort of compartmentalisation increasingly unhelpful in a subject which is becoming much more cross-boundary and process-based in recent years. Topics such as the land-ocean-atmosphere-climate interactions of carbon dioxide or the land-water-atmosphere problems of pollution don't fit neatly into this scheme and worse, can encourage students to think that these 'boxes' are independent entities. The authors have attempted to offset this problem a little by using an interesting inclusion in the form of 'Fermi' questions which appear in each chapter and which encourage readers to use informed imagination to investigate real problems but this is more of a nod in the direction of the principle than wholehearted commitment to it.

So, if one accepts the three compartment air-water-land premise how well are the subjects covered? The page balance ratio given to these 3 systems is roughly 1:1:0.5 which, when it is considered that the terrestrial section also includes a section on organic biocides, might be considered a bit meagre in that specific area. All chapters have suggestions for additional reading and a number of set problems (plus the 'Fermi' questions mentioned above) and there is a companion web site for lecturers to crib the answers if necessary. There is also a 'Main Points' box at regular intervals to summarise each significant section.

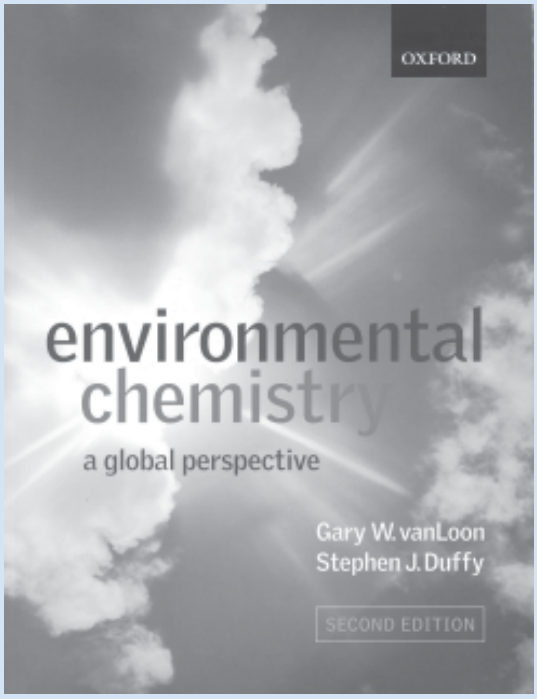
The atmospheric chemistry section is well thought out with appropriate and accessible descriptions of stratospheric and tropospheric systems including precipitation and aerosols. There is also a specific chapter on urban and indoor atmospheres. The final chapter in this section is on the chemistry of global climate. If it had been left to me I would have put this chapter at the beginning rather than the end but perhaps this reflects the different views of its importance from across the Atlantic.

The coverage in the aquatic area is a bit uneven and there are some oddities. There is significant discussion of units with the recommendation that "For chemical studies, molar units are the most appropriate" yet the data in the book is inconsistent with eg Tables 16.1 and 16.2 in mass per unit volume units but Appendix B1 in molar units. There are pH/Eh diagrams (and accompanying theory), as a marine chemist I find it hard to

Footnotes (additional comments on Summary Review)

Academic content	*Technically good, coverage patchy, conceptually a little old fashioned*
Usefulness to student	*Good on principles, weaker on processes. Doesn't project holistic approach*
Usefulness to teacher	*As for student*
Meets objectives	*Good for main title but less so for sub-title. I don't really get a feeling of 'a global perspective' from it*
Accuracy	*Very good - I spotted one typo but that was all*

Environmental Chemistry: a global perspective



From the publisher...

Environmental Chemistry
A Global Perspective

By Gary W vanLoon and Stephen J Duffy

Chemical processes shape the world we live in - the air we breathe, the water we drink, the weather we experience. Environmental Chemistry: a global perspective describes those chemical principles which underpin the natural processes occurring within and between the air, water, and soil, and explores how human activities impact on these processes, giving rise to environmental issues of global concern. Guiding us through the chemical composition of the three key environmental systems - the atmosphere, hydrosphere, and terrestrial environment - the authors explain the chemical processes which occur within and between each system.

0-19-927499-1 532pp 2005 £29.99

accept Chesapeake Bay as the principal example of the saline waters that cover nearly three quarters of the Earth's surface. Phosphorus environmental chemistry is considered in a chapter on colloids and surfaces whereas the nitrogen, carbon and sulphur cycles are within a chapter on microbial processes. Perhaps these decisions can be justified but the end result leaves me with the feeling of a lack of a holistic approach to environmental systems.

In the terrestrial section the subject of geochemistry (at least as my geology colleagues would understand it) is, to all intents and purposes, reduced to around 3 pages relating to weathering. There is virtually nothing on the origins, properties and behaviour of crustal minerals, high temperature/pressure systems, crystallography or thermodynamics. Soil chemistry receives more substantial coverage as do inorganic and organic solid wastes. The organic biocides component sits a bit uncomfortably within the terrestrial environment section but this is the problem with trying to fit a whole-Earth problem neatly into a 3-box environment framework. I found this the least satisfactory of the components of this book and the quotation used at the start of this Section which begins "How little I know of this world." perhaps sums up my conclusions.

The intended readership of this book is for year 2 or 3 chemistry undergraduates and that is probably a fair assessment of its qualities. The use of a compartmental rather than a processes based approach makes it more a description of the chemical features and principles of (some of) the environment rather than what I would see as a more modern approach to 'Environmental Chemistry'.

So would I recommend it as a textbook? It will certainly have its place in chemistry teaching where an environmental component is needed. What is does, it does well. It is not as suitable for environmental science students who need some chemistry, not so much because of the difficulty of the chemistry, though that might be an issue, but more because of the artificial environmental boundaries it imposes. The book would need to be much more based on the 'Fermi' approach to be wholeheartedly recommended for this purpose.

Introduction to Solid-State NMR Spectroscopy

Subject area
General Chemistry.

Description
This book is written for undergraduate and graduate students of chemistry, either taking a course in advanced or solid-state nuclear magnetic resonance spectroscopy or undertaking research projects where solid-state NMR is likely to be a major investigative technique.

Authors
Melinda J Duer.

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

Date/Edition
2004.

ISBN
1-4051-0914-9.

Level
Undergraduate, research.

Price
£29.99.

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Preston
PR1 2HE
November 2005

and

Tom Halstead
Department of Chemistry
University of York
Heslington
York YO10 5DD
July 2005

Summary Review

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

The author approaches the field of solid state NMR spectroscopy from a thorough, mathematical point of view. Quantum mechanical explanations are developed into the practical pulse techniques that are employed in solid state NMR experiments. The book begins with general NMR basics and then moves onto techniques, such as magic angle spinning, that allow us to measure spectra in the solid state. Familiar ideas of shielding and chemical shift are then developed, followed by an explanation of the use of dipolar and quadrupolar coupling for determining connectivity in molecules. Finally, less familiarly, methods of studying molecular motion in solids are developed for the elucidation of the properties of materials, a field which holds much potential for materials chemists, both in academia and industry.

As an NMR practitioner about to move into the field of solid state NMR spectroscopy, I found the material covered in the book to be very useful in improving my understanding of the differences between solid and solution state experiments and I now have a greater appreciation of the difficulties and limitations of the technique. However, a great deal of time and effort was needed to distil out this understanding from the thorough treatment given; I wonder how many readers, for instance, would have given up on page 4 as the rotating frame of reference was introduced?

The author states that the book is written as an introduction for undergraduate or graduate chemistry students specialising in advanced or solid state NMR spectroscopy or as a practical introduction for industry. While the book certainly presents introductory material, the approach is certainly not introductory and the level of mathematical detail makes this book of limited utility for the majority of chemistry undergraduates and may even tax the mathematical understanding of undergraduate physicists. I could certainly not recommend this book as essential reading to my undergraduates or to most postgraduates just wanting to use solid-state NMR, but I can see it being of value to postgraduates and postdoctoral researchers who want to develop an understanding of more advanced solid state techniques or examine the properties of the materials that they are studying.

Richard W McCabe

Summary Review

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

This book begins with an account of the basics of NMR, which includes a description of spin systems in terms of density operators and interaction tensors, and an overview of the Fourier transform NMR experiments. Chapter 2 deals with the theoretical basis and practical implementation of those techniques that are the bread and butter of solid-state NMR: magic-angle spinning, hetero-and homo-nuclear decoupling, and cross-polarization. The next three chapters describe the theory and uses of the

Introduction to Solid-State NMR Spectroscopy

three main internal nuclear interactions: chemical shielding, dipolar coupling and quadrupole coupling. NMR techniques for studying the geometry and rate of molecular motion in solids are the subject of the final chapter. The emphasis is on the analysis of the lineshapes of spinning powder samples, but 2H powder patterns for static samples are also discussed. Relaxation phenomena are outside the scope of this book and only a very brief description of the theoretical basis for understanding relaxation processes is given.

Solid-state NMR has the deserved reputation of being a tough topic, hence it has not regularly found a place on undergraduate chemistry syllabuses at British universities. Unfortunately typical undergraduate courses, such as 'mathematics for chemists', 'quantum chemistry' and 'NMR for organic chemists', which are certainly prerequisites for any course on solid-state NMR, will not adequately prepare students to follow the theoretical arguments presented in this book. Well aware of this state of affairs, Melinda has provided an admirably concise account of most of the ideas needed to fill the knowledge gap. Her treatment is necessarily mathematical and covers such topics as the Dirac notation, angular momentum, density operators, spherical tensor operators, Wigner rotation matrices, and time-dependent perturbation theory.

It would be virtually impossible to give a quantum mechanical account of NMR that would satisfy every reader. Melinda follows the modern trend by using Dirac bras and kets to represent spin states, density operators to represent many-spin systems and spherical tensor operators to express the various interactions to which nuclear spins may be subject. The idea, however, that spherical tensor operators can also be used as a basis set for the density operator (ie to represent the spin system itself) is introduced with hardly any elaboration in the last chapter, as part of the discussion of 2H NMR spectra. Certain topics, such as: quantum mechanics and NMR, the NMR spectrometer, average hamiltonian theory, the dipolar hamiltonian in terms of spherical tensors, and the analysis of the REDOR experiment, are presented in boxes, some of which are up to 10 pages in length. Some of these topics could possibly be omitted at a first reading, but the reader is given no advice about this. There are also two useful appendices: one gives the NMR properties of commonly observed nuclei and the other the general form of a spin interaction hamiltonian in terms of spherical tensors.

The content is generally clearly written in a scientific style that is readable and easy to understand and the many line drawings help to clarify the arguments. The theory of each experiment is described clearly in detail and therefore graduate students and other research workers ought to find the book digestible and a useful stepping stone between elementary textbooks and research papers. The book could be used as a text on an advanced undergraduate spectroscopy course, but it does lack some of the characteristics commonly associated with student texts. There are, for example, no end-of-chapter quizzes, or problems, or worked mathematical examples and no use of colour. On the other hand, an adequate list of references to research papers follows each chapter. Greater use could have been made of real spectra, not only to illustrate how the values of parameters are extracted, but also to show how this information is used to add to our knowledge about the materials being studied. Despite the statement in the Preface that this book is intended to provide the necessary background for those wishing to use solid-state NMR to solve problems in chemistry, biochemistry, materials, geology and engineering, readers other than chemists may be disappointed at the lack of illustrative examples drawn from their area. For example, neither polymers, nor non-crystalline materials nor minerals (except for coesite) are mentioned. This was possibly a deliberate decision, in order to keep down the size and cost of the book, which is competitively priced compared with the other two or three books in this, rather specialized area.

In summary, this is a well-written book, with a rigorous treatment of many areas of solid-state NMR, but it may be more useful as a graduate text or researcher's reference than as a book to accompany an undergraduate course.

Tom Halstead

Learning To Teach In Higher Education

Subject area
General.

Description
This book is an introduction to the practice of university teaching and its underlying theory.

Authors
Paul Ramsden.

Publishers/Suppliers
RoutledgeFarmer (http://www.tandf.co.uk/books).

Date/Edition
2003/2nd Edition.

ISBN
0-415-30345-1.

Level
HE teachers.

Price
£24.99.

Summary Review

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

When the first edition of **Learning and Teaching in Higher Education** appeared in 1992 I suspect that many subject specialists paid little attention to generic books dealing with teaching and learning. However much has changed over the past decade and few university teachers can continue to doubt that such books are written for them. The amended and extended second edition of this book by the Director of the Higher Education Academy is well timed, and I started to read the book with high expectations. I was not disappointed. The book addresses the role of teaching in promoting learning in a thoughtful and erudite manner, is well written with few typographical errors and is free of jargon that would make difficult reading for the non-specialist in education.

Unlike many recent publications on teaching this book neither discusses specific approaches to teaching nor does it resort to offering simple tips for a quick fix to improve student learning. Rather it takes the philosophical approach that to improve student learning we must first understand how students learn and then adopt our teaching to support this process. Rather than tell readers how to teach the book seeks to help them find their own solutions through evidence based practice. Emphasis is placed on the need to teach and assess for understanding so as to encourage deep rather than surface approaches to learning. The book holds out the promise that we can all improve our teaching but stresses that this will be neither easy nor rapid. In Ramsden's words "Learning to teach is a process that never ends". If we are to improve as teachers we are told, we must continually reflect on the effect of our teaching on our students' learning and amend our practice appropriately. It is not enough, Ramsden emphasises, that our students are learning better; we must also seek to understand why this is so if improvements are to be maintained and built upon.

The book consists of 12 chapters arranged in three sections dealing with 'Learning and teaching in higher education', 'Design for learning' and 'Evaluating and improving quality'. Each chapter is introduced by a relevant and provocative quotation and carries a clear message. Although the bulk of the discussion is of a somewhat generic nature this is well reinforced by a number of case studies of good practice from a range of disciplines that are revisited from time to time throughout the book. The real strength of the book is the holistic, often synergistic, way in which learning, teaching, assessment, quality, evaluation and curriculum development are all interrelated. The importance of consistency in the aims of the individual lecturer, the course, the department and the institution is also clearly developed. Failure to recognise and reward good teaching is recognised as a major obstacle to institutional progress. The author suggests that Quality Assurance has degenerated into a tool of control but argues that academics should take ownership of the process and use it to drive improvements rather than resort to futile opposition.

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Newtownabbey
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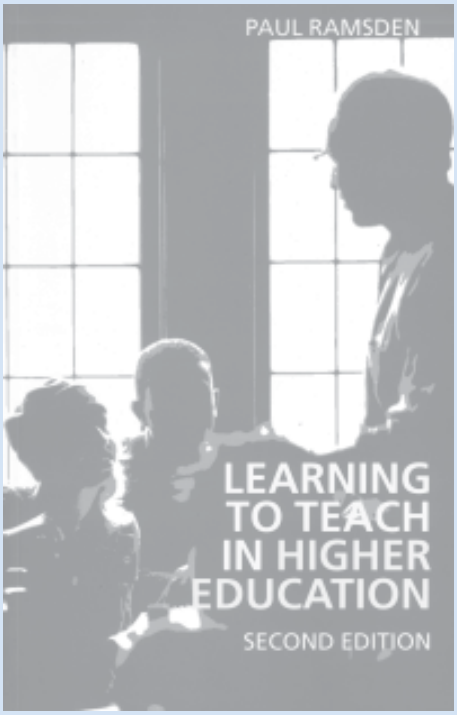
September 2005

Learning To Teach In Higher Education



From the publisher...

Learning to Teach in Higher Education

By Paul Ramsden

This bestselling book is a unique introduction to the practice of university teaching and its underlying theory. This new edition has been fully revised and updated in view of the extensive changes which have taken place in higher education over the last decade and includes new material on the higher education context, evaluation and staff development.
The first part of the book provides an outline of the experience of teaching and learning from the student's point of view, out of which grows a set of principles for effective teaching in higher education. Part two shows how these ideas can enhance educational standards, looking in particular at four key areas facing every teacher in higher education: Organising the content of undergraduate courses, Selecting teaching methods, Assessing student learning, Evaluating the effectiveness of teaching.

0-415-30345-1 288pp 2003 £24.99

While the author suggests that the book is suitable for both new and experienced lecturers I suspect that it is likely to be more useful for the latter. New lecturers, as I remember well, find it difficult initially to appreciate the magnitude of the problems involved. This probably accounts in part for the criticism new lecturers are now expressing at having to take courses on teaching, though to my jaundiced eye they are likely to benefit considerably from them.

I enjoyed reading this provocative book and learned something through reading it. More importantly it made me think a lot about my own teaching and this surely is the key point. To any lecturers who wish to improve their teaching and are prepared to work at it, which surely should include us all, I recommend reading Paul Ramsden's stimulating book as an excellent first step.

Lecturing: A Practical Guide

Subject area
General.

Description
This text is designed to help new and experienced lecturers in the art of lecturing.

Authors
Sally Brown and Phil Race.

Publishers/Suppliers
Kogan Page Ltd ((http://www.tandf.co.uk/books).

Date/Edition
2002.

ISBN
0-7494-3671-9.

Level
HE teachers.

Price
£22.99.

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

Like their previous books (such as *The Lecturers Toolkit* and *2000 Tips for Lecturers*), this book contains some excellent advice on how to lecture, for both new and experienced lecturers, but more importantly Sally Brown and Phil Race use a clever approach to make you examine your own lecturing style through the eyes of those that attend your lectures.
Specific anecdotal accounts and quotes frequently found in books on lecturing are replaced by a series of fictional characters that epitomise the skills and flaws of many of us that choose to lecture, and examples of how students feel and react to each personality and style.

At first the characters seemed a little over the top, but many of the traits were instantly recognisable when remembering back to my days as a student. Over the course of the book I found myself relating to some of the concerns and troubles of the various characters, and found the student responses and advice from the authors very interesting.

After the fictional lecturers are introduced, the authors take a step back and ask; “What is lecturing?” and use the responses from a large number of people with a range of backgrounds to show that the answer really does depend on whom you ask. The answers from students range from those obviously inspired, to those that were left lifeless, but the same diversity in enthusiasm is found in lecturers themselves. According to one, lecturing is “a form of posturing in front of people anxious to maintain the illusion they are still awake”. I’m glad that I’m not in that class!

The fictional lecturers return to address the issue of why we give lectures, and the authors also provide their perspective on this question in the context of the changing education system and calls by some to remove lecturing from the way we teach. Subsequent chapters address what you and your students can each do before, during and after lectures, and linking lectures to other activities for the best teaching and learning outcomes

As noted in the elegant foreword by Donald Bligh, the book covers important topics that receive very little focus elsewhere in the literature, such as the chapter on disabilities. Bligh cites a section on lecture room architecture as another example, but I felt - when reading the book from start to finish - that this early section stalled the initial momentum of the text, although I use lecture rooms that cannot be modified in the ways the authors suggest; others may find this section interesting. Furthermore, the style of this accessible book encourages the reader to select and then later return to sections of interest when the need arises. The references and further reading contains a number of useful and up-to-date resources. Finally, take note of the postscript, in which the characters each give a review of the book, which serve as a humorous reminder about how easily one can dismiss good advice. I recommend this book to all lecturers.

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May 2005

Light Vision Color

Subject area
General Science.

Description
A broad interdisciplinary approach combining the fundamentals with the most recent developments in vision science.

Authors
Arne Valberg.

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

Date/Edition
2005.

ISBN
0-470-84903-7 (pbk).

Level
Undergraduate, research.

Price
£34.95.

Brian James
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School of Computing Science and Engineering
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November 2005

Summary Review

range: * poor to ***** good

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

The author has written this book as a resource for students of subjects such as ophthalmology, optics, biophysics, medicine and cognitive science. The author's intention is to provide a broad introduction to vision science. The physics content is limited to an introduction to the geometrical optics necessary to understand imaging in the eye and chapters on 'Color' and 'Color vision' that deal with the quantitative aspects associated with the measurement of colour and the qualitative aspects of colour as a visual experience. The other chapters in the book after the 'Introduction' cover 'Physiology of the eye', 'Sensitivity and response' (of the eye), 'Neural correlates' and 'Brain processes'. As is clear from the contents this is not a physics textbook but it is a useful book that could be read by both physics students or graduates who wished to understand more about vision science or image processing. The 18 page glossary provides a useful reference for the terms used in the main text.

The book is clearly written and well presented in an easy to read style with extensive reference to related work and the source of the topics discussed. The content is appropriate to the intended readership but this readership is not made clear by the title which is too general and might be used for books with very different content. It would be appropriate to add the words "an introduction to vision science" to the title to make the intended audience clearer. Many parts of this book could also find a place amongst the genre of 'science for a wider public' books that have proved so successful in recent years - although the wide use of simple mathematical expressions in parts of the text may be too much for this readership.

The introduction contains many visual illusions that are used to show the difference between seeing and cognition. In chapter 2 with the title 'Optics' a paragraph about the disturbance of mans diurnal rhythm by changes in daylight and night indicates the broad inclusive nature of the contents. In the same chapter when describing the colour temperature of a light source the explanatory statement 1 K = - 273 ºC is at best inaccurate and at worst confusing. It would be more correct to say 1 K = 1 ºC and that a temperature of 1 K is approximately equivalent to a temperature of - 273 ºC. Further on, when describing the chromatic doublet, the author is initially careful to say "it is possible to combine two lenses in such a way that the aberrations of one lens are to some extent cancelled by the aberrations of the other(s)". But at the end of the paragraph it is stated incorrectly that the achromatic doublet is free of chromatic aberration.

I am less well able to comment on the accuracy of the content of other chapters although I did find the chapter on 'Color' inconclusive in the difficult subject of the choice of colour description and measurement system, an area that is still unsettled. The inaccuracies mentioned above do not greatly detract from the usefulness of the book for the purposes intended by the author but they do raise concern whether other inconsistencies, inaccuracies or approximations are present in the text elsewhere. It is hoped to be that those mentioned are corrected in future editions.

Liquid Chromatography-Mass Spectrometry: an introduction

Subject area
Analytical chemistry.

Description
Undergraduate text giving an introduction to principles and practice of LC-MS.

Authors
Robert E Ardrey.

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

Date/Edition
2003/1st Edition.

ISBN
0-471-49801-7.

Level
Undergraduate.

Price
£32.50.

Simon W Lewis
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July 2005

After a long gestation, liquid chromatography-mass spectrometry is maturing into an extremely powerful technique, with a rapid growth in applications. This book is therefore timely, as it can be expected that this analytical technique is only likely to become more widespread.

Summary Review

range: * poor to ***** good

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

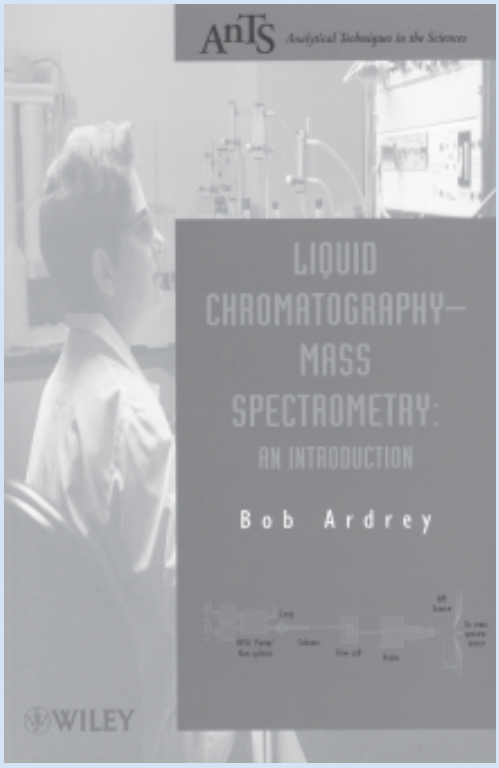
The book is part of the 'Analytical Techniques in the Sciences' (AnTS) series, a follow on from the earlier 'Analytical Chemistry by Open Learning' (ACOL) books. For those unfamiliar with these texts, they are aimed at undergraduate students, particularly those who cannot pursue traditional courses. The texts are intended to be user-friendly, with helpful additions such as learning objectives, chapter summaries and frequent questions (with responses). This is certainly true of this book as it is written in a straightforward clear style.

The book itself is divided into five chapters. After an introductory chapter, chapters 2 and 3 give brief overviews of liquid chromatography and mass spectrometry. Chapter 4 deals with the heart of the LC-MS system, the interface, while Chapter 5 deals with applications LC-MS and also method development.

Chapters 2 and 3, which deal with descriptions of HPLC and MS are not comprehensive. However, as the author points out in his preface, they were not intended to be. Instead they lay the groundwork for an understanding of the hyphenated technique. In Chapter 4 a number of interfaces are described, with the relevant advantages and disadvantages being discussed. The chapter highlights two forms of interface, electrospray and atmospheric-pressure chemical ionisation, in particular as these are the most widely used interfaces. Earlier interfaces are included from an historical point of view, this is useful as it shows the difficulties that needed to be overcome for LC-MS to take off.

Chapter 5 begins with a brief description of method development, including an overview of experimental design and choice of electrospray or ACPI before diving into applications of LC-MS. This chapter makes up almost half of the text (105 pages out of 234 excluding responses to questions and the index) and is probably the most useful part of the book. A key objective of the authors in the examples chosen was to demonstrate that the combination of the two techniques is more powerful than HPLC or MS used in isolation. Illustrative examples are drawn from the key areas where LC-MS has had an impact including analysis of biopolymers (proteins, enzymes, amino acid sequencing) and small molecules (combinatorial chemistry, target compound analysis, drug metabolites). The use of LC-MS for quantification is also dealt with using examples from toxicology and DNA analysis. One surprising omission (considering the author's background) is the area of forensic science, where there has been much interest.

Liquid Chromatography-Mass Spectrometry: an introduction



From the publisher...

Liquid Chromatography – Mass Spectrometry: An Introduction

By Robert E Ardrey

First explaining the basic principles of liquid chromatography and mass spectrometry and then discussing the current applications and practical benefits of LC-MS, along with descriptions of the basic instrumentation, this title will prove to be the indispensable reference source for everyone wishing to use this increasingly important tandem technique.

First book to concentrate on principles of LC-MS
Explains principles of mass spectrometry and chromatography before moving on to LC-MS
Describes instrumental aspects of LC-MS
Discusses current applications of LC-MS and shows benefits of using this technique in practice

0-471-49801-7 296pp 2003 £32.50

Each chapter has a list of references (particularly important for Chapter 5) with the most recent being ca 2002 and there is an extensive bibliography including useful websites and journals. The self assessment questions (with responses are at the back of the book) and discussion questions (with responses within the text) are a useful guide to understanding of the material. From the sample reviewed, the responses are accurate and helpful.

Overall this is an excellent book, well suited to its target audience of undergraduate students. It will also be a useful resource for teachers (particularly the examples in chapter 5). It will also be helpful for postgraduate researchers, as attested to by the PhD students I showed the book to, who need to come to grips with this technique as part of their project. Highly recommended.

Making Learning Happen: a guide for post-compulsory education

Subject area
General.

Description
This book provides an accessible and practical discussion of teaching and learning for the post-compulsory sector of higher and further education.

Authors
Phil Race.

Publishers/Suppliers
Sage Publications (http://www.sagepub.co.uk).

Date/Edition
2005/2nd edition.

ISBN
1-4129-0709-8.

Level
Teachers.

Price
£19.99.

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October 2005

Summary Review

range: * poor to ***** good

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

I have just received for review the most recent book by Professor Race, who is without doubt a master of intelligent simplicity. The book may seem to be innocent of theory, but a serious understanding of the needs of learners is clear behind every page. The approach is to make sense of the collated feedback from thousands of students and teachers, gleaned by questions asked during workshops and seminars; Race is very persuasive about the value of listening to what learners and teachers say. He deals with learners' perceptions of how they learn and how they were aided, whether by their own efforts, peers, teachers, or other factors, and then relates these to a very small tranche of theory.

These are the 4 questions that he has asked people, and around which the early chapters revolve (p 20):

'Four questions about your own learning'
Please use this page to revisit four aspects of your own learning. The first part of each of the four questions which follow is to get you thinking about particular instances in your own learning. The second part of each question asks you to put pen to paper to capture some of the processes which led to the success - or otherwise - of the respective instances of your learning.

1. Think of something you are good at - something which you know you do well. (This may be an academic subject, but equally could be a hobby or skill - in short, anything at all that you're good at.)

Next, jot down a few words about 'how' you became good at this.

2. Think of something you feel positive about - something which you like about yourself. This could be anything about yourself which you're proud of.

Now jot down a few words about how you 'know' that you can be proud of this - in other words, upon what evidence is this positive feeling based?

3. Think of something which you don't do well! This could be the result of an unsuccessful learning experience, maybe long ago or maybe recently. If you've nothing in this category, you can miss out question 3 - no one has so far, however!

Now jot down a few words about each of the following: what went wrong, do you think, in your learning relating to this thing you do not do well? And who, if anyone, might have been to blame for this?

4. Think of something you can indeed do well, but that you didn't 'want' to learn at the time you learned it. This could be something like 'driving', 'swimming', 'cooking' or, equally, it could relate to a particular area of academic study - perhaps 'statistics' or 'economics' and so on. Whatever it is, you're probably pleased now that you succeeded with it - it's likely to be useful to you now.

Making Learning Happen: a guide for post-compulsory education

Finally, jot down a few words about what kept you going, so that you did indeed succeed in this particular episode of learning.

Now that you've answered the four questions and noted down your own replies to the second parts of each of the questions, look back over your answers and see if you can pick out what these answers can tell you about how you yourself learn best - and, indeed, worst.

After pausing to reflect on your learning as illustrated by these four facets of it, please press on to read my account of most people's answers to the same questions. You can then compare to what extent your answers are mirrored by those of other people.

On the basis of responses, Race offers 5 key learning factors which, as he admits, are nothing new, except that they are so lucidly and persuasively presented in simple language. In effect, he is referring to intrinsic and extrinsic motivation, repetition or trial and error, support through feedback, and uptake or processing. Nothing is gone into very deeply, and so there is no actual discussion of any of these beyond what commonsense gives ready acceptance to. All Race's work is based on solid commonsense, and that in my view is his great strength. His books may give a first impression of being superficial, but they are not intended to contribute to theory. Of course, titles like:
How to Win As a Final Year Student, Essays, Exams, and Employment, 2000, Paperback
Lecturer's Toolkit, The, A Practical Guide to Learning, Teaching and Assessment 2001, Paperback
may make some academics cringe, and indeed there is little theoretical justification to be found in the present book.

For instance, Race acknowledges (p 42) the important recent critique of the learning styles fashion (Coffield et al[1]; Reynolds[3]) but offers only two quite simplistic responses, saying, first, that his questioning of learners is intended to "get *behind* (sic) learning styles into the factors which underpin successful learning" (p 44) and, second, that his goal is to raise awareness. Even if one wished to take issue with him, and argue that the first is pretty well meaningless, while the second is at best unfounded, and at worst ignores the negative effects of awareness in some contexts, one is still left with considerable uncertainty about the actual value of collecting impressionistic data (Johnson[2]; Reynolds[3]).

That said, there is an enormous amount of practical, useful material in this book. It is replete with lists, charts, bullet points, pithy hints, and guidelines that cover:

- 100 questions about learning along with automated feedback on the possible replies and a scoring system;
- 20 points about good study skills;
- extensive ideas about teachers' problems and solutions to assessment headaches;
- ways of managing teaching, including:
- formative feedback,
- large and small learner groups, including advice on the difference between note-making and note-taking during lectures
- workshops;
- diversity (with special reference to SENDA);

and even short chapters on:

- employability;
- e-learning (though this is the weakest, self-evidently not derived from true engagement).

Overall, I will not be in the least surprised if this book is a runaway success.

References

1. Coffield F, et al 'Learning Styles and pedagogy in post-16 learning: A systematic and critical review'. Learning Skills Research Centre (2004) . The full work was, and may still be, freely available from: http://www.lsrc.ac.uk/publications/index.asp
2. Johnson, R 'The Authority of the Student Evaluation Questionnaire' *Teaching in Higher Education* **5**(4) pp 419-434 (2000).
3. Reynolds, M 'Learning styles: a critique' *Management Learning* **28**(2) pp115-33 (1997).

(All references, unless otherwise indicated, are to this book.)

Mathematics for Physical Chemistry

Subject area
Physical Chemistry, Mathematics.

Description
This book is intended to introduce students taking physical chemistry at undergraduate level to the appropriate range of mathematical topics essential for a proper understanding of their subject. The emphasis is on applications to physical chemistry rather than mathematical theory.

Authors
Robert G Mortimer.

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

Date/Edition
2005/3rd Edition.

ISBN
0-12-508347-5.

Level
Undergraduate.

Price
£27.99.

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TA1 1DZ
October 2005

Summary Review

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

Although there are many mathematics textbooks at undergraduate level which support the physical sciences, there are few aimed specifically at the area of physical chemistry, so an update of the 1999 edition of this book is welcome. The book is divided into 11 chapters, the first 5 of which are intended mainly as revision material, with the remainder introducing topics more likely to be new to the student. The first 10 chapters provide a set of mathematical topics which contain much of the essential material needed by the student. There are many examples from various areas of physical chemistry. It is essentially a physical chemist's view of the relevant mathematics. The final chapter, on the treatment of experimental data, is really a short statistics course for chemists.

Each chapter is well organised, starting with a brief list of the principal facts and ideas plus a list of objectives, and ending with a short summary of the main conclusions. There are problems set within the text and also a further set at the end of each chapter. Unfortunately, there are no answers given to these, which may reduce the usefulness of the book for self study, one of the objectives stated in the preface. Some chapters have sections using the software *Mathematica* (Wolfram Research Inc.), although this is not essential for the appreciation of the topics covered. I think that in many cases alternative software, e.g., *Mathcad*, *Maple* or *Derive*, could be used instead.

There are a number of trivial and typographical errors in the text. More significant errors are indicated under the appropriate chapter headings below.

Chapter 1: 'Numbers, Measurements and Numerical Mathematics'. This is an elementary account which covers topics which are sometimes neglected by students, such as the number of significant digits to quote, and handling combinations of SI units in lengthy calculations.

Chapter 2: 'Symbolic Mathematics and Mathematical Functions'. This deals with the manipulation of algebraic and trigonometric functions, vectors and coordinate systems, complex numbers and problem solving using symbolic mathematics. The treatment of all topics is quite concise, emphasis being placed on the use of formulae rather than on their derivation. DeMoivre's formula, on page 47, is more often used in a form avoiding the exponential term. It might have been helpful to give both versions here. Also I think the solution to Example 2.13 (b), page 47, should evaluate to 16i, whereas the answer given does not.

Chapter 3: 'The Solution of Algebraic Equations' covers algebraic, graphical and numeric solutions of equations with one or two unknowns. Several of the examples are taken from areas of chemistry such as acid/base equilibria and the molar volumes of gases. Graphical methods incorporate the use of spreadsheets such as Microsoft *Excel*. Some numerical and symbolic calculations here employ *Mathematica*.

Mathematics for Physical Chemistry

Chapter 4: 'Mathematical Functions and Differential Calculus'. This is a good straightforward account of elementary differential calculus, with some of the problems relating to physical chemistry. The emphasis is on application rather than theory.

Chapter 5: 'Integral Calculus'. Topics include antiderivatives of functions, an outline of the process of integration, calculation of the area under a curve, indefinite integrals, improper integrals, methods of integration, and numerical integration. The chapter concludes with an account of probability distributions, particularly illustrated with the Gaussian distribution of molecule speeds in gases.

Chapter 6: 'Mathematical Series and Transforms'. Tests for convergence and divergence in various types of series are given, including, as an example, the molecular partition function. Maclaurin and Taylor series are introduced and examples given in some areas of chemistry, eg, non-ideal gas behaviour and colligative properties. There is a short account of Fourier and similar functional series: an example involving quantum mechanical operators is briefly introduced. The chapter concludes with an introduction to Fourier and Laplace transforms.

Chapter 7: 'Calculus with Several Independent Variables'. Both differential and integral calculus are included and the chapter ably covers most of the areas that would be expected. Much of the material is discussed in relation to either thermodynamics or to quantum mechanics and should hold the student's interest because of this. The chapter has sections on vector derivative operators using Cartesian, spherical and cylindrical coordinate systems and on the determination of maximum and minimum values of functions.

Chapter 8: 'Differential Equations'. Analytical methods for solving a variety of types of differential equation are discussed and related to oscillating systems using Newtonian mechanics. The chapter concludes with a short account using numerical methods. There are fewer direct references to areas in physical chemistry in this chapter, but connections should be apparent to the student.

Chapter 9: 'Operators, Matrices and Group Theory'. An important aspect of this chapter is the introduction of symmetry operators and their relation to the symmetry elements of simple molecules. The section on matrix algebra is straightforward, but Example 9.10 (pages 286-7), to find the inverse of a matrix, appears to be wrong. I believe the answer at the bottom of page 287 should be [0,1,-2;1,-2,4;-1,2,-3]. This would also affect Exercise 9.16 on page 288.

Chapter 10: 'The Solution of Simultaneous Algebraic Equations'. This is a short chapter, introducing the methods available, concluding with an introduction to the use of *Mathematica* for this purpose.

Chapter 11: 'The Treatment of Experimental Data'. This is a valuable addition to this text and relates directly to the abstraction of properly assessed data from project work and other sources. It is quite a long chapter and can be taken on its own without much reference to the remainder of the book.

In conclusion this is a well organized text in the application of mathematics to physical chemistry. It should retain the interest of students by its well set out objectives and by many examples taken from areas within physical chemistry. Apart from the errors noted above, there are several trivial and typographical errors. This should not detract from the overall value and usefulness of the book.

Minor and typographical errors found in the text:

Page 17, line 6: The argument has 5 significant digits not 4.

Page 128, last line in solution to Example 5.6, should be-

$$-(1)-[-(1)] = 0$$

Page 133, line 1: -f(a) should be –F(a)

Page 161, Equation 6.7b should have 'a' not 'ar' outside the bracket.

Page 162: The use of 'a' after the summation signs does not seem to be consistent with its use in Equation 6.9 at the top of the page.

Page 164, Example 6.4: The limits on the actual integral sign should be infinity and one, not zero and one.

Page 175, Example 6.12: I think there is an integral sign missing in the term after the first equals sign.

Page 203, Equation 7.32: M(x, y, z) not M(x, v, z).

Mechanism and Synthesis – The Molecular World

Subject area
Organic Chemistry.

Description
This is a self-study illustrated text with interactive CDROM; final book in second level OU course.

Authors
Peter Taylor (ed).

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

Date/Edition
2002.

ISBN
0-85404-695-X.

Level
Undergraduate.

Price
£27.50.

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University of Ulster
Newtownabbey
Co Antrim BT37 0QB
November 2005

Summary Review

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

This is the 8th (and final) book 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[1,2,3,4,5]. There is a very useful CDROM which installs easily and contains all the required software for viewing figures and drawing organic molecular structures.

Throughout the book (about 350 pages), synthesis is emphasised, and there is a further emphasis on understanding why reactions occur by considering their mechanisms. There is extensive use of colour both for curly arrows and for active sections of molecules in the numerous clearly drawn diagrams. This is very effective, although I found the (rarely used) yellow difficult to see in artificial light. Throughout the chapters there are formative questions with answers supplied. There are very useful summary tables and charts at the end of each part of the book and more questions (with answers) on the CDROM.

Part 1 considers carbonyl compounds: nucleophilic addition (aldehydes and ketones) and nucleophilic addition/elimination (mostly carboxylic acid derivatives). Images of charge distribution in the bonds are derived from software introduced elsewhere[3] but are easy to understand. Knowledge of hybridisation, pi-orbitals and curly arrows is assumed but briefly reviewed. Nucleophiles are grouped as carbon-, hydrogen-, oxygen- or nitrogen-nucleophiles and the catalytic effect of H^+ is emphasised. The effect of the presence (or absence) of a good leaving group on the outcome of the reaction is extensively discussed. The CDROM has an excellent review of carbonyl chemistry from a mechanistic point of view.

Part 2 extends the reactions of carbon nucleophiles with carbonyl compounds by considering Grignard, organolithium and organocopper reagents. There is also a brief description of organoboron compounds as an alternative source of alcohols. The complex structures of the organometallic reagents are briefly referred to, but it is emphasised that they are effectively sources of R^- and can be treated as RMgX, RLi or R_2CuLi with a polar metal-carbon bond. Again, electron distribution images of carbonyl substrates are used to emphasise where nucleophilic attack is likely to occur. Reactions with other substrates such as carbon dioxide, nitriles and oxiranes are also described. The need for dry polar solvents for the reaction, followed by suitable work-up, is discussed. In addition to the usual summary charts there is a useful comparison table of reactions which are of synthetic utility. The questions within the text are again supplemented by a set of questions on the CDROM; some of the latter, as usual, require the student to input molecular structures using the *Java Molecular Editor* software. The JME is a stimulating aid to learning structures, although a little difficult to master at first; it requires all structures to be drawn in 'stick' format, so it is a pity that the structures drawn in the CDROM questions themselves use a slightly different presentation. This can sometimes lead to confusion about the length of carbon chains.

Mechanism and Synthesis – The Molecular World

Part 3 shows how radical reactions can be used for synthesis. Fish-hook arrows are used to explain chain reactions such as alkane chlorinations, and site selectivity is discussed. Tributyl tin hydride is then introduced as a reagent for selectively performing both inter- and intra-molecular radical reactions on alkenes.

Part 4 is the largest one and is entitled 'Strategy and Methodology in Organic Synthesis'. The main theme is retrosynthetic analysis, and again colour is used effectively to show how a complex molecule can be theoretically broken down in various ways into pairs of nucleophilic and electrophilic synthons which can be related to actual reagents. A large number of examples are given, featuring a wide range of classes of compound. There is a very good CDROM activity that gives the student practise at spotting C-C and C-X disconnections and identifying Functional Group Interconversions. The synthons have to be correctly labelled with their charges and the appropriate synthetic reactions selected from data tables. It is sometimes difficult to work out which reaction should be selected, eg for the conversion of a haloalkane plus a ketone into a compound containing a new C-C bond, the program expects the student to select a reaction to form a Grignard reagent rather than looking for the reaction of a ketone with an organometallic. However, all the facts given seem to be correct. The book continues with other considerations in synthesis, eg selectivity, protecting groups, yields and costs. There is an extensive set of questions on the CDROM which revises part 4 and uses the JME. I found a few minor errors in the electronic responses, but the main answers given are correct.

Part 5 compares laboratory synthesis (by retrosynthetic analysis) with natural biochemical pathways. Terpenes and Steroids are chosen to illustrate the principles. This is very well presented with extensive use of colour to show how sections of molecules link together; however I did notice that the colours allocated to the five-carbon head and tail sections of growing terpenes became interchanged from one section to the next. The function of ATP and the importance of the phosphate leaving group is clearly brought out.

The final part is a case study on polymer chemistry. A brief history is followed by a table of common polymers and then the mechanisms of step growth and radical chain growth polymerisation. The design of polymers is discussed and this leads to polyacrylamide gels for electrophoresis and hydrogels for contact lenses. There is a video sequence to illustrate the latter.

I found this book and CDROM very stimulating. Throughout the book there are boxes giving thumbnail biographies of key researchers and boxes describing the sources of natural products. The full selection of topics in the six parts 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. Mortimer, M and Taylor, P, 'Chemical Kinetics and Mechanism'.
3. Moore, E, 'Molecular Modelling and Bonding'.
4. Taylor, P, and Gagan, M, 'Alkenes and Aromatics'.
5. Smart, L, 'Separation, Purification and Identification'.

All published 2002 by OU & RSC and reviewed in *Physical Sciences Educational Reviews* **6** (2003).

Organic Synthetic Methods

Subject area
Organic Chemistry.

Description
RSC tutorial text aimed at second year undergraduate chemistry students.

Authors
James R Hanson.

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

Date/Edition
2002/1st Edition.

ISBN
0-85404-682-8.

Level
Undergraduate.

Price
£14.95.

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October 2005

Summary Review

range: * poor to ***** good

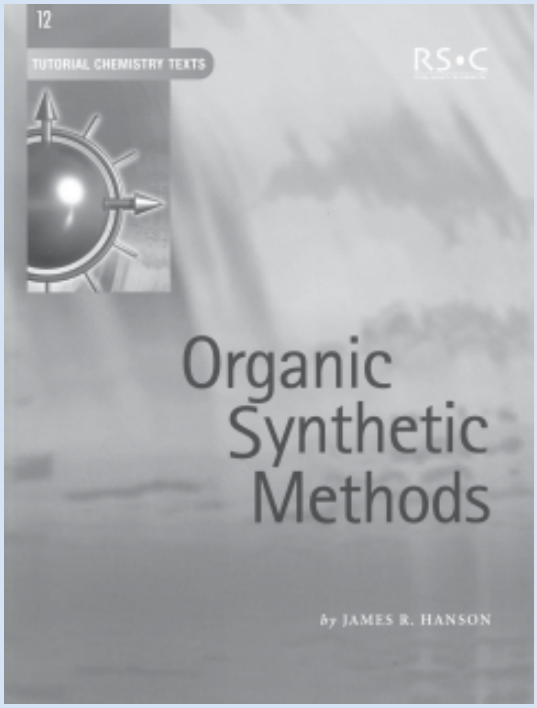
Academic content	*****
Usefulness to student	*****
Usefulness to teacher	*****
Meets objectives	***
Accuracy	*****

Organic chemistry is a discipline that can be broadly divided into two areas; the principles associated in appreciating the shape and reactivity of molecules and functional groups, and the methods of performing transformations of these species. Since the principles necessarily describe what is going on in any transformation, the latter can be used as an effective tool to reinforce the important concepts. In his book **Organic Synthetic Methods**, James Hanson attempts to provide an overview of many synthetic processes together with rationales for reactivity and selectivity.

The book itself forms part of the Royal Society of Chemistry's 'Tutorial Chemistry Text' series, aiming to provide 'bite-sized' chunks of chemistry at affordable prices to the student. Adopting the same approach as other books in the series the book is small and easy to handle, and makes use of margins to include important notes and concepts. Colour is limited in use throughout, but it is effective in illustrating key points. I personally did not like the mixed use of shorthand structural diagrams throughout since students should be able to use the abbreviated or skeletal representation competently at this level. However, one of the most important advantages it has over similar books is the use of worked examples throughout, together with end of chapter questions with answers at the end of the book. This means that the student can use this book as an additional resource to the lecture course they are attending, with the appropriate level of information, questions and feedback to give them independence in their studying and confidence in their ability.

The book deals with the rather daunting task of tackling a topic as large Organic Synthetic Methods in a pretty reasonable way. Chapter 1 introduces the basic concepts involved in designing and planning a synthesis, and defines some of the basic vocabulary of the synthetic chemist. This is a pretty tall task and one which I do not think the book tends to spend long enough discussing. Most students, even those who are good at synthetic organic chemistry, find retro-synthesis very hard. Thus, I would like to have seen a much more comprehensive section on the principle of retro-synthesis here. Chapter 2 moves on to look at carbon-carbon bond formation, reviewing quite briefly what are basic concepts, and ploughing straight into organocopper reagents, palladium catalysed cross coupling, and directed orthometallation. Chapter 3 then moves to examine enolate chemistry, including alkylation, condensation and aldol reactions and I was quite surprised at the level of detail included here, with the conclusion of the chapter dealing with the stereochemistry of aldol reactions, a quite demanding topic dealt with very quickly. Chapter 4 briefly discusses the generation and reactivity of carbocations in important reactions such as Friedel Crafts acylations and a few rearrangements. Chapter 5 then deals with radical and pericyclic reactions, while Chapter 6 examines methods for making carbon nitrogen bonds. Finally Chapters 7-9 deal with functional group transformations, protecting group chemistry and finally some examples of the use of all of this chemistry in some actual target syntheses.

Organic Synthetic Methods



From the publisher...

Organic Synthetic Methods

By J R Hanson; University of Sussex

Synthesis is one of the major endeavours of the organic chemist and the design of a successful synthesis requires a sound knowledge of functional group chemistry stereochemistry and organic reaction mechanisms. Organic Synthetic Methods introduces the major methods of creating carbon-carbon and carbon-nitrogen bonds along with functional group interconversions (oxidation reduction halogenation). The use of protecting groups and solid-phase methods are also discussed. The analysis of the structure of a target molecule in terms of the structural consequences of synthetic reactions is introduced to enable the student to identify key dissections and building blocks and hence develop a suitable synthetic method. Examples of the synthesis of labelled compounds are also provided.

0-85404-682-8 176pp 2002 £14.95

In a nutshell there is wealth of chemistry in this book, but far too much in my mind for a single lecture course or even one year of undergraduate study. The book is targeted at second year undergraduate study, yet there are topics that many students find difficult in their third year. Additionally, there appears to be some inconsistency with the content with some topics being covered in detail, while others are mentioned only briefly. I would rate this as an excellent book but as a revision tool for a student starting a fourth year undergraduate project or a PhD in organic chemistry where they need to get a good overview of lots of areas of organic chemistry in a succinct manner. If aimed at lower ability students I would worry that the volume of information would overwhelm them.

Physics and Chemistry of the Solar System

Subject area
General Science.

Description
This book is a comprehensive survey of the physics and chemistry of the solar system containing information published up to about 2002. It is aimed mainly at second year and above undergraduate and graduate students studying planetary science.

Authors
John S Lewis.

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

Date/Edition
2004/2nd Edition.

ISBN
0-12-446744-X.

Level
Undergraduate, research.

Price
£46.95.

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October 2005

Summary Review

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

Although published in 2004, this encyclopaedic book was written in 2002, so lacks information from the more recent planetary space missions such as Mars Express (ESA) or the Cassini-Huygens (NASA and ESA) mission to the Saturn system. Nevertheless, the undoubted strength of this book lies in its approach, which is to encourage students to assess and interpret data through the rigorous use of physical and chemical principles. As a prerequisite, students are assumed to have completed at least first year courses in mathematics, physics and physical chemistry. The 'Appendices' contain brief outlines of relevant areas such as 'Equilibrium Thermodynamics' which serve as reminders of previous work done.

The style is friendly and encouraging, and sometimes not without humour. The historical backgrounds to the chapters are both apposite and entertaining. Each chapter ends with well thought out exercises, divided up by topic headings relating to specific areas covered. This is also helpful to tutors, who may wish to emphasise specific topics in their courses. The book is well illustrated with many well drawn diagrams, graphs, tables of data, black and white photographs and a set of colour plates.

The author employs mainly cgs units throughout, as much of the literature and many current practitioners in astronomy and related sciences still do not use SI units. The author makes the point that students in planetary science need to be conversant with both old and new systems.

One slight drawback is the absence of selected citations to the original literature within the chapters. Learning to access and abstract data from original sources is an important part of any science degree, and some directed reading here would have been welcome. This omission is mitigated to some extent by the 'Selected Readings' at the end of the book. This contains review articles from which original work could be accessed.

I give below a brief outline of the contents, although it is not possible to mention all the topics covered due to the encyclopaedic coverage of this book.

After an introductory chapter, Chapter II, 'Astronomical Perspectives', starts with an outline of the origin and evolution of the Universe and the synthesis of the lightest elements according to the Big Bang theory. The formation and classification of stars is outlined, as is an account of the nucleosynthesis of the heavy elements. An omission in the text which may be worth mentioning is the absence of the part played by an excited form of carbon, C*, in the formation of carbon-12 in the triple-alpha process (pp 35-36, Equations II.86, II.87 and II.88). Also Equation II.73 on page 30 is, I believe, in error (See page 14, *The Physics of Stars*, Second Edition, by A C Phillips). The overall objective here is to describe the formation and abundance of the elements that eventually formed the Solar System.

Chapter III: 'A General Description of the Solar System'. This is a short but concise survey of the contents and dynamics of the Solar System.

Physics and Chemistry of the Solar System

Chapter IV: ‘The Sun and the Solar Nebula’. The first sections of this significant chapter describe energy product and transport in the Sun, the internal structure, photosphere and chromosphere. The physics of the corona, solar wind and space plasmas leads on to an account of the physics and chemistry of the elements in the Solar System environment. The geophysical classification of the elements is discussed in relation to the physical factors which control the placement and form of minerals within the present and past solar environs.

Chapter V: ‘The Major Planets’. This is a comprehensive account of the physics and chemistry of Jupiter, Saturn, Uranus and Neptune. Internal structure is discussed in relation to the constituents and chemical forms likely to be stable at various depths. There is a detailed discussion of the chemistry and physics of these planets and of the magnetospheres and radiophysics of Jupiter and Saturn.

Chapter VI: ‘Pluto and the Icy Satellites of the Outer Planets’. The application of physics and chemistry to the study of the surfaces and interiors of these icy worlds is described. The planetary ring systems of all four of the gas giants are also discussed. It is a pity that the impressive Cassini-Huygens data could not be included here.

Chapter VII: ‘Comets and Meteors’. After an entertaining historical introduction the author examines cometary orbits and whether they could have been modified in the past by passing stars while in the Oort cloud. This is important as comets are often assumed to be primitive Solar System Material. Evaporation and effects of solar radiation on comet constituents, particularly water, are discussed. Also considered is the behaviour of dust in space. The latter part of the chapter is concerned with meteors and allied phenomena.

Chapter VIII: ‘Meteorites and Asteroids’. This is a substantial chapter emphasising the important role that a study of these objects now has in planetary science. There is a vast amount of information presented here, but the author leads the student through it very ably.

Chapter IX: ‘The Airless Rocky Bodies: Io, Phobos, Deimos, the Moon, and Mercury’. These rather disparate bodies illustrate the very varied physical conditions that exist throughout the Solar System. The internal structure and surfaces are examined in the light of observation and physical principles and reveal quite a few surprises. I found particularly intriguing the evidence for ice near the north pole of Mercury!

Chapter X: ‘The Terrestrial Planets: Mars, Venus, and Earth’. The cogent questions as to why these three planets are now so very different and what conditions prevailed in the past are discussed. All relevant factors are included but the sections on the physics, chemistry and photochemistry of the atmospheres are particularly well covered. There is a relevant selection of images from space missions.

Chapter XI: ‘Planets and Life around Other Stars’. Since this book was written, the number of planets discovered around other stars has increased significantly. This relatively short chapter is important in the general context of planetary system science. The chapter also assesses the importance of brown dwarf stars which may be regarded as super-Jupiter planets.

Chapter XII: ‘Future Prospects’. This is mainly a brief look ahead at possible space missions to Solar System bodies and beyond. Political and budgetary factors are considered.

In summary I found this an excellent book for the intended readership. I found a few errors, but in a book of this size this is not surprising. The price of the book for students is rather high, but this is strongly mitigated by its usefulness and coverage.

Polymer Chemistry: A Practical Approach

Subject area
Polymer Chemistry.

Description
This book aims to provide a detailed and accessible laboratory guide for those who are new to the area of polymer synthesis.

Authors
Fred J Davis (ed).

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

Date/Edition
2004/1st edition.

ISBN
0-19-850309-1.

Level
Undergraduate.

Price
£84.00.

Marie Walsh
Department of Applied Science
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ROI
October 2005

This book is a new volume in the 'Practical Approach to Organic Chemistry' series. It is a relatively small text (250 pages) which contains a wealth of valuable information for anyone interested in or new to polymer synthesis.

Summary Review

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

Fred Davis has compiled a collection of nine chapters from a number of sources in the UK, or collaborations between UK establishments and Germany, China, Sweden, Thailand and the US. Each chapter has been presented by a different group and covers a different topic. It aims to provide a detailed and accessible laboratory guide for those who are new to the area of polymer synthesis. This aim is admirably met and the book should be an essential part of course development in this area.

The first chapter is a general introduction to polymer characterization and includes information on synthesis, particle size analysis and microscopic and other instrumental analyses. Each of the subsequent chapters introduces a different aspect of the topic, provides a number of well-thought out and presented laboratory protocols, and concludes with links to the other areas covered in the book. The protocols are embedded in text which develops the thread of information from introduction to conclusion of each topic. The topics covered are:

- General procedures in chain-growth polymerisation
- Controlled/'living' polymerisation methods
- Step-growth polymerisation - basics and development of new materials
- The formation of cyclic oligomers during step-growth polymerisation
- The synthesis of conducting polymers based on heterocyclic compounds
- Some examples of dendrimer analysis
- New methodologies in the preparation of imprinted polymers
- Liquid crystalline polymers.

The chapter lengths vary as do the number of protocols, but Chapter 2 on chain growth polymerisation contains 18 protocols and references 68 sources, as well as recommending relevant and useful textbooks on polymer science.

Each protocol lists the equipment necessary, materials and methods. Annotations of alternatives for materials or methods are provided for many of the protocols. The protocols also provide essential 'extra' information which is not always found in standard laboratory manuals. For example, there is information and advice about solvent purification, equipment and reaction conditions. Any 'new' equipment prescribed is shown diagrammatically. There are also schematic equations for all processes. The novice will find the assessment of potential problems and hazards helpful, with key advice from MSDS summarised in the materials lists.

This text should be on the shelf of any polymer scientist - an excellent reference text, but also a must for undergraduate polymer chemists and technical support staff.

Quality Issues in ICT-based Higher Education

Subject area
General.

Description
This book is an edited collection of contributions covering a number of issues in the area of 'quality' when using ICT-based approaches in a number of contexts.

Authors
Fallows, S and Bhanot, R (Eds).

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

Date/Edition
2005.

ISBN
0-415-33521-3.

Level
HE teachers.

Price
£22.50.

Gren Ireson
Matthew Arnold Building
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October 2005

Summary Review

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

The text sets out, in chapter one, four main questions that the editors, through the contributors, will address:

- Can the use of ICT-based approaches enhance the quality of learning and teaching?
- Does the use of ICT-based approaches enhance the quality of learning and teaching?
- How does the use of ICT-based approaches enhance the quality of learning and teaching?
- Are we fully enabled to maximise the quality of the benefits that can arise from the use of ICT?

In addressing these questions too few of the twenty five contributors appear to offer any useable measures for lecturers to answer them in their own teaching. I found too little evidence of any structured evaluation of ICT-based approaches against more traditional ones and one could, in the most part, replace ICT-based with, for example, group-based or investigation-based and ask the same questions. The series editors' foreword tells the reader that this text is "the partner volume to Educational Development Through Information and Communications Technology" by the same editors and having not had access to this text I cannot comment on whether it sets the current volume in a better context.

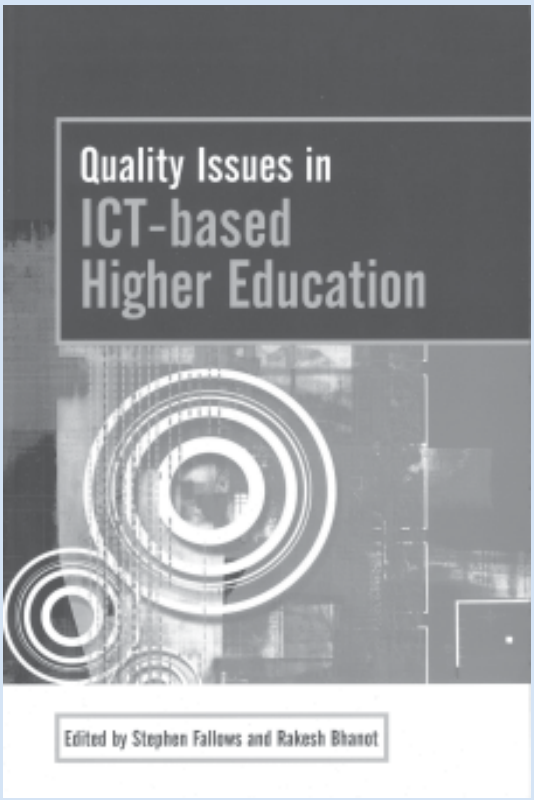
Chapters which address a wide range of issues including e-learning, ICT and the disabled student, e-Mentoring and postgraduate supervisor development are all very readable and relevant in their own right. However, I find it difficult to report on anything which is strikingly novel and I cannot grasp the overall structure of the collected works. I am left at a loss as to how the contributors and chapters came together.

Three chapters of the sixteen on offer, for me, stand out and are worthy of further comment. Chapter fourteen addresses computer anxiety and as someone who delivers an ICT module to first year undergraduates this made a poignant read. Whilst the work discussed relates to the teaching of computer technology the approach is easily mapped onto any other learning environment providing the lecturer with additional skills to support the 'computer-anxious' student. Since I, like many readers, use postgraduate teaching assistants in the computer laboratory this chapter is one to refer them to if only to raise awareness of the issue.

Chapter fifteen addresses the issue of plagiarism or as the authors more aptly call it, countering the on-line 'paper mills'. This chapter guides the reader carefully through the issue of detecting plagiarised papers, tracking down plagiarised papers and combating internet-based plagiarism. I would argue that making students aware of the detection, tracking and combat we, as lecturers, can and are willing to employ will in itself prevent many from trying. If nothing else this chapter provides a number of very useful, web-based, references.

Continued on page 40

Quality Issues in ICT-based Higher Education



From the publisher...

Quality Issues in ICT-based Higher Education

Edited by Rakesh Bhanot, Stephen Fallows

Providing a wide-ranging account of the quality issues surrounding the use of ICT in higher education, this book develops useful advice and guidance on key areas including:

* devising an institution-wide strategy
* developing course materials
* providing distance and e-learning courses
* using ICT-assisted assessment
* adopting professional support processes.

0-415-33521-3 224pp 2005 £22.50

Continued from page 39

Chapter eight, which would be my personal recommendation, addresses ICT and quality in the research process. Unlike chapters addressing learning and teaching this chapter really does deliver. From conducting a literature review to using data analysis software ICT is made central and its benefits clearly articulated. However, the author is also eager to explain that using ICT may result in better research but that it will not cause better research. I my view this is the best chapter of the sixteen and one worth directing both staff and students to.

In conclusion what we get from this text is a wide-ranging account of some of the quality issues surrounding the use of ICT-based approaches to most things from developing institution wide strategies to developing course specific material and computer-based assessment. This coupled with the breadth of contributors should offer something for everyone but as outlined above personally I only found something in three of the sixteen chapters.

Radical Reactions in Organic Synthesis

Subject area
Organic Chemistry.

Description
This book adopts an integrated approach using a few basic principles to explain most types of radical reactions, the emphasis being placed on synthetic applications.

Authors
Samir Zard.

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

Date/Edition
2003.

ISBN
0-19-850241-9.

Level
Undergraduate, research.

Price
£63.00.

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University of Oxford
Chemistry Research Laboratory
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October 2005

Summary Review

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

The gestation period for radical intermediates in synthetic organic chemistry has arguably been the longest of all the reactive intermediates. This monograph, written by one of the most important players in the field in recent years, and dedicated to the most important protagonist it the area, Sir Derek Barton, is a beautifully written, easily read comprehensive account of the development of radicals from chemical curiosity to synthetic necessity.

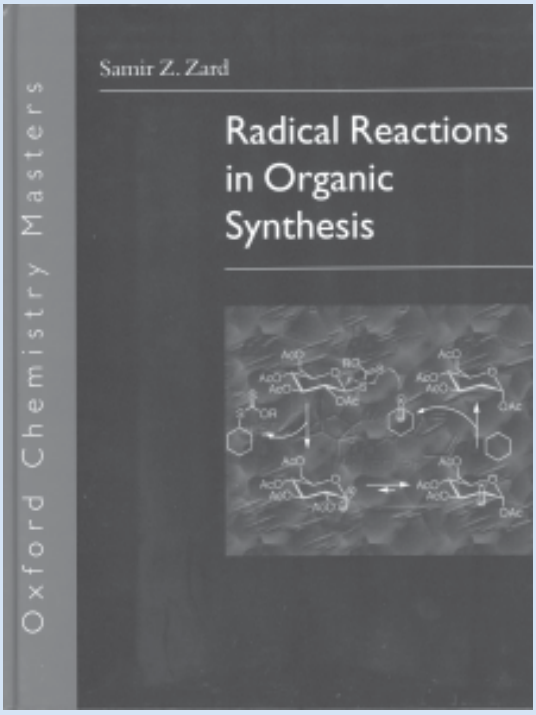
The volume begins with a brief historical overview, which illustrates the crucial importance of serendipity and the extraordinary unwillingness of the chemical community to accept a three valent carbon with an unpaired electron as a plausible structure. A comparison of radical and ionic reactions, the nature of the stability of radicals and radical chain reactions in Chapter 1 is followed in Chapter 2 with a more detailed and very valuable overview of the basics of radical chemistry, covering kinetics, thermodynamics, solvents and concentration effects. This analysis makes use of organostannanes as the prototype, since this area has been the most widely developed and most widely used. The importance of relative and absolute reaction rates are discussed in the context of reduction reactions. A discussion of Barton-McCombie deoxygenation and reduction of C-N bonds is followed by a detailed analysis of inter- and intramolecular radical additions to alkenes, covering the underlying aspects of rates, regio-, chemo- and stereo selectivity and their synthetic applications. The chapter concludes with a specific consideration of oxygen and nitrogen centred radicals. Chapter 3 develops the radical chemistry of stannanes further by considering in detail the opening and closure of small rings, radical rearrangements by 1,2-shifts, ring openings, radical translocations, and fragmentation reactions.

More esoteric and generally less well-applied radical reactions of silicon, germanium, and mercury derivatives are considered in detail in Chapter 4. Ironically, although generally less useful chemistry, the detailed discussion of these systems neatly illustrates the power of organostannane chemistry described in the earlier chapters, and gives a good understanding of the subtle variations which are possible. Nonetheless, important advantages of the other Group IV systems are drawn out. Of interest is the lack of examples of organolead based systems, although these have received scant attention except for work in the area of petroleum additives.

Barton decarboxylation is discussed in Chapter 5 and its mechanism and scope fully explored. Chapter 6 covers radical mediated atom and group transfers (the so-called Kharasch process, and the remaining Chapters 7 and 8 cover non-chain processes and redox process, respectively. The volume is drawn together at the end by a brief conclusion outlining some of the advantages and some of the pitfalls of radical mediated processes. All of the chapters are fully referenced.

Continued on page 42

Radical Reactions in Organic Synthesis



From the publisher...

Radical Reactions in Organic Synthesis

By Samir Z Zard

This book provides a description of radical reactions and their applications in organic synthesis. It attempts to show that armed with an elementary knowledge of kinetics and some common sense, it is possible to harness radicals into a tremendously powerful tool for solving synthetic problems.
The book adopts an integrated approach using a few basic principles to explain most types of radical reactions, the emphasis being placed on synthetic applications.
The book contains numerous examples of synthetic applications (nearly 300 schemes)
The book contains more than 700 references
The special features of the various types of reactions are explained taking the viewpoint of the synthetic organic chemist

0-19-850241-9 268pp 2003 £63.00

Continued from page 41

This volume is a beautifully written and very easy to read account of a class of reactive intermediate that no student can afford to ignore. The authors has achieved an excellent balance of a description of the underlying physical process and of the synthetic exemplification. However, it is not just a list of successful radical reactions; the author interleaves the reporting of the experimental results with an easily understood explanation of what makes those results important.

This book is almost certainly too detailed for all but the most able of undergraduates, but is an excellent source text for any beginning postgraduate and any practising synthetic chemist.

Spectrometric identification of organic compounds

Subject area
Organic Chemistry.

Description
This book provides a thorough introduction to the three areas of spectrometry most widely used in spectrometric identification: mass spectrometry, infrared spectrometry, and nuclear magnetic resonance spectrometry.

Authors
Robert M Silverstein, Francis X Webster, David Kiemle.

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

Date/Edition
2005/7th edition.

ISBN
0-471-42913-9.

Level
Undergraduate, research.

Price
£36.95.

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October 2005

Summary Review

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

I first came across **Spectrometric Identification of Organic Compounds** as the 4th Edition written by Silverstein, Bassler and Morrill, when I was an undergraduate student 25 years ago, and when carbon NMR was sufficiently time consuming that a week long wait in the queue for a carbon NMR spectrum was common. At that time, I found their book to be the most readable and comprehensive that I could find, giving enough of the background of spectroscopic techniques to allow an understanding of the technique, but also containing invaluable sets of highly detailed tables with characteristic data relevant for the assignment of all functional groups; I still have that book on my bookshelf and use it regularly. I never really liked the later editions of this text, which somehow seemed to be incomplete, perhaps as a result of the rapid changes during the nineties when the value of two-dimensional techniques was emerging. That criticism, which in any case was an unfair one, since no text could have kept pace with these developments, is certainly not true of the Seventh Edition, this time completed by Silverstein, Webster and Kiemle. This edition gives both a comprehensive account of all of the spectroscopic techniques commonly used by organic chemists today, and their application to specific problems. The decision, taken in an earlier volume and continued in this one, to exclude ultraviolet spectroscopy, is entirely understandable, since it is not now routinely used for structural assignments, but given its historical importance and undisputed value, it is nonetheless regrettable that a generation of chemists are not exposed at least to the merits and possibilities of this technique.

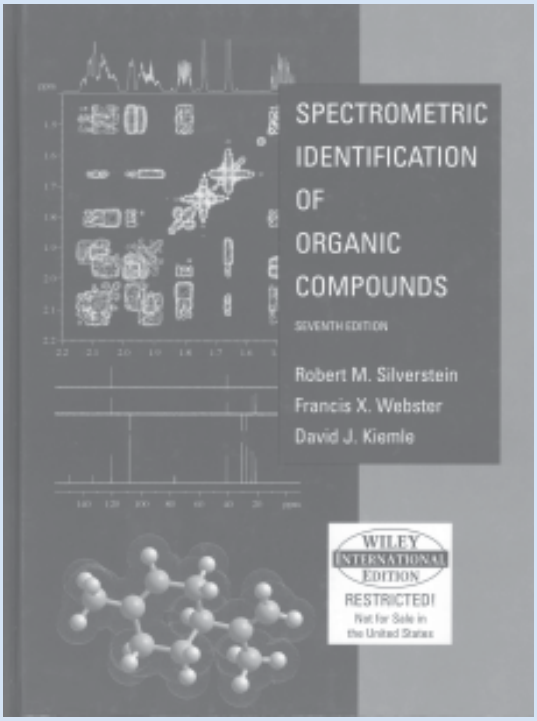
The book begins with the one technique able to allow an investigator to “go for the molecular formula” - a catchphrase adopted by the authors and designed to emphasise the single most important piece of information which sooner or later is essential for target identification. Chapter 1 therefore gives a detailed account of ‘Mass Spectrometry’, including ionisation techniques (another rapidly changing area), and the interpretation of spectra, along with a very detailed exposition of characteristic mass spectra of common chemical classes. A detailed reference list, student exercises, valuable appendices of formula masses, and masses of common fragments, are also included.

The next technique considered is Infra-red spectrometry, which of course is experimentally simple, permitting the rapid identification of many common functional groups, and particularly those not immediately obvious by NMR methods. Chapter 2 gives an overview of the theory and instrumentation, but most usefully a detailed discussion of methodology for the interpretation of spectra. Characteristic group frequencies for all common (and not-so-common) groups are discussed in detail, and exemplified fully, and the chapter concludes with a reference list and student exercises plus tables of valuable data necessary for spectral interpretation.

Most of the remainder of the book (Chapters 3-6) is unsurprisingly given over to NMR techniques, the single most important development in analytical science relevant to organic chemistry over the last 40 years. The discussion begins in Chapter 3 with ‘Proton NMR’, with the chapter grouped in the now familiar pattern of theory, instrumentation, spectral interpretation, reference list, and student exercises.

Continued on page 44

Spectrometric identification of organic compounds



From the publisher...

The Spectrometric Identification of Organic Compounds

By Robert M Silverstein, Francis X Webster, David Kiemle

Originally published in 1962, this was the first book to explore the identification of organic compounds using spectroscopy. It provides a thorough introduction to the three areas of spectrometry most widely used in spectrometric identification: mass spectrometry, infrared spectrometry, and nuclear magnetic resonance spectrometry. A how-to, hands-on teaching manual with considerably expanded NMR coverage--NMR spectra can now be interpreted in exquisite detail. This book:

* Uses a problem-solving approach with extensive reference charts and tables.
* Offers an extensive set of real-data problems offers a challenge to the practising chemist

0-471-42913-9 512pp 2005 £36.95

Continued from page 43

Chemical shift and coupling information is discussed explicitly, as well as the complications which arise from conformational, chiral and long range effects. Decoupling and NOE are included as tools which enable elicitation of more detailed information. Again, the chapter finishes with many useful appendices of valuable chemical shift, coupling and solvent information. Chapter 4 overviews Carbon NMR, following the same pattern as the earlier chapters; the DEPT sequence is rightly presented as the generally most useful route to obtaining an interpretable Carbon NMR spectrum. Chapter 5 gives an account of 'Correlation Spectrometry', but adopts a different presentational sequence: after a brief theoretical overview (more than adequate for most organic chemists!), the application of the armoury of correlation techniques, including COSY, HMQC, HMBC, INADEQUATE, TOCSY, ROESY, is showcased by the structural assignment of four complex natural products. This approach is entirely appropriate, since it is the application of these techniques which is of single greatest importance for organic chemists, and this can only be learnt by consideration of specific examples and by practice. Chapter Six gives a useful but brief overview of other common Spin 1/2 nuclei (15N, 19F, 29Si, and 31P).

The book concludes with two chapters which illustrate structural identification using spectroscopy. Chapter 7 gives a detailed discussion of structural assignments for 6 examples, and two further structures for the student to work through alone. Chapter 8 gives nearly 60 structural assignment exercises based on compilations of MS, IR and NMR data of increasing complexity, and additional exercises are available from the relevant web-site. Although answers are not provided, they can be obtained on request from the publisher.

This is an excellent book: it is very readable, setting an appropriate balance between theory and application, with extensive compilations of valuable data, exemplification of specific cases, and sample problems. It probably embraces more than is needed at undergraduate level, but is so good at what it does that it is entirely appropriate as an undergraduate text. It would be an excellent text and reference for beginning (and perhaps even finishing!) graduate students, and invaluable source of material for tutors and lecturers.

Studying for Success

Subject area
General.

Description
A very good overview of the psychology as well as the more mechanical (skills) aspects of study. Primarily aimed at sixth formers but much of it is relevant to college and university students.

Authors
Richard Palmer.

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

Date/Edition
2004.

ISBN
0-415-33818-2.

Level
A-level, access, undergraduate.

Price
£13.99.

David Harwood
Institute for Science Education
University of Plymouth
Plymouth PL4 8AA
September 2005

Summary Review

range: * poor to ***** good

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

Richard Palmer has written an entertaining and useful book on the development of good independent study habits and techniques. Unlike many books of the 'genre' such as Stella Cotterell's excellent *Study Skills Handbook* (Palgrave-Macmillan, 2003), which focus almost exclusively on the development of skills, Richard Palmer's book begins with the learner getting down to study and the psychology of study, in a very accessible and practical manner. His style of writing is very reminiscent of the classroom and the book is primarily aimed at those setting out on independent study for the first time: making the transition from main school into the sixth form. Nevertheless, as he himself points out, much of the material is immensely useful to college and university students. Whilst reading this, I found myself being mentally transported back into the classroom and whilst this could be a little irritating at times, the whole experience was an enjoyable one and Mr Palmer's students clearly have the enviable luxury of an inspirational and entertaining English teacher if these pages are anything to go by!

Part 1 of the book is entitled 'How to get the best out of your mind' and explores issues such as concentration span, attitudes to study and achievement in study, in a practical way with plenty of graphs, diagrams and good distillations of research which will appeal to science students. The book is also liberally interspersed with fine examples which bring out the points the author is trying to make very well indeed. He looks too at the importance of memory and although one might disagree with his thesis that it is simply a matter of training, there is certainly truth in the assertion that all students would positively benefit from attending to this aspect of their studies.

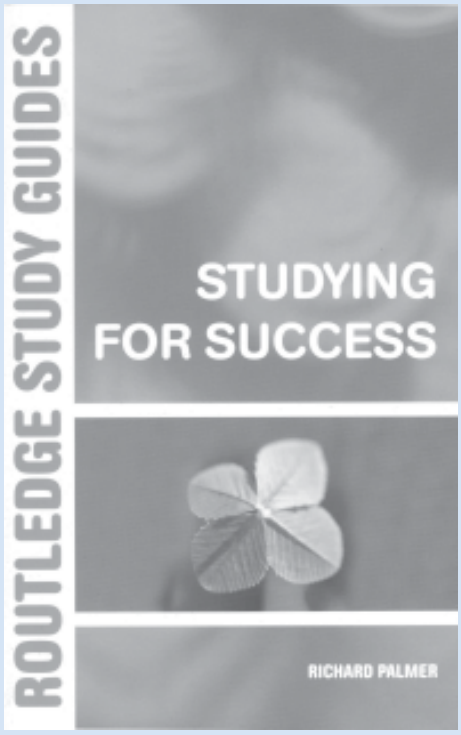
Next, there is a helpful chapter, by John Down on the use of ICT, the only part of the book the author has not penned personally. It includes, most importantly, what computers, the internet, word processors etc cannot do for the student as well as a very practical and useful guide to buying a computer for study use. The author himself returns to end this section by looking at the teacher-learner partnership.

Part 2 concentrates on developing the fundamental skills required for successful study beginning with a very entertaining chapter on reading skills, as well as the misconceptions often associated with them. Perhaps the weakest chapter then follows, concerning note-taking (the title is actually 'Creative Doodling: Note Taking'). Whilst this chapter is not without merit, a university science undergraduate is going to need much more guidance on the techniques available than these eleven pages can give. The eighth chapter, on essay writing, is very good indeed and its 32 pages do justice to the subject with some good examples. However, one has to say that this would not be a principle focus for a science student.

The book ends with a very good section on examinations and how to approach them beginning again with the psychology of exams. Richard Palmer also looks at revision, a topic very well covered in the earlier chapters in the context of regular review of work. Although there is an emphasis on long answer/essay type questions, as one would expect given the author's discipline.

Continued on page 46

Studying for Success



From the publisher...

Studying for Success

By Richard Palmer

This lively and stimulating book offers an enlightening new approach to effective study. Without minimising the importance of good organisation and hard work, the author stresses throughout that study must and can be fun.

Delivered with characteristic humour and wisdom, Richard Palmer updates and reinvigorates a classic, best-selling book with new sections on computers and the internet, as well as chapters covering important areas such as: memory and review; essay planning and writing; note-taking; time management; using resources; exam techniques and preparation.

This is an inspiring, essential read for all students studying for A Levels and undergraduate degrees who want to find the key to achieving success both in coursework and exams.

0-415-33818-2 256pp 2004 £13.99

Continued from page 45

On balance this is a very good book in that it is readable, entertaining and contains a good deal of practical advice from an experienced teacher who clearly understands the need to develop independent learning in his students. Although the emphasis would be different if one was looking for a book purely for science undergraduates, I think that reading this book would be of benefit to any serious university student, regardless of their chosen discipline.

Systematic Identification of Organic Compounds

Subject area
Organic Chemistry.

Description
This book provides directions for experiments described in a micro or mini scale and clean up directions are given at the end of each procedure.

Authors
Ralph L Shriner, Christine K F Hermann, Terence C Morrill, David Y Curtin, Reynold C Fuson

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

Date/Edition
2003/8th edition.

ISBN
0-471-45165-7.

Level
Undergraduate, research.

Price
£35.95.

Mark Moloney
Department of Chemistry
University of Oxford
Chemistry Research Laboratory
Mansfield Road
Oxford OX1 3TA
October 2005

The 8th Edition of the **Systematic Identification of Organic Compounds** by Shriner, Hermann, Morrill, Curtin and Fuson is a detailed compilation of a huge amount of theoretical, practical and laboratory information relevant to (student) organic chemists for the identification of unknowns, and particularly, using a systematic sequence.

Summary Review

range: * poor to ***** good

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

The book begins in Chapters 1 and 2 with an overview of valid approaches for the qualitative analysis of organic compounds, including physical properties, spectroscopic techniques, preparation of derivatives and ultimately the reporting of results.

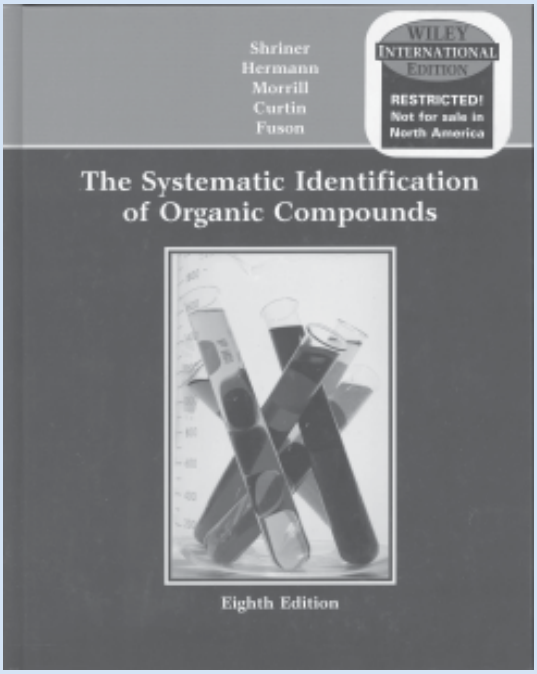
Chapter 3 gives a detailed discussion of the importance of the determination of the physical properties of an unknown (including, for example, physical state, melting or boiling points, refractive index, optical rotation, qualitative elemental analysis, and molecular weight) along with related techniques (e.g. recrystallisation, distillation). Chapter 4 continues this theme and gives a valuable and comprehensive account of the purification of unknowns, which of course is critical for their accurate identification. Chapter 5 explains the classification of organic compounds on the basis of their solubility.

The next three chapters cover the three most important spectroscopic techniques open to the analytical organic chemist; NMR, IR and MS. Each chapter overviews relevant theory, and gives a detailed exposition of the application of the technique and the interpretation of spectra which are generated; this is done at a level which permits the beginning student to see how information allowing structural information can be extracted from what is too easily seen as a bewildering array of lines or curves on a page. The NMR chapter, covering 1H and 13C isotopes, includes up-to-date 2 dimensional techniques (e.g. COSY, HMQC, INADEQUATE), which are today routine but essential knowledge for even the beginning student. All of these chapters have been skilfully crafted to include reference data of essential value for structural assignment.

Chapters 9 and 10 describe chemical tests for functional groups and the preparation of derivatives respectively, arranged by compound class, and Appendix II includes relevant tables of melting point data. Chapter 11 gives a wealth of detailed structural assignment problems, beginning with a series of worked examples and concluding with many examples to be worked through independently. Chapter 12 briefly overviews the literature relevant to organic chemistry, ranging from primary literature to monographs. The appendices give huge amounts of useful data, but one of undisputed value is Appendix I, containing valuable lab information not always easy to track down, e.g. heating media, drying agents, pressure-temperature nomograph for distillation.

Continued on page 48

Systematic Identification of Organic Compounds



From the publisher...

The Systematic Identification of Organic Compounds

By Ralph L Shriner, Christine K F Hermann, Terence C Morrill, David Y Curtin, Reynold C Fuson

Most directions for experiments are described in a micro or mini scale and clean up directions are given at the end of each procedure.
* Discusses chromatography, distillations, and the separation of mixtures.
* Questions and problems emphasize the skills required in identifying unknown samples.

0-471-45165-7 720pp 2003 £35.95

Continued from page 47

This is an unusual book: much of it I suspect covers material which is not now routinely covered in undergraduate practical courses and would probably be considered to be old-fashioned (e.g. solubility tests and derivative formation of unknowns) – that is not to say this situation is ideal, since there is much to be learnt from these 'simple' exercises. However, the spectroscopic chapters are excellent, and ideal for the beginning student; the worked and set problems use high quality spectra, and nicely structured to guide the learning of the student. The problem-solving dimension is further developed in Chapter 11, where a large number of exercises of different levels of complexity – some worked but most not – are provided. This book would therefore be of substantial use to students and staff in parts, but would most certainly be a useful reference text.

The Physics and Vibrations of Waves

Subject area
Physics, Physical Chemistry.

Description
This book gives students a thorough grounding in the theory of waves and vibrations and demonstrates the pattern and unity of a large part of physics.

Authors
H J Pain.

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

Date/Edition
2005/6th Edition.

ISBN
0-470-01296-X.

Level
Undergraduate, research.

Price
£34.95.

Alan Hinchliffe
School of Chemistry
The University of Manchester
Sackville Street
Manchester
M60 1QD
November 2005

Summary Review

range: * poor to ***** good

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

The main theme of the book is that a medium through which energy is transmitted via wave propagation behaves essentially as a continuum of coupled oscillators.

The author rationalizes the behaviour of transverse waves on a string, longitudinal waves in a gas and solid, voltage and current waves on a transmission line and electromagnetic waves in a dielectric and a conductor with that powerful idea.

A simple oscillator is characterized by three parameters, two of which are concerned with storing and exchanging energy whilst the third is concerned with energy dissipation. The product of the energy storing parameters determines the velocity of wave propagation through a given medium, whilst the third parameter determines the attenuation (ie, energy loss).

With the above in mind, the Chapter headings should come as no surprise. They are

1. 'Simple Harmonic Motion'
2. 'Damped Simple Harmonic Motion'
3. 'The Forced Oscillator'
4. 'Coupled Oscillations'
5. 'Transverse Wave Motion'
6. 'Longitudinal Waves'
7. 'Waves on Transmission Lines'
8. 'Electromagnetic Waves'
9. 'Waves in More than One Dimension'
10. 'Fourier Methods'
11. 'Waves in Optical Systems'
12. 'Interference and Diffraction'
13. 'Wave Mechanics'
14. 'Non-linear Oscillations and Chaos'
15. 'Non-linear Waves and Solitons'

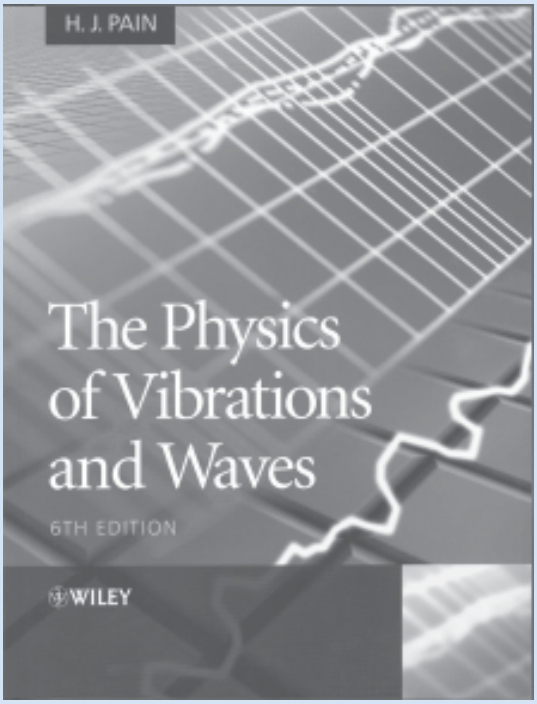
Together with three very useful 'Appendices'.

Book reviewing is a subjective business. The first edition of this highly successful book appeared in 1968. What else is there for a Reviewer to say? Where to begin? First of all, I'm a quantum chemist so Chapter 13 caught my eye. Second, some years ago I worked as an Open University (OU) Course Team member to write SMT356 *Electromagnetism*, so let's start with Chapter 8.

Chapter 8
I read the list of Contents before opening the body of the text, and imagined that Maxwell's equations would figure within the first couple of pages of this Chapter. Divine inspiration proved correct, with everything beautifully done. Maxwell's equations are most succinctly written in vector form, but Maxwell knew nothing of vectors. They were invented by Josiah Willard Gibbs long after Maxwell's time. The author gives the four vector equations in their inherent simplicity but hedges his bets by explaining everything in Cartesian coordinates.

Continued on page 50

The Physics and Vibrations of Waves



From the publisher...

The Physics of Vibrations and Waves

By H J Pain

The main theme of this highly successful book is that the transmission of energy by wave propagation is fundamental to almost every branch of physics. Therefore, besides giving students a thorough grounding in the theory of waves and vibrations, the book also demonstrates the pattern and unity of a large part of physics.
This new edition has been thoroughly revised and has been redesigned to meet the best contemporary standards. It includes new material on electron waves in solids using the Kronig-Penney model to show how their allowed energies are limited to Brillouin zones, The role of phonons is also discussed. An Optical Transform is used to demonstrate the modern method of lens testing. In the last two chapters the sections on chaos and solitons have been reduced but their essential contents remain.

0-470-01296-X 576pp 2005 £34.95

Continued from page 49

The standard cases are considered; free space, finite permittivity and finite permeability. That accounts for the first two parameters. Then we consider the case of finite conductivity (the third parameter). The thing that interested me was the overlap (high) between the material given here and the material the OU wrote for SMT356. Professional physicists obviously agree more or less, on core material.

I wish the author would make more use of vector notation. It simplifies things. But you can get a UK degree in Physics these days by careful avoidance of all hard modules, especially vector calculus (plus quantum mechanics, electromagnetism, relativity).

Chapter 13
Origins, Heisenberg, Schrödinger, one-dimensional infinite well, Born interpretation, finite well, square well, harmonic oscillator, density of states; in short, everything you would have found in a decent Physics degree when I graduated in 1964. In 1964, all Physics degrees were decent, because it was not possible to dilute them with football and media studies but that's the material for a different review.

Nothing remotely 'molecular', and the word 'molecule' does not appear in the Index. But then, why should it. The text isn't aimed at chemists.

There are a disappointingly small set of problems. The book really should follow the modern trend and have a website with lots of extra material, problems and solutions.

I was amused to read the author's opening remark in the 1968 Edition. "The opening session of the physics degree course at Imperial College includes an introduction to vibrations and waves where the stress is laid on the underlying unity of concepts that are studied separately and in more detail at later stages".

Those were the days. I know many highly respected UK science departments who spend their first few weeks 'entertaining' new students. The name of the game is to keep them on the books until December, when the count is done.

I'm digressing, but what can I possibly write about such a superb book? I was flattered when my publisher asked me to consider a Second Edition for one of my books. But a Sixth Edition? Extrapolation suggests that I will then be aged 152.

Loved it.

Understanding Solids: the science of materials

Subject area
General Chemistry, Materials Science.

Description
This book provides a modern introduction to the science of materials taking a unique integrated approach designed to appeal to both science and engineering students.

Authors
Richard J D Tilley.

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

Date/Edition
2004.

ISBN
0-470-85276-3

Level
Undergraduate.

Price
£34.95.

Lesley Smart
Department of Chemistry
The Open University
Walton Hall
Milton Keynes
MK7 6AA
October 2005

This book is intended to be a comprehensive and self-contained account of the properties of solid state materials for materials science and engineering undergraduates. It is aimed at mathematically literate students and assumes differential calculus. It is clearly written in an authoritative style, and has a strong chemical background.

Summary Review

range: * poor to ***** good

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

The book is divided into five parts. ‘Structures and Microstructures’ covers the chemical background to materials science. It discusses atomic structure and electronic configuration, the different types of chemical bonding, defects in solids, phase diagrams and crystal structures. ‘Classes of Materials’ looks at metals, ceramics, polymers and composites. ‘Reactions and Transformations’ explores diffusion and ionic conductivity, phase equilibrium, martensitic transformations, and sintering. ‘Physical Properties’ is a very large section covering mechanical, insulating, electrical, magnetic, optical and thermal properties of solids. The final very small part covers ‘Nuclear Properties’.

At the end of each chapter is a ‘Further Reading’ section citing books and papers and review articles. Many of the books referenced are old classic texts and so will have to be found in libraries. Each chapter also has two sets of questions, a Quick Quiz for the student self-assessment, and a more testing set of problems, answers to all of which are given at the end of the book. More advanced material for each part has been taken to the end of the book as ‘Supplementary Material’.

There is no separate section on nanomaterials, instead the author has taken the view that this subject is better discussed as a subsection of the particular material being considered at the time, rather than as a subject in its own right. Given the current interest in this topic, and the many misconceptions surrounding it, it would probably have been better to have found room to take both approaches, so that students could have seen the subject pulled together in one place.

While the author’s wish to write a truly self-contained book is to be commended, it does mean that many of the subjects are covered in far too small a space. I wonder how many undergraduate students with no prior knowledge of atomic theory will be able to follow the intricacies of the construction of the Periodic Table or the solution of the Schrödinger equation, each covered in about one page? I also found the leap from molecular orbital theory back to valence bond theory, and the constant use of hybridisation most confusing.

I personally don’t like the two-column layout of the book, and can’t really see why the publishers chose to use it. Perhaps it was to save space, certainly one of the effects has been to make many of the diagrams rather small and in places the labelling almost unreadable.

There are many features to recommend this book, in particular Tilley’s very clear writing style and the sheer breadth of the coverage. The huge numbers of problems and exercises will be very useful to students and lecturers alike. I’m sure it will become a necessary addition to the shelves of all materials scientists.

Your Research project: How to manage it

Subject area
General.

Description
This book guides the student through the transition from passive learner to active researcher. Covering everything from choosing and refining a research topic to writing the actual report, the book shows students how to manage their workload, and how to approach the viva.

Authors
Andy Hunt.

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

Date/Edition
2005.

ISBN
0-415-34408-5.

Level
Research.

Price
£13.99.

Keith Taber
Faculty of Education
University of Cambridge
(Homerton College Campus)
Hills Road
Cambridge CB2 2PH
October 2005

Summary Review

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

This is a very readable book intended for the student setting out on a research project. The assumption behind the book is that readers will be new to the requirements and responsibilities of a project. My initial response to the book was that it was disappointing in being somewhat 'light-weight'. Much of the book content seemed little more than 'common sense'. However, this was perhaps a judgement based on what I would want such a book to be for my own students, to inform them on managing the academic and technical aspects of setting out on postgraduate research. Yet, to be fair to Hunt he attempts to write a book that will be useful at all levels, and regardless of disciplinary background. This is a 'big ask' for any author.

Given this brief, it is perhaps unfair to judge the book in terms of the specific needs of particular students. However, this does mean that, perhaps inevitably, the book plays to the lowest common denominator – undergraduates looking for first degree project credit. It also means that the book is only able to offer general advice that would be applicable regardless of the subject area. Within that remit, Hunt takes the reader through all stages of the process, and offers a good deal of potentially helpful advice. The notion of separating out the manager and worker roles within the student seemed a little artificial, but could prove to be a useful tactic to help weaker students develop their metacognitive skills.

Probably the fairest way to judge the book is in terms of its subtitle. This book will be of little use to students who needs help in approaching the disciplinary requirements for different research degrees, or those needing detailed advice about framing literature reviews, learning the accepted narrative structures for writing up in their field etc. However there are other books that offer this. On the other hand, students who are not used to having to organise themselves to manage projects, and need some starter advice on such issues as scheduling their time will find very useful advice. Of course this will indeed seem just like common-sense to a lot of students who are used to regulating their own learning to a high level (including most postgraduates I would hope.) Yet, I am sure Hunt is right in assuming that there are many students out there who need this dose of common sense if they are to manage their projects and submit something appropriate by their deadline. So, for weaker undergraduates, who are either lacking confidence or proving too dependent on their supervisor, this would be a useful book to recommend. It will not help develop advanced research skills, but for the reader lacking basic self-management skills it will be useful - doing just what it claims on the cover.

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Physical Sciences Centre

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- A new briefing paper, Using Card Sorts
- A new primer, Study Skills
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