ISSN 1471-7166

Number 6
June 2003

ltsn
Learning and Teaching Support Network

Reviewed in this issue...

4 software packages

2 web sites

18 books

Physical Sciences Educational Reviews

LTSN Physical Sciences
...supporting learning and teaching in chemistry, physics and astronomy

Department of Chemistry
University of Hull
Hull
HU6 7RX

Phone: 01482 465418/465453
Fax: 01482 465418
Email: ltsn-psc@hull.ac.uk
Web: www.physsci.ltsn.ac.uk

The journal of the LTSN Physical Sciences Subject Centre

Physical Sciences Educational Reviews

ltsn
Learning and Teaching Support Network
Physical Sciences

Physical Sciences Educational Reviews is the journal of the LTSN Physical Sciences Subject Centre. It is issued twice yearly in Spring and Autumn.

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

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

LTSN Physical Sciences is part of the Learning and Teaching Support Network (http://www.ltsn.ac.uk) and is funded by the Higher Education Funding Councils of England and Wales, the Scottish Higher Education Funding Council, the Department for Higher and Further Education, Training and Employment of Northern Ireland and is supported by the Universities of Hull, Liverpool, Surrey and Leeds.

Editor

Roger Gladwin
LTSN Physical Sciences
Chemistry Department
Liverpool University
Liverpool L69 7ZD
Tel: 0151 794 3576
Fax: 0151 794 3586
Email: rgladwin@liv.ac.uk

Editorial

Welcome to this, the sixth issue of Physical Sciences Educational Reviews, the journal of the LTSN Physical Sciences Centre. This edition has twenty-four reviews with a bias towards chemistry. We would like to redress the balance so **if you are aware of physics and astronomy resources** that we could review, please let us know.

I would like to thank all those who undertake reviewing for the Centre. Why do we do it? It is really a question of quality. Academics are used to the peer review process already in many areas of activity (papers, research) and our review programme is just another aspect of that. Through this programme we are able to collect examples of resources whose use in higher education is recommended - thus saving others the time of sifting through many choices. A valuable job!

Roger Gladwin
Editor

In this issue...

Web reviews...

Book reviews...

Software reviews...

Other information...

From Stargazers to Starships

Subject area
Astronomy.

Description
Large course and resource on astronomy, space and physics.

Authors
David P. Stern.

Last updated
13 December 2001.

Level
A-level, access, undergraduate.

Plugins required
None.

Other features used
None.

Reviewed using
PC Pentium 500MHz running Linux Red Hat and Netscape 7 over an Ethernet connection.

Web address
http://www.phy6.org/stargaze/Sintro.htm

Rene Oudmaijer
The Dept of Physics & Astronomy
University of Leeds
Leeds, LS2 9JT
May 2003

This is a large site focused on astronomy, physics and spaceflight, by a retired NASA physicist. It includes calculations at the pre-calculus level, but stresses ideas and concepts. History is its main framework, giving a logical order, and it contains a chronology with dates both in science (red) and society (black). History also provides a wide selection of stories, personalities, and of interesting discoveries and applications, meant to draw the reader to the by-ways of science.

Summary Review

range: * very poor to ***** excellent	
Ease of navigation	*****
Speed of response	*****
Ease of learning	*****
Content	*****
Relevance	*****
Accuracy	*****
Usefulness to student	*****
Usefulness to teacher	*****

With about 80 main sections, it is quite big. Intended mainly for individual study, the site could be studied as a single course (given time!) or as several shorter ones. Or else one could skip around, pick and choose, as teachers are likely to do, and perhaps most web surfers. The level is high school to beginning university, though many parts can be understood and enjoyed by even younger students.

The site is meant for readers, to stimulate the mind rather than please the eye: wide margins, fast loading, pleasant colour, apt but small (or simple) illustrations, many internal links and selected external ones. It contains 4 main sections:

1. Astronomy - the sky, sundials (including a cut-out paper model), seasons, navigation, a handful of calendars - then precession, the horizon, size and shape of the Earth (and where Columbus went wrong), ancient derivations of the distance of the Moon, heliocentric theory, and so on to Kepler's laws and planetary motion.

2. Mechanics, from Galileo to Newton and his laws, ideas of mass (and how it was measured in weightlessness), gravitation (incl. Newton's apple), orbits to Mars, circular motion, ending with frames of reference applied to airplane flight and to rotating space stations.

3. The Sun is used to introduce a variety of topics - weather and climate, the Sun's structure, sunspots and magnetism, spectra and the emission of light, the Sun in X-rays and the source of the Sun's energy, leading to supernovas and nuclear energy - even in reactors and bombs.

4. Spaceflight, from rockets to Goddard, Von Braun and the space race, then types of spacecraft, a variety of orbits, Lagrangian points and finally, deep-space flights using gravity-assist manoeuvres.

These are just highlights - one has to browse through it to get the true flavour. The site also has a math course, a Spanish translation (by J. Mendez of Algorta), 42 lesson plans (they could stand updating) and various other additions. The extensive timeline, listing both scientific and historic highlights, from the Ice Ages to the present day, is an interesting feature. There is also a glossary with links to the text, questions from site visitors (98 by the last count), problems to puzzle out, guidance for teachers and an article explaining the underlying ideas.

Teachers and scientists, as well as aspiring students, should learn here a lot of new science, new history and enjoyable trivia!

Making Matter

Subject area
Chemistry and Materials Science.

Description
Visualization of the 3D structures of inorganic materials.

Authors
M. Hewat.

Last updated
2001.

Level
Undergraduate.

Plugins required
CosmoPlayer (preferably 2.1.1) for Windows and Macintosh, or VRMLview for Windows, Linux, BeOS and SGI.

Other features used
Java, Javascript.

Reviewed using
Dell Inspiron, 2500; 260MB RAM; 8 Mbps Internet Line Speed; Microsoft Windows 2000, Service Pack 3; Internet Explorer 6.0.2800.1106.

Web address
http://whisky.ill.fr/dif/3D-crystals/

Brian Murphy
Department of Chemistry
Faculty of Science
United Arab Emirates University
PO Box 17551
Al Ain
United Arab Emirates
February 2003

Summary Review

range: * very poor to ***** excellent	
Ease of navigation	***
Speed of response	****
Ease of learning	*****
Content	*****
Relevance	*****
Accuracy	*****
Usefulness to student	*****
Usefulness to teacher	*****

This website ***Making Matter*** is basically a set of pages that illustrate the three-dimensional structures of a wide variety of inorganic materials taken from the Institut Laue-Langevin (ILL, the international research centre in neutron science and technology based at Grenoble in France) ICSD-for-WWW database. The database itself is used by scientists at the European High Flux Reactor and elsewhere for the study of the atomic structure of materials. The site consists of an overall synopsis of inorganic materials, with appropriate three-dimensional examples covering the following topics: an introduction to the properties of materials and an account as to why atomic structure plays a pivotal role in not only the appearance of materials but also in their linked properties; close-packing; the packing of different sized atoms; perovskites; covalent bonding; zeolites, gemstones and minerals; superconductors, magnetism in solid-state physics and layered structures. The site is appropriate for undergraduate chemistry students, and also forms a nice introduction to materials at the MSc level in a course on Materials Science.

Each topic consists of a short account of the subject area, usually based on an initial question e.g. why is atomic structure important? How do atoms pack together? How do different sized atoms pack? At the end of each unit, the reader is brought onto the next topic by reference to a leading question. For example, in the second unit on close-packing, the reader is asked to figure out what happens when the second atoms are too small for the holes between the larger atoms and to think about what happens when there are more than two kinds of atoms present? This then completes this unit, and naturally brings the reader to the unit on perovskites. For this reason, the site itself is a good account in terms of a suitable set of notes for students taking a course on materials.

However, the real benefit of this site to users is the linked graphics. In each unit, a series of graphics are visible. If the user clicks on these, a larger static picture can be obtained. Depending on the unit, these graphics vary from examples of cubic close-packing (CCP), hexagonal close packing (HCP) to structures such as wurtzite (ZnO), cristobalite (SiO_2), perovskites, ZSM-5 catalyst and even covers the structures of the superconductors such as $YBa_2Cu_3O_7$ and giant magneto-resistive (GMR) oxides such as $(La,Ca)MnO_3$. However, many of these structures consist of flagged links, indicating that you can get a 3D VRML model of the respective structure. In order to get such a model, the user has to download a VRML viewer such as CosmoPlayer (preferably version 2.1.1) for Windows and Macintosh operating systems, or VRMLview for Windows, Linux, BeOS and SGI. This is not immediately clear to the user, as the technical note is positioned at the end of the opening page of the site, and would ideally be better placed at the beginning. However, the help page describing the VRML viewers for the interactive 3D models is comprehensive and has many useful tips on the choice of viewer. For example, VRMLview has the advantage that it can directly print JPEG images of the structure, but Cosmo is faster and can blink between structures to compare them. With the VRML viewer installed, the interactive 3D models, illustrated by flagged links are then the source of

Continued on page 4

Making Matter

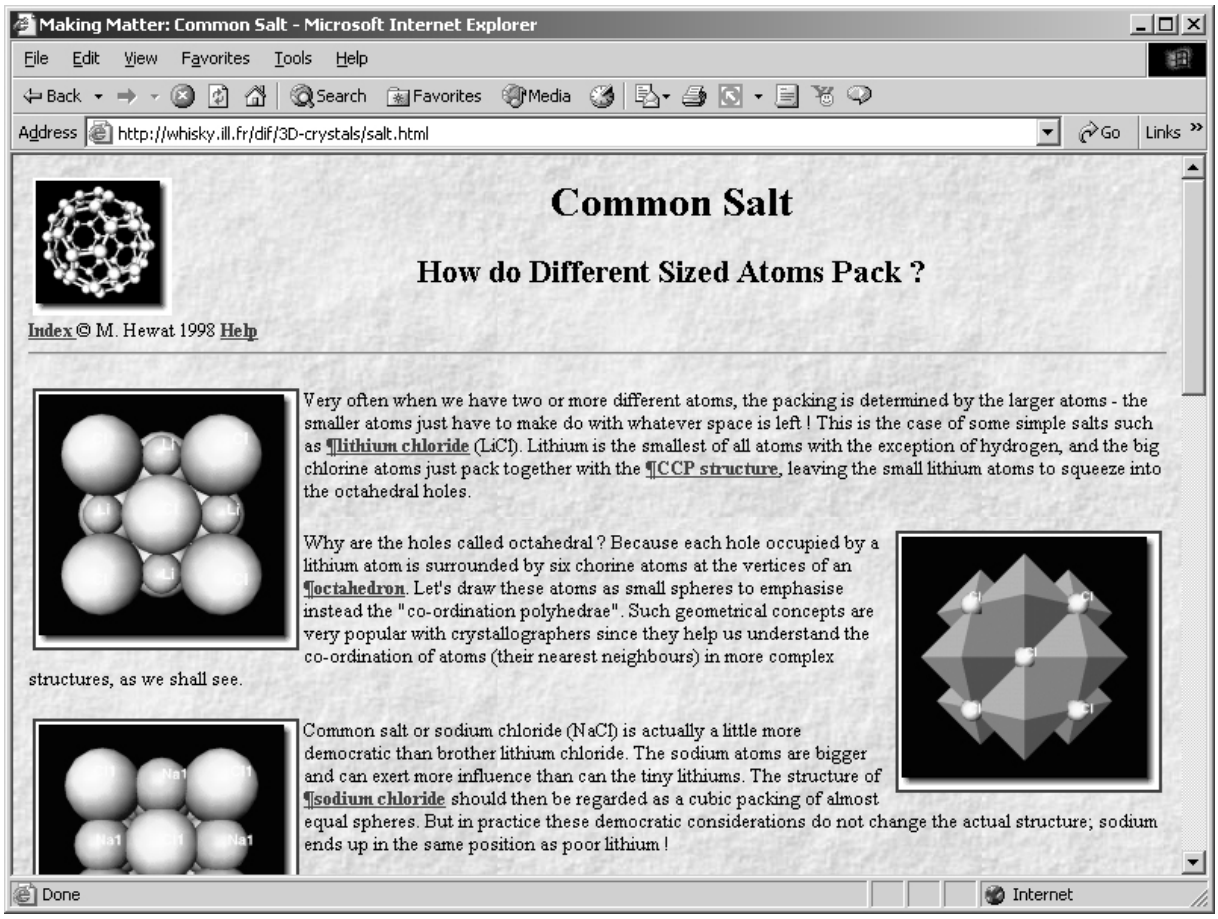


fig 1: Example screen

Continued from page 3

some excellent graphics of structures. I can see this site benefiting both the student and instructor for such interactivity. In the lecture setting, by having such a comprehensive range of interactive structures available, this opens up a forum for some very nice illustrations and brain-storming in class e.g. the development of the CCP, HCP and BCC packing mechanisms, the differences between LiCl and NaCl structures, the differences between the structures of diamond and graphite, and why diamond can be used as a drilling bit for oil and why graphite is an important lubricant. All of these graphics can show aspects such as symmetry, coordination number etc. features which are lost in the static pictures used in books. With the VRML viewer, the structures can be zoomed in on, panned, translated and rotated. I have tried this website with a cohort of students in a wireless classroom setting on campus, where the students have their own laptops, and found the real benefit of such a site.

Academically, the choice of examples are excellent. I was particularly pleased to see such structures as the ZSM-5 catalyst available (Mobil invented a process for converting methanol into high-quality gasoline through the use of the company's versatile ZSM-5 catalyst, which is an Al_2O_3-SiO_2 artificial zeolite). In addition, the units on superconductors and magnetism are particularly strong, with nice links to Er_6Mn_{23} and other well-cited current research work.

In conclusion, I recommend this site strongly, to anyone teaching material science. The site would benefit however with some restructuring. The script going with the units could be stand-alone links, with the structures in each unit clickable links, to facilitate easier classroom use. In addition, if the authors could include a list of further reading and academic papers going with some of the newer structures, it would be advantageous to students.

Alkenes and Aromatics - The Molecular World

Subject area
Organic Chemistry.

Description
The chemistry of alkenes and aromatic compounds.

Authors
Peter Taylor and Michael Gagan (Eds.).

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

Date/Edition
2002.

ISBN
0-85404-680-1.

Level
Undergraduate.

Price
£17.50.

Ron Cole
School of Applied Medical Sciences and Sports Studies
University of Ulster
Jordanstown
Newtownabbey
Co. Antrim BT37 0SB
April 2003

Summary Review

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

This is the 5th book in a series of eight entitled ***The Molecular World***, published by the Royal Society of Chemistry, which provide the textbooks for the Open University course, S205, The Molecular World.

In the introduction it is stated that ***The Molecular World*** aims, 'to develop an integrated approach, with major themes and concepts in organic, inorganic and physical chemistry, set in the context of chemistry as a whole'. Having read this before starting, I wondered if I should have read the first four in the series before starting number 5. In fact this book stands alone but there are times when knowledge from the previous members of the series is needed, particularly the first book in the series *The Third Dimension*[1] which deals with stereochemistry.

After an initial look at the book you will probably install the software that comes on the CDROM. On installation the ***The Molecular World*** provides a pdf Data Book, which is probably most useful if printed, and a number of additional resources under the title *Alkenes and Aromatics*.

Introduction: Tells you about the available multimedia activities.
ISIS/Draw and WebLab Viewer Lite: Provides an introduction to these resources. These are a drawing and viewing package.
Java Molecular Editor: This is a resource that enables you to draw structures and use them as answers to questions.
Questions: These are additional questions, which use the multimedia resources, and provide a more challenging formative assessment.
Figures: This provides the database of structures that can be viewed through WebLab Viewer Lite.

The book is sub-divided into 4 parts:

Part 1	Addition - Pathways and Products.
Part 2	Aromatic Compounds.
Part 3	A First Look at Synthesis.
Case Study	Industrial Chemistry

Part 1. Addition - Pathways and Products.
This takes a traditional mechanistic approach to the reactions of alkenes (with a mention of the similarity of alkynes) and is divided into 2 sub-sections, electrophilic addition reactions of alkenes and other useful addition reactions. It is well presented with clear diagrams and good explanation of all topics. Throughout the section there are a number of "Boxes" that give either further explanation or information, i.e. a brief pen sketch of Markovnikov or the way in which the alkene/halogen reaction is used in lipid analysis. Throughout the text there is reference to images on the CDROM that can be viewed using the supplied WebLab ViewerLite. The use and manipulation of these images add significantly to the understanding of the material presented.

At the end of each sub-section there is a very useful Summary and Questions. At the end of the section as a whole the questions are discussed and the answers given.

Overall there is a very clear discussion of the reactions of alkenes that requires very little use of information not provided in this book although a lack of understanding of stereochemistry would be a hindrance.
Part 2. Aromatic Compounds.

Continued on page 6

Alkenes and Aromatics - The Molecular World

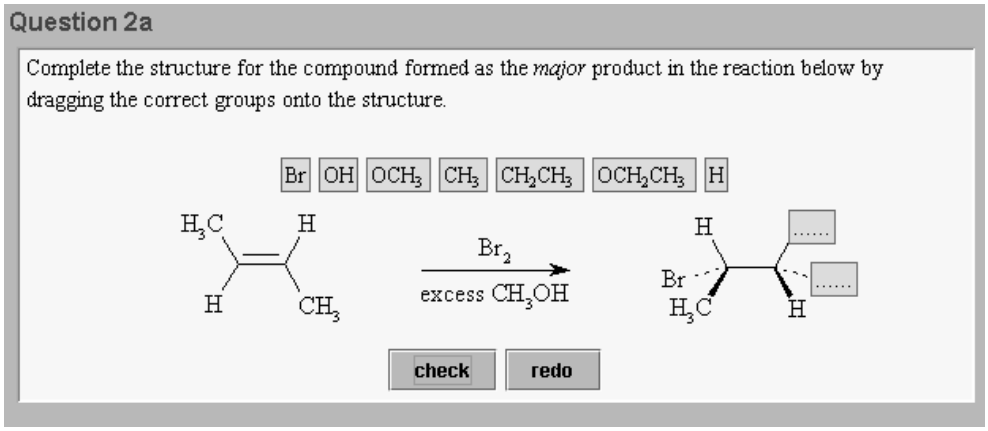


Fig 1: An example question

Continued from page 5

The topic is introduced with a brief history of aromatic chemistry, then looks at aromaticity following the same pattern as the first section so providing a very clear introduction to the chemistry of aromatic compounds by considering the reactions of benzene.

Parts 1 and 2 provide a very good introduction to the reactions of alkenes and aromatic compounds (using benzene as an example). Where appropriate the stereochemical implications of the reactions are considered, this being aided by the reference to the structures provided in WebLab ViewerLite.

The questions within the text provide an excellent formative assessment of the material. The study of these two areas is further enhanced by use of the questions that are available on the supplied CDROM and are accessed from the Molecular World program made available at installation.

You need to be aware of the approach taken by the authors when undertaking the questions (see fig 1). There are a number of ways to approach the question when you have decided the reaction you are considering. By looking at the shell for the answer it is clear that the initial attack of Br^+ is considered to be from below, and as this is an anti addition the CH_3O^- attacks from above and this will allow for the stereochemistry given in the answer. It is here that you need to appreciate the stereochemical implication.

If you considered the initial attack from above you would need to undertake some stereochemical manipulation to provide the correct presentation of the product to allow the program to recognise your answer as correct.

It is within the questions that you will use the (JME) Molecular Editor. This allows you to give a structure and have the data fed back into the question.

Part 3. A First Look at Synthesis.
This takes us into the strategy for drug discovery and the application of alkene and aromatic chemistry in the synthesis of pseudoephedrine. Finally questions are asked about efficiency in synthesis and the impact on the environment (Green Chemistry). Once again the Learning Outcomes are clearly stated and questions provided.

The final section of the book is a **Case Study**:
This section deals with the chemical industry and its perception and then takes two brief case studies:
1. Petrochemicals.
2. Speciality & Fine Chemicals.

In both cases the chemistry and the environmental factors are considered.

The last two sections provide an interesting and informative insight into the application of the chemistry introduced in the first two sections, and questions economic and environmental issues associated with industry.

Overall the material both in the book and on disc are very well presented, with very few errors, and provides an excellent learning environment which like all Open University books is structured to encourage independent learning.

Reference
1. Smart, L. and Gagan, M., *The Third Dimension*, (2002), Open University and Royal Society of Chemistry.

Basic Atomic and Molecular Spectroscopy - Chemistry Tutorial Text

Subject area
Physical Chemistry.

Description
This book is an undergraduate text in the area of spectroscopy.

Authors
J.M. Hollas.

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

Date/Edition
2002/1st Edition.

ISBN
0-85404-667-4.

Level
Undergraduate.

Price
£12.95.

Summary Review

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

The study of quantum mechanics and spectroscopy are intimately linked and any good text should have a balance of quantum mechanics and applications of that theory to actual spectra. This text by Hollas does achieve the balance.

The book is volume 11 in the RSC's ***Tutorial Chemistry Texts*** series; it is intended for 1st or 2nd year undergraduates, 'particularly those with minimal mathematics qualifications'. No calculus is required to comprehend the book. There is only one derivative, which appears in the Schrödinger equation, but the reader is quickly referred to the reading list for further details. There are two integrals, the normalisation of a wavefunction and the transition moment, both of which appear in "boxes" rather than the main text. My only criticism of the mathematical content is a minor inconsistency in the symbol for frequency, which changes from ν to ω in a few places.

After a brief introduction -*What is Spectroscopy?* and *The Electromagnetic Spectrum* - the first half of the book is devoted to quantum mechanics - *Quantization and the Hydrogen Atom*, *Quantization in Polyelectronic Atoms*, *Electronic States of Diatomic and Polyatomic Molecules*, *Molecular Vibrations*, and *Molecular Rotation*, as well as a chapter on *How Spectra are Obtained*. As implied by the title, this is a book on basic spectroscopy. Rotational, vibrational and electronic absorption spectra and vibrational Raman spectra are discussed in the second half of the book. I particularly liked the well-chosen spectra, which illustrate these latter chapters. Atomic spectra are covered in the chapter on quantization, but without any actual spectra. More advanced types of spectroscopy, such as photoelectron, X-ray, NMR, and laser spectroscopy, are beyond the intention and coverage of this book.

The book is well presented and consistent with guidelines for good student-centred learning practices. Every chapter has a clear set of aims, worked problems, summary of key points and problems. An appendix gives worked answers to all the end-of-chapter problems. Many chapters also have "boxes" which introduce concepts requiring more advanced mathematics than the main text, for example: Box 5.2 Vector representation of orbital and electronic spin angular momenta in a diatomic molecule.

I found the style and presentation to be easy-to-read. For example, the nomenclature of term symbols has been difficult for me: Hollas gives a clear and concise description of this topic and the rest of the book is equally insightful.

This is an excellent book, and is great value-for-money. I will be prescribing Hollas's text for my students. This ends a search for a suitable spectroscopy text, which has lasted several years. I highly recommend the book to you as a class text. It would also be a worthwhile addition to the departmental library or your personal reference library.

Kieran Fergus Lim
School of Biological and Chemical Sciences
Deakin University
Geelong, VIC 3217
Australia
May 2003

Chemical Kinetics and Mechanism - The Molecular World

Subject area
Chemistry, Physical Sciences.

Description
Kinetics and Mechanism Module from Open University S205, co-published by OU and RSC.

Authors
Michael Mortimer and Peter Taylor (Eds.).

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

Date/Edition
2002/1st Edition.

ISBN
0-85404-670-4.

Level
Undergraduate.

Price
£22.50.

Alan Hinchliffe
Department of Chemistry
UMIST
Sackville Street
Manchester M60 1QD
April 2003

Summary Review

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

This book is part of a new series co-published by the Royal Society of Chemistry and the Open University (OU); it actually comprises one module (from 11) of the OU second level 60-credit course S205, ***The Molecular World***. It is a specified course in many of the OU BSc science programmes. There is an associated residential school and three TV programmes. You don't have to take the residential school or watch the programmes to benefit from the book. If you know the OU, you might like to know that S205 replaces S246 and S247.

I can't give a better introduction than quote from the OU homepage; [this volume]…'considers the role of the rate of reaction, and starts with an introduction to chemical kinetics. The rate equations are developed using a Maths Toolbook on CDROM. It goes on to introduce the functional group concept of a group of atoms within a molecule that display particular chemical properties, and the common reaction mechanisms of organic substitution and elimination reactions are discussed'.

For your money you get the printed book and a substantial accompanying CDROM.

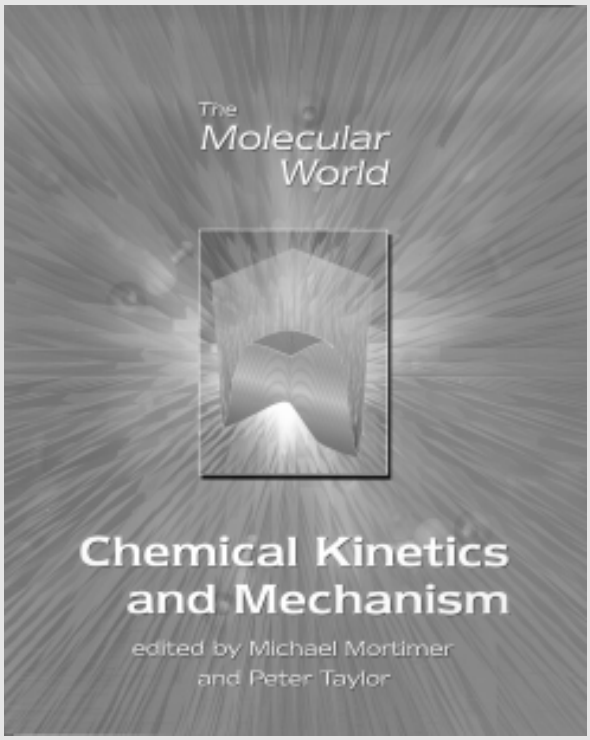
The printed book comprises three parts plus a Case Study. Part 1 covers the usual physical chemistry-style material; factors that determine the rate, how to determine the rate equation, the effect of temperature, elementary reactions and the concept of reaction mechanism. Students of this subject need to be adept at the quantitative treatment of experimental data, which is where the Maths Toolbook (later called the Kinetics Toolkit) comes into its own - think watered-down MS/EXCEL.

So far so good. The fun part of chemical kinetics comes once the data has been processed. Can we understand why a given reaction follows the rate law that it does, and equally can we predict a rate law from general chemical knowledge? There is a good discussion of reaction mechanisms with a focus on inorganic materials, and many interesting historical illustrations such as Belousov's oscillatory reactions.

At this point, the text turns its attention to elementary organic reaction mechanisms and it seems to me that we now enter a different non-quantitative world. I didn't spot a single mathematical equation from this point on. Part 2 is concerned with SN1 and SN2 whilst Part 3 treats elimination reactions.
I don't think many traditional UK Chemistry Departments would leave organic reaction mechanisms until second level, but the OU approach is perfectly logical given their course structure. It may not be to your taste, and it certainly would not suit my present department. On the other hand I am reviewing a book that could be used for current teaching, not an integrated Course.
The Case Study is entitled *Shape-Selective Catalysis using Zeolites*. Very up-to-the minute, with lovely illustrations.

Extensive use is made of the freely-available commercial packages ISIS/Draw and WebLab ViewerLite, and the chemical structures discussed are all available on the CDROM as .msv files.

Chemical Kinetics and Mechanism - The Molecular World



From the publisher...

Chemical Kinetics and Mechanism – The Molecular World

Michael Mortimer and Peter Taylor (Eds.).

Chemical Kinetics and Mechanism considers the role of rate of reaction. It begins by introducing chemical kinetics and the analysis of reaction mechanism, from basic well-established concepts to leading edge research. Organic reaction mechanisms are then discussed, encompassing curly arrows, nucleophilic substitution and E1 and E2 elimination reactions. The book concludes with a Case Study on Zeolites, which examines their structure and internal dimensions in relation to their behaviour as molecular sieves and catalysts. The accompanying CD-ROM contains the "Kinetics Toolkit", a graph-plotting application designed for manipulation and analysis of kinetic data, which is built into many of the examples, questions and exercises in the text. There are also interactive activities illustrating reaction mechanisms

0-85404-670-4 256pp 2002 £22.50

The CDROM contains the Kinetics (ie, Maths) Toolkit and the structures, together with substantial audiovisual presentations on the following topics:

ISIS/Draw and WebLab Viewer Tutorial
Java Molecular Editor, which is used to draw skeletal molecular diagrams
Activity 1, how to use curly arrows.
Activity 2, Kinetics and Stereochemistry
Activity 3, Inductive and Resonance effects
Elimination exercise.

Many years ago, I was part of an OU Course Team (SMT356 Electromagnetism, before you ask). The OU make extensive use of the Team Approach and they have excellent audiovisual production facilities. Their approach ensures consistency, quality and an attention to detail rarely seen in UK University teaching. Everything is integrated, the learning outcomes are decided on before the material is written, all the i's are dotted and all t's crossed. To take a simple example, correct use is made of quantity calculus throughout, there are no logs of concentrations and no plots of quantities against inverse temperatures. The material is designed to last for many years before revision will be needed.

I can see how this Unit fits into the OU scheme of things, and it is beautifully done. Despite many years of general dumbing down and modular exams, my Department still thinks that chemical kinetics and organic reaction mechanisms should be given pride of place in first year and we teach them in parallel very early on.

Whilst we could use this new book for our first year teaching, we have to consider the total cost of recommended texts for impecunious students (who don't have the means to buy books any more). At the recommended price, it's a snip but the student will have to buy many more such texts. I wish I knew what advice to give them.

Chemistry for Environmental Engineering and Science

Subject area
Environmental engineering, environmental chemistry, or environmental science.

Description
A general chemistry textbook focusing on water and wastewater chemistry with a particular emphasis on water analysis.

Authors
Clair Sawyer, Peter McCarty, Gene Parkin.

Publishers/Suppliers
McGraw-Hill (http://www.mcgraw-hill.co.uk).

Date/Edition
2002/5th International Edition.

ISBN
0-07-119888-1.

Level
Undergraduate.

Price
£39.99.

Adrian Watson
Department of Environmental and Geographical Sciences,
Faculty of Science and Engineering
Manchester Metropolitan University
John Dalton Extension
Chester Street
Manchester M1 5GD
April 2003

Summary Review

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

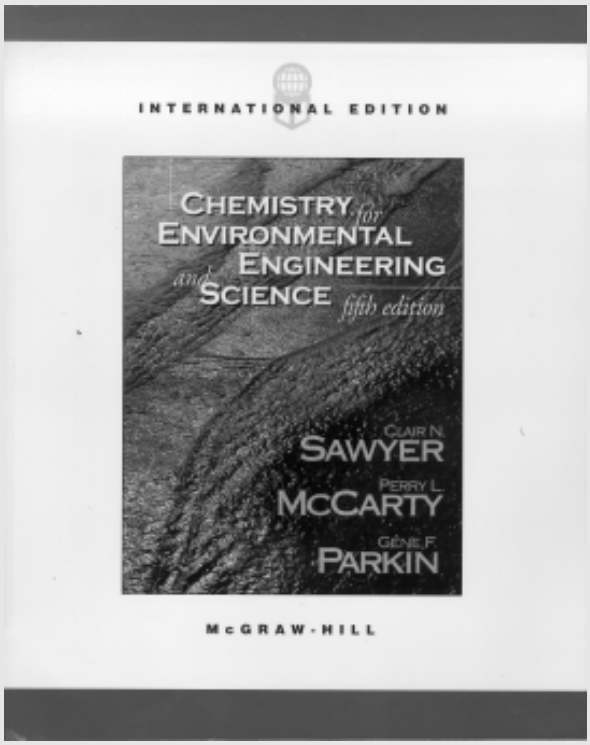
This book is the 5th (international) edition of a well-established text that has been published in one format or another for over 40 years and has consequently been an adopted text for many undergraduate and postgraduate university courses, particularly engineering courses in the United States. The text is aimed primarily at the engineering undergraduate who has already studied A-level chemistry, and most environmental engineers or scientists who bought this book would find that it would last them throughout their course because of the wealth of information within it. As with any text that is so well established it would be expected to have many strengths, and this is indeed the case. The style, layout and tone of the text takes a traditional chemistry based approach, i.e. whilst a little "dry", the text is informative and authoritative with many worked examples, tables and black and white diagrams to illustrate the text. Also as expected after many revisions, the text is largely error free and each chapter concludes with an adequate further reference list and a very good range of self-study/revision questions, which allows the student to test their level of understanding of the material.

Although the title implies that the book will cover general environmental chemistry, the text effectively limits itself to the chemistry associated with water and wastewater systems, so chemical aspects of environmental issues such as air pollution and contaminated land are largely ignored, while aquatic chemistry is covered extensively. Hence the book may be of more use to the geochemist or environmental engineer who has a focus on water chemistry, rather than the broader approach of the environmental scientist. In the latter case an alternative text such as those by Manahan[1], or vanLoon and Duffy[2] may be more appropriate.

The format of the text is unusual in that it is effectively two separate books in one; the first half of the book is a general chemistry text, covering as expected the key principles of physical, organic and inorganic chemistry but also including specific sections on nuclear, colloid and biochemistry. Whilst the content is overall both sound and appropriate, I feel that there is too little environmental contextualisation of the chemistry, which I believe is important particularly when the book is aimed at supplementing the chemistry of students who will probably consider themselves non-chemists i.e environmental engineers and scientists. Consequently a few more environmental case studies to supplement the chemistry would have been useful. As an aside, a common criticism of many American Environmental texts, including this one, is that they are often very parochial, so that despite being well written they often have a lack of case studies or information regarding the environment beyond the United States, which certainly limits their use as a teaching aid outside of the US.

The second half of the book is the section where the book comes into its own. Taking as a key reference the *Standard methods for the Examination of Water and Wastewater*[3] the book becomes an analytical text comprehensively detailing "wet chemical" standard methods for water analysis, such as alkalinity, BOD, and chloride for example. Whilst many of the wet chemical techniques are well established and understood, the fact that the wealth of material presented here is collated into a single text is extremely useful, and in many cases the student could use the text as a practical manual. Also within this section the contextualisation, which I felt was missing in the first section, is more evident, and the text reads better accordingly. The only criticism I have of

Chemistry for Environmental Engineering and Science



From the publisher...

Chemistry for Environmental Engineering and Science

Clair Sawyer, Peter McCarty, Gene Parkin.

This is the definitive text in a market consisting of senior and graduate environmental engineering students who are taking a chemistry course. The text is divided into a chemistry fundamentals section and an applications section.

0-07-119888-1 650pp 2002 £39.99

this second section is that given the relative importance of instrumental analytical techniques in the water industry, I would have expected a little more depth on the applicability of chemical instrumentation in water analysis.

Overall this is an authoritative text that deserves to be on the reading list for many environmental engineering courses, in particular those that have a strong emphasis on water and wastewater chemistry. For environmental chemistry or science courses that have a wider perspective, the book content may be a little limited and other alternatives may need to be considered.

References

1. Manahan, S.E., *Environmental Chemistry* 7th Edition (2000), CRC Press, Boca Raton, Florida.
2. vanLoon, G.W. and Duffy, S.J., *Environmental Chemistry – a global perspective*, (2000) Oxford University Press, Oxford.
3. Cleseri, L.S. Greenberg, A.E. and Eaton, A.D. (Editors), *Standard Methods for the Examination of Waste and Wastewater*, 20th Ed, (1998), American Public Health Association, Washington, DC.

Data Reduction and Error Analysis for the Physical Sciences

Subject area
Physical Sciences.

Description
This book is designed as a laboratory companion, student textbook or reference book for professional scientists. The text is for use in one-term numerical analysis, data and error analysis, or computer methods courses, or for laboratory use.

Authors
Philip R. Bevington and D. Keith Robinson.

Publishers/Suppliers
McGraw-Hill
(http://www.mcgraw-hill.co.uk).

Date/Edition
2003/3rd Edition.

ISBN
0-07-247227-8.

Level
Undergraduate, Research.

Price
£21.99.

Adrian Barnes
H.H. Wills Physics Laboratory
Royal Fort
Tyndall Avenue
Bristol BS8 1TL
May 2003

Summary Review

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

In any scientific experiment there are always uncertainties in the values of the measured parameters. The treatment of these experimental errors and their influence on the precision and accuracy of any declared results and conclusions is hence a crucial part of any experimental work. The purpose of this book is to serve as an introduction to the basic concepts and methods commonly used for data treatment used in the physical sciences.

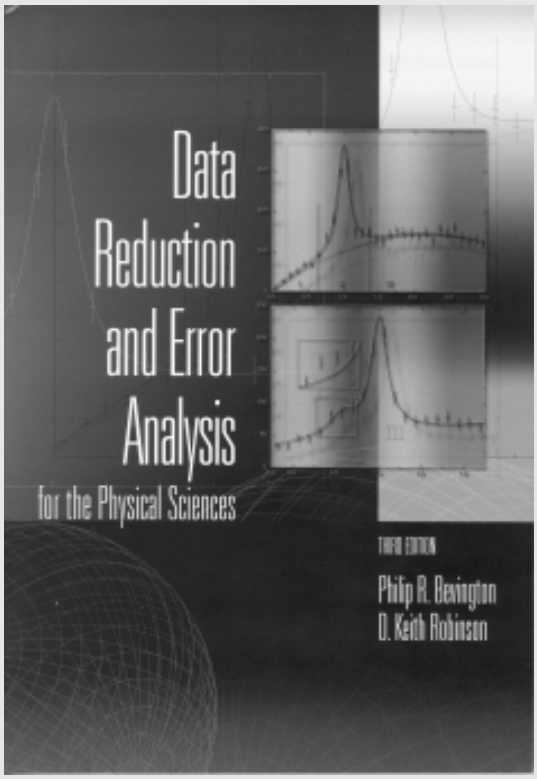
The book commences by explaining the origins of errors in experiments and the ways in which they can be estimated. Especial care is taken in establishing the important difference between random and systematic errors and the methods by which they can be minimised through good experimental practice. Following this introduction the authors proceed to a clear and logical explanation of the statistical ideas behind experimental measurements and the basic distribution functions that underlie them. The important concepts of maximum likelihood, the differences between the standard deviation and the standard error of a set of measurements, and the differences between Gaussian and Poissonian statistics are all carefully introduced and explained. Methods for comparing sets of experimental data and their significance are also explained in depth.

There is a rather unusual chapter that describes in detail the use of Monte Carlo methods for both planning experiments and as a tool for analysing experimental results. In the latter case the technique is often easier and simpler to apply where obtaining analytic fitting functions for conventional least squares methods is difficult or not possible. An example of a particle physics scattering experiment is used to demonstrate the method. Such analysis techniques are now readily approachable with desktop computers.

The rest of the book concerns the basic ideas of fitting data and ranges from the simple linear least squares to the more complex non-linear least squares methods. The importance of including errors in the data as statistical weights in the fitting procedure, as well as demonstrating the errors that may be introduced by falsely assuming Gaussian statistics, are clearly shown. The methods by which error estimates may be made for the fitted parameters are also clearly explained. Although there are a large number of data analysis software packages that exploit these methods these chapters are essential reading in order to obtain a real understanding of the ways in which they can and should be applied. Indeed after reading this book some of the limitations of some of these packages will become apparent to the reader.

The final chapter concerns the direct application of maximum likelihood methods to data analysis. These methods are normally computationally intensive and have not been used extensively in the past for this reason. However, with the computational power now available on the desktop, it is a method that is being increasingly used. The authors carefully discuss the advantages and disadvantages of this method over the more conventional least squares routes and suggest where its use may be most useful and appropriate.

Data Reduction and Error Analysis for the Physical Sciences



From the publisher...

Data Reduction and Error Analysis for the Physical Sciences

Philip R. Bevington and D. Keith Robinson.

The purpose of this book is to provide an introduction to the concepts of statistical analysis of data for students at the undergraduate and graduate level, and to provide tools for data reduction and error analysis commonly required in the physical sciences. The presentation is developed from a practical point of view, including enough derivation to justify the results, but emphasizing methods of handling data more than theory. The text provides a variety of numerical and graphical techniques. Computer programs that support these techniques will be available on an accompanying website in both Fortran and C++.

0-07-247227-8 352pp 2002 £21.99

This book is suitable for anyone concerned with experimental measurements in the physical sciences and especially to those concerned with fitting data. Its content is essential reading for any undergraduate or postgraduate physicist. Its approach is unashamedly mathematical and a good knowledge of calculus and linear algebra is essential for the reader. Despite this, the main strength of the book is that it takes the theoretical concepts and demonstrates, through practical examples, how they may be applied in realistic situations. Perhaps one criticism of the book is that there is no discussion of Bayesian methods of model fitting. This is increasingly used and a discussion of the principles, uses and pitfalls of these methods would be a useful extension to this book.

There is a comprehensive set of FORTRAN subroutines listed that the reader can easily incorporate into their own programmes. FORTRAN and C++ versions of the subroutines described in the book are also available for download from the web (details in book).

Fundamentals of Chemical Reaction Engineering

Subject area
Chemistry.

Description
This book is an introduction to the quantitative treatment of chemical reaction engineering. It is appropriate for a one-semester undergraduate course. The text covers homogeneous and heterogeneous reacting systems, and chemical reaction engineering plus chemical reactor engineering.

Authors
Mark E. Davis and Robert J. Davis.

Publishers/Suppliers
McGraw-Hill
(http://www.mcgraw-hill.co.uk).

Date/Edition
2003/International Edition.

ISBN
0-07-119260-3.

Level
Undergraduate.

Price
£37.99.

Martin Pitt
Chemical & Process Engineering
University of Sheffield
Sheffield S1 3JD
April 2003

There are a number of good, well-established books in this field, so any new entry has to be something special to displace them. It does not seem to me that this does so. These are course notes converted into a book. Nothing wrong with that, but it does seem to depend on a very specific curriculum and mindset.

Summary Review

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

This is an exposition of reaction kinetics for homogeneous reactions and solid-catalysed reactions, with a consideration of non-ideal flow and non-isothermal reactions. There are appendices on chemical equilibria, regression analysis and transport in porous media. It is rather more applied chemistry than chemical engineering, with one chapter on the *Microkinetic Analysis of Catalytic Reactions*.

Each chapter has examples, exercises (but no solutions) and some examples ("vignettes") of bits of research or applications which could be useful asides or the basis for student literature essays. (Though many of these are quite old.)

This book is clearly based on a style of teaching chemical engineering common in France, in which students are taught chemical engineering science and left to develop engineering design skills later. It specifically acknowledges and draws extensively from Michel Boudart[1] (now at Stanford) and his out of print book. (Boudart's papers are well-referenced.) This is a rigorous, mathematical, somewhat abstract and disciplinarian approach. If the student has not taken the prior courses assumed by these authors, they have no mercy.

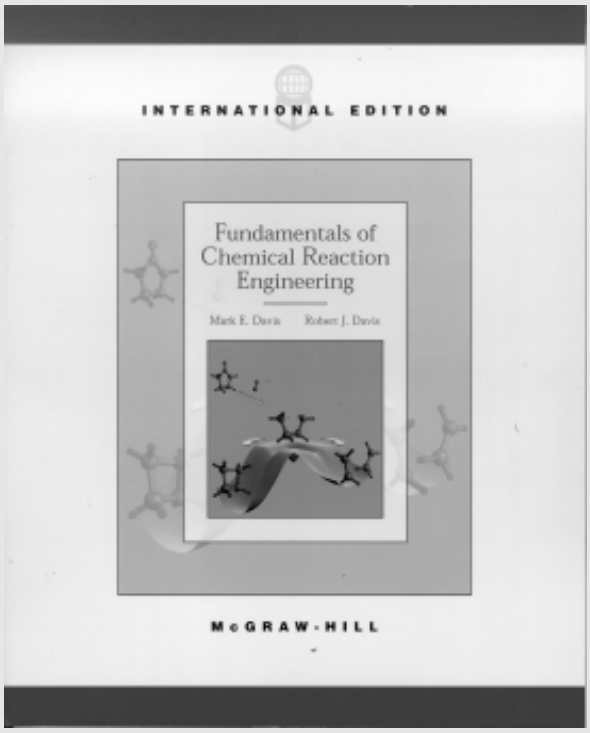
On page 3, in the very first example, the Lewis and Randall rule is invoked. If you do not know what this is, tough. It is not explained in the appendix on chemical equilibria, which again assumes it. (It is also not in other likely student textbooks on my shelf on physical chemistry, such as Atkins[2]. Other books on chemical reaction engineering manage without it altogether.) The authors like named reactions, rules and criteria.

The second example, on page 9 produces a matrix equation for no obvious purpose or use later on. This would be enough to put off most students.

Almost at the end of the book are a couple of diagrams and a not particularly informative 'photograph of a commercial reactor', confirming the authors' initial statement that they are teaching reaction rather than reactor engineering, and the student's prejudice about impractical academics.

Trying to be positive, this book would suit a certain kind of academic and a minority of students of the sort who go on to be academics. It might be useful for a mathematically adept chemistry graduate to learn the basics at the start of a PhD on catalysis.

Fundamentals of Chemical Reaction Engineering



From the publisher...

Fundamentals of Chemical Reaction Engineering

Mark E. Davis and Robert J. Davis.

This book is an introduction to the quantitative treatment of chemical reaction engineering. It is appropriate for a one-semester undergraduate (or first-year grad) course. The text provides a balanced approach in two regards: first, it covers both homogeneous and heterogeneous reacting systems, and second, it covers both chemical reaction engineering and chemical reactor engineering.

0-07-119260-3 432pp 2003 £37.99

I believe that in the UK many chemistry students would find the mathematics daunting, and many chemical engineering students would find it too far removed from the design of reactors, with too much detail on certain aspects related to catalyst design. I would not choose it to replace established texts.

In my view, a more comprehensible and much cheaper run through the maths is given by Metcalfe[3].

References

1. Boudart, M., (1968, 1991) *Kinetics of Chemical Processes*, Prentice-Hall.
2. Atkins, P.W., (1995) *Physical Chemistry*, 5th ed, Oxford University Press.
3. Metcalfe, I.S., (1997) *Chemical Reaction Engineering - A First Course*, Oxford Chemistry Primers.

Heterocyclic Chemistry - Chemistry Tutorial Text

Subject area
Organic chemistry.

Description
The book describes the syntheses and reactions of heterocyclic compounds containing a single heteroatom.

Authors
Malcolm Sainsbury

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

Date/Edition
2001.

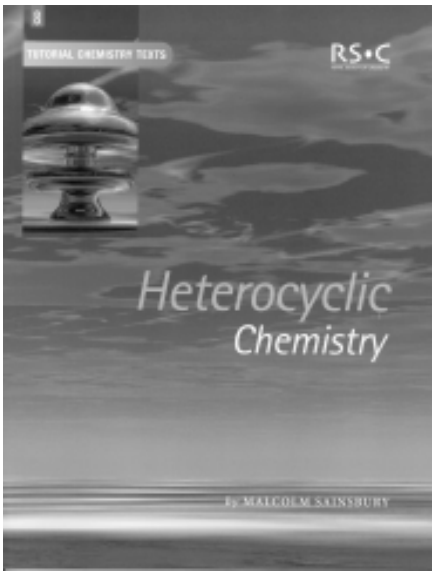
ISBN
0-85404-652-6.

Level
Undergraduate.

Price
£9.95.

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

Heterocyclic Chemistry by Malcolm Sainsbury describes the syntheses and reactions of heterocyclic compounds containing a single heteroatom. This is small text book and the author has sensibly targeted the reactions and descriptions of simple systems. The book provides a good balance of reactions of heterocycles, syntheses of heterocycles and also molecular orbital, conformational and nomenclature matters. Selective material has been covered in a coherent and easy to read fashion. The written descriptions are clear and the book is laid out in a logical way. I believe that most chemistry students having taken organic chemistry courses in year 1 would be able to find this book approachable and easy reading. This book is not a reference book and was not written with this in mind, that said good references are given for further reading.



Questions are provided, and these are good questions, pitched at the right level to test the student's understanding of the subject, with the answers, generally speaking, to be found without recourse to other texts.

There is the odd error but these are of an insignificant nature, such as exclamation marks for the degree sign in schemes 2.9 and 2.10.

There are many excellent text-books on the subject of general organic chemistry which dedicate chapters to the syntheses and reactions of heterocyclic chemistry, for instance books such as *Organic Chemistry, Structure and Function* by K.P. Vollhardt and N. Schore[1], or *Introduction to Organic Chemistry* by Streitwieser, Heathcock and Kosower[2]. However Malcolm Sainsbury's book goes into the subject in much more depth-which is a necessity for supporting a specialist, undergraduate course in heterocyclic chemistry.

Perhaps one criticism could be that the section on the importance to life and industry could have been expanded a little, with the addition of recent work in the area of conducting polymers.

I would thoroughly recommend this book for consideration by undergraduates, majoring in Chemistry, it is targeted to the key issues, explains facts well and is at a competitive price.

References

1. Vollhardt, K.P. and Schore, N., *Organic Chemistry, Structure and Function* (2002), Palgrave McMillan.
2. Streitwieser, A., Heathcock, C.H. and Kosower, E.M., *Introduction to Organic Chemistry* (1999), Pearson Publications.

Norman Ratcliffe
University of the West of England
Faculty of Applied Sciences
Coldharbour Lane
Frenchay
Bristol BS16 1QY
March 2003

Main Group Chemistry - Chemistry Tutorial Text

Subject area
Inorganic Chemistry.

Description
Main Group Chemistry covers the chemistry of the s- and p-block elements, together with a brief chapter on the chemistry of zinc, cadmium and mercury, often classified as main group elements rather than as transition elements.

Authors
W. Henderson.

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

Date/Edition
2000/1st Edition.

ISBN
0-85404-617-8.

Level
Undergraduate.

Price
£9.95.

Keith Wilkinson
International School of Lusaka
PO Box 50121 RIDGEWAY
Lusaka,
Zambia
May 2003

Summary Review

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

This is the third in the RSC's series of ***Tutorial Chemistry Texts***. As the title suggests, this text covers the Chemistry of Groups 1 & 2 and 13 - 18. The early chapters rapidly build up foundation ideas in structure and bonding, move on to the chemistry of hydrogen and then devote a chapter to each group. A welcome appending chapter towards the end is devoted to zinc, cadmium and mercury (Group 12), as these can get orphaned in a typical coverage of d-block elements. Whilst this is intended as an undergraduate text, it would also serve well as a resource for further reading in school and departmental libraries for International Baccalaureate (IB) students and A-level examination candidates.

I particularly enjoyed reading the chapter on Group 13 elements where the area of boranes is well treated using Wade's rules for predicting cluster shape. As with other chapters, each is well supported with worked examples through the text, and the end of chapter has a selection of appropriate further problems for which answers can be consulted from the back of the book. Each chapter also has both references and a bibliography of recommended further reading. The latter will be much appreciated by the more able students who would normally seek other sources with further data and analysis to hammer out a complete understanding. The references quoted are from some classic papers, and by way of extension, a support website that made these papers available to view and download would make for an excellent form of background reading and appreciation of the historical development of the chemical ideas presented.

The straightforward style of presentation of this book makes it easy to navigate and use as a teaching resource. It holds no pretensions to being an exhaustive text of the magnitude of say Shriver and Atkins *Inorganic Chemistry*[1]. As it is, to take on the task of presenting main group chemistry in a slim volume and keeping this both readable and approachable is no mean feat. This book is aimed at early undergraduate courses, but a good many of the problems are accessible to IB and A-level students, and provide plenty of ideas for classroom/seminar activities and discussion. I would warmly recommend this text as a well written overview that would be useful as reference text in a school or departmental library.

Strengths:
Good summary text with wide coverage in a slim volume. Attractive layout, and easy to navigate. The sepia & black illustrations are very clear and photocopy well onto OHP's. Good set of worked problems, and end of chapter problems with answers at end of book.

Weaknesses:
Students and teachers seeking more extensive detail than is possible for such a slim volume to provide will need access to a more exhaustive text such as Shriver and Atkins *Inorganic Chemistry*.

Other:
As many readers might not have access to the referenced articles, a support website with the articles to download by arrangement with the journals would make this a unique study.

Reference
1. Shriver, D.F. and Atkins, P.W., *Inorganic Chemistry* (1999) Oxford University Press.

Metals and Chemical Change – The Molecular World

Subject area
Physical & Inorganic Chemistry.

Description
Part of the second level Open University course. Well illustrated text with integrated questions (and answers) plus an interactive CDROM containing video reaction sequences, data book and calculation questions.

Authors
David Johnson (Ed.).

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

Date/Edition
2002.

ISBN
0-85404-665-8.

Level
Undergraduate.

Price
£25.

David Ruddick
School of Applied Medical Sciences & Sports Studies
University of Ulster
Newtownabbey
Co Antrim BT37 0QB
March 2003

This is the second book in ***The Molecular World*** series, which are the texts for a second level Open University course. It assumes some knowledge of the solid state from the first book, *The Third Dimension*[1], but is essentially free-standing.

Summary Review

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

The book introduces Thermodynamics via the reactivity of metals. Students study CDROM video sequences of the reactions of various metals with acid and with solutions of other metal ions. This is a stimulating way to involve the reader in the creation of their own Activity Series which they can compare with the stabilities of metal oxides and halides.

A pragmatic approach strips the theory down to constant pressure systems only, and uses a minimal amount of mathematics. This is internally consistent, but can lead to difficulties when looking for clarification or additional examples in other texts, where the equations may be different. For example, the First Law becomes ΔH = heat added + electrical work done (only). Entropy is explained in terms of Disorder, but simply defined in terms of $\Delta S = q/T$. Integrations are not attempted, but Absolute Entropies are neatly built up with summations of areas under graphical curves.

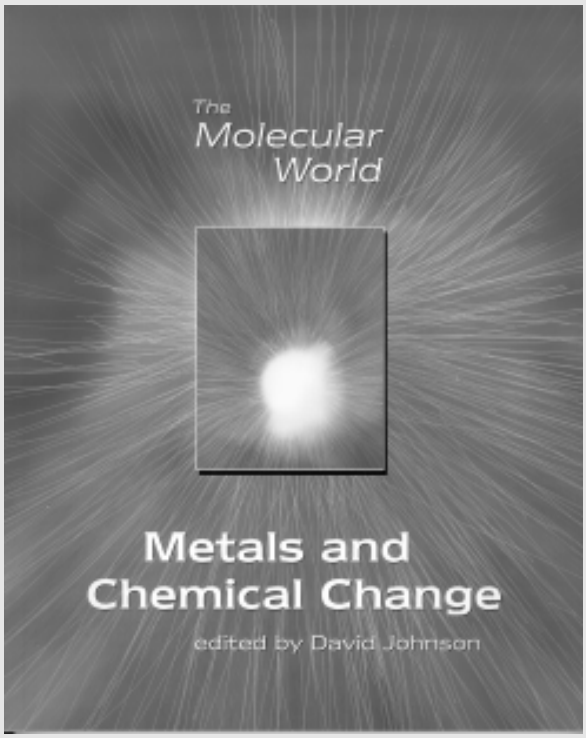
An extensive Data Book is provided on the CDROM in .pdf format. It includes standard ΔH, S and ΔG values for many inorganic compounds and elements, but very few organic compounds. The textbook introduces the Gibbs function and states how ΔG is related to the reaction equilibrium constant, and hence to the extent of reaction. There are then several worked examples of calculations, and more to practise on. The theory is extended to aqueous ions, and later to Redox potentials.

Throughout the text, practical applications are stressed and illustrated. Consideration is given to the reasons for the different common methods of extraction of metals from their ores. Particular emphasis is given to calculating the minimum temperature at which carbon can be used to reduce a metal oxide.

The stability of solids is continued into Born-Haber cycles, and lattice energies are examined using the Born-Landé and Kapustinskii equations. This leads naturally into the chemistry of groups I and II, where the relative stabilities of the hydrides, oxides, peroxides, etc, depend strongly on lattice energies. The chemistry of complex ion formation is also introduced, and illustrated with crown ether and cryptate ligands for group I, and EDTA, etc for group II. The industrial importance of groups I and II is illustrated with the chlor-alkali industry and lime for glass manufacture, etc.

The book concludes with a well developed Case Study on batteries and Fuel Cells. There is a good survey of the wide range of primary and rechargeable batteries, and the common ones are considered in detail. Modern developments of fuel cells are discussed, with examples of applications extending from electric vehicles to space flight.

Metals and Chemical Change – The Molecular World



From the publisher...

Metals and Chemical Change –
The Molecular World
David Johnson (Ed.).

This book looks at how molecules react, and how the feasibility and outcome of chemical reactions can be predicted. Beginning with an introduction to the concept of an activity series of metals, Metals and Chemical Change then introduces chemical thermodynamics (enthalpy, entropy and free energy) and applies the concept to both inorganic and organic elements. A Case Study on batteries and fuel cells is also included. The accompanying CD-ROM includes video sequences of the reactions of metals with water, acid and aqueous ions, and gives the reader an opportunity to make experimental observations and predictions about chemical behaviour. A comprehensive Data Book of chemical and physical constants is included, along with a set of interactive self-assessment questions.

0-85404-665-8 272pp 2002 £25

Like all Open University texts, this one is structured to encourage independent study. The layout is clear and there are plenty of coloured diagrams, tables, graphs and photographs. Each chapter has a summary, and there is a page-referenced glossary of terms. Throughout the text there are short questions, with answers given either immediately or at the end with an appropriate amount of explanation.

There are additional calculation questions on the CDROM. Disconcertingly, submission of the wrong answer initially always generates the response “your answer is incorrect” even if only the sign is wrong. A second attempt evokes some general hints. I was surprised to discover that a second run through the entire question set produced variations in some of the questions, although there was no warning of this. However, the questions do provide valuable practise in the manipulation of thermodynamic data. There are also the reactions of four unknown metals at the end of the video sequences, to challenge the enthusiastic student (no answers given).

The book and CDROM provide an excellent learning resource of the material covered. They are almost error-free, and can be strongly recommended (with the slight reservation that the thermodynamics is constant pressure only).

Reference

1. Smart, L. and Gagan, M., *The Third Dimension*, (2002), Open University and Royal Society of Chemistry.

Molecular Modelling and Bonding – The Molecular World

Subject area
Chemistry.

Description
A book and CDROM which look at some of the methods used to model molecules and at the principles behind them.

Authors
Elaine Moore (Ed.).

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

Date/Edition
2002.

ISBN
0-85404-675-5.

Level
Undergraduate.

Price
£17.50.

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

The stated purpose of ***Molecular Modelling and Bonding*** is to look at some of the methods used to model molecules and at the principles behind them. The content includes material found mostly in the first year of a conventional undergraduate degree programme in chemistry. A brief chapter on molecular mechanics (9 pp.) is followed by treatments of atomic orbitals (18 pp.), molecular orbitals for diatomics (29 pp.) and polyatomics (9 pp.), symmetry (15 pp.), calculations in practice (2 pp.) and bonding in solids (18 pp.). A summary of learning outcomes and of answers and comments to the self-assessment questions, is then followed by a case study on Molecular Modelling and Rational Drug Design (24 pp.). There is an accompanying CDROM.

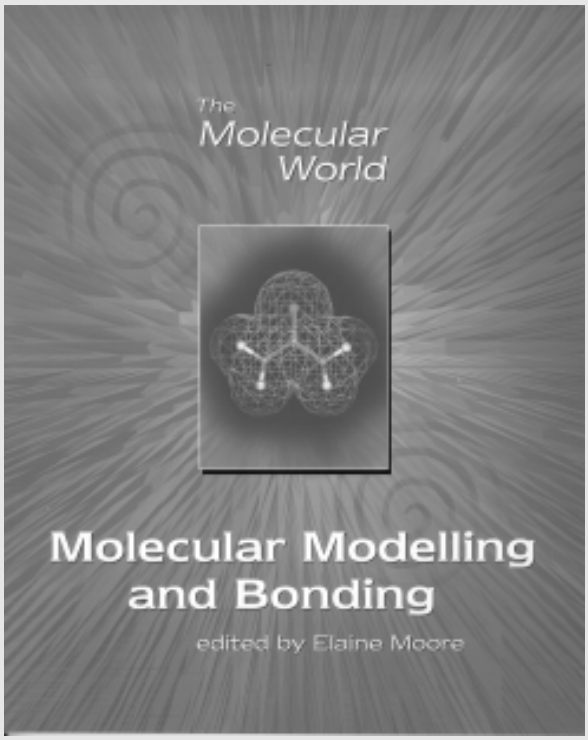
The text is laid out in the now customary manner, with wide margins, lots of colour illustrations, and (a few) inset boxes. Each chapter has a number of self-assessment questions which are related to the listed learning objectives, and frequent use is made of bulleted in-text questions and answers; however, the role of these is not explained in the Introduction. A deliberately non-mathematical approach has been adopted: there is not a single equation in the book. Consequentially the topics are discussed in a qualitative and rather chatty style. This may make for easy reading, but does not necessarily ensure comprehensibility or accuracy.

There are no explicitly stated prerequisites for this book, other than 'some background knowledge of chemistry' for the S205 course as a whole. However, there are a significant number of terms and concepts used in the book that are not defined or explained within it (although perhaps these are introduced in one of the other titles in ***The Molecular World*** series). For example, quantum numbers n and l, and the s, p, d notation, are used without explanation in the chapter on atoms, and the Schrödinger equation is mentioned as if the reader is already familiar with what it is. Similarly, there are no explanations for spin, Hund's rule, or Gaussian functions.

There are numerous instances where the discussion is inaccurate, misleading, or potentially confusing. The van der Waals interactions between ions in a crystal lattice are not 'intermolecular forces'. The ions in a 'perfect crystal' cannot be considered simply as being in a spherically symmetric environment. It is very misleading to illustrate the torsional contribution to a molecular mechanics description of an organic molecule as a spring connecting 1,4-nonbonded atoms. The Newman projection shown for ethane is described as portraying an eclipsed conformation but is clearly staggered. The subject of molecular mechanics is discussed without mentioning how energy depends upon geometry, or showing any graph to illustrate this fundamental idea, and I would suspect that many students could read this chapter and remain completely clueless about the basics of the subject. We are shown graphs (with unlabelled y-axes) for six Gaussian functions that may be used to describe a 1s orbital, but how and why these are added together is likely to baffle many readers. Hybrid orbitals are introduced as the means to predict molecular shape (instead of the consequence of it), but no role for electron-nuclear attractions and electron-electron repulsions is mentioned. Although it is a worthy aim to employ pictorial methods to convey key concepts, I am not convinced that the treatments offered in this book succeed in their intentions.

Ian H. Williams
Department of Chemistry
University of Bath
Bath BA2 7AY
April 2003

Molecular Modelling and Bonding – The Molecular World



From the publisher...

Molecular Modelling and Bonding – The Molecular World
Elaine Moore (Ed.).

Why do molecules adopt particular shapes? What determines the physical and chemical properties of a material? Molecular Modelling and Bonding answers these questions by introducing the ideas behind molecular and quantum mechanics, using a largely non-mathematical approach. Atomic and molecular orbitals, computational chemistry and bonding in solids are also discussed. A Case Study, Molecular Modelling in Drug Design, explores ways in which computer modelling, in conjunction with experimental techniques, is used to design new drugs. The accompanying CD-ROM illustrates applications of molecular and quantum mechanics, and includes many of the structures and orbitals illustrated in the text. It provides the programs necessary to view orbitals and 3D structures.

0-85404-675-5 154pp 2002 £17.50

The (very brief) overview on Calculations in Practice is the only part of the text that depends upon the CDROM. I am rather doubtful that there is sufficient guidance provided to allow the intended learning outcome ('to select suitable methods, size of basis sets and type of run for a given calculation') to be achieved in any manner other than the most superficial.

The case study stands alone at the end of the book. It is interesting and informative but bears almost no relation to the preceding content. It does not provide a clear demonstration to the reader of how the principles introduced in the main text find application in the natural world and in industry.

The book seems to raise as many problems as it solves. There are no references to other texts for more complete explanations, and the only suggestions for further reading are other titles in the same series. This is a serious omission, given that the book is 'designed for independent learning'. To where should an independent learner turn for help? One of the texts recommended for preparatory reading for the Open University Course S205, The Molecular World, is Chemistry: Molecules, Matter, and Change by Jones and Atkins[1]; in my opinion this contains much better presentations for all the topics also covered by Molecular Modelling and Bonding. I could not recommend Molecular Modelling and Bonding for use in the context of the undergraduate courses with which I am familiar. There is indeed a place for a text that covers the subject of molecular modelling and bonding at an introductory level, but I do not consider that the most has been made of the present opportunity.

Editor's note: The reviewer also submitted a review summary for the CDROM which accompanies the book. The table is presented below...

Summary Review

range: * very poor to ***** excellent

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

Reference

1. Jones, L. and Atkins, P., *Chemistry: Molecules, Matter, and Change* (1997) W.H. Freeman.

Quantum Optics in Phase Space

Subject area
Physics.

Description
An advanced text on the mathematical basis of quantum optics, based largely on the phase space representation. Of value to research students or established researchers.

Authors
Wolfgang P. Schleich.

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

Date/Edition
2001.

ISBN
3-527-29435-X.

Level
Research.

Price
£55 (www.amazon.co.uk).

Summary Review

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

Advanced techniques for manipulating light underpin such diverse applications as Bose-Einstein condensation of atoms and cryptography involving entangled photons. Popular accounts of these phenomena abound, but the technical details are quite difficult, and there are surely many lecturers and students who would like an accessible source of more complete descriptions. Unfortunately, Wolfgang Schleich's book does not provide that. What it does offer in its 700 pages is a comprehensive and unreservedly mathematical treatment of quantum optics which aims to enable its readers to tackle current research literature.

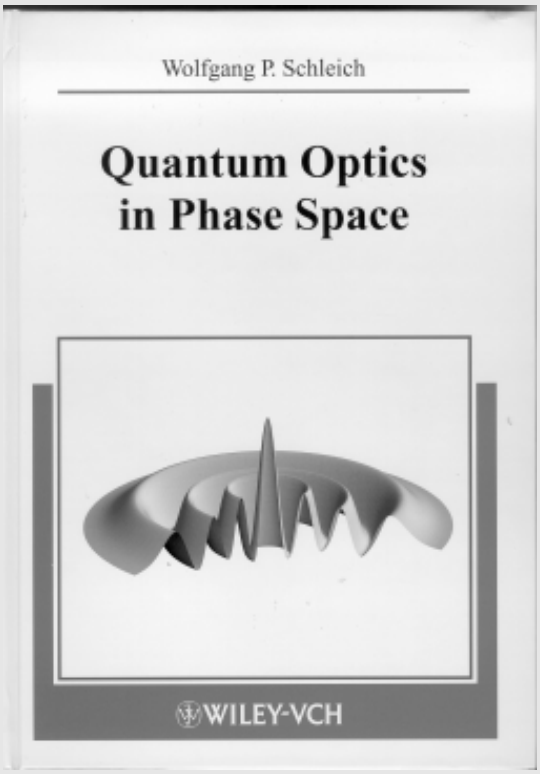
The introductory chapter is a relatively brief discussion of the key experimental phenomena of quantum optics. The story starts with the resonant fluorescence of trapped atoms, where it is found that for high-intensity exciting radiation there is incoherent emitted radiation both at the incident frequency and in bands either side of it. Furthermore, there is a time delay between successive photons emitted from the atom: as opposed to normal thermal light, in which photons arrive in bunches, resonant fluorescence is *antibunched*. The next effect is that quantum mechanics restricts the extent to which we can simultaneously know the magnitude and the phase of the electromagnetic field. We can tailor the field so that we know the phase very accurately (for interferometry), but in so doing we increase the uncertainty in the amplitude. Altering the *shape* of the uncertainty region in this way introduces the idea of a *squeezed state*. Add to these phenomena the effects of resonant cavities of such high quality that their decay times are long compared with the time scales of the internal dynamics of atoms interacting with photons, and the changes of momentum of the atoms as they interact with the radiation, and we have defined the range of problems that the book aims to tackle.

The starting level of the book is clearly laid out in a chapter on quantum mechanical fundamentals. The reader is expected to be familiar with the time-dependent Schrödinger equation, Dirac notation, the density operator, and time-ordered integrals. The early parts of the treatment, however, rely on semi-classical ideas. To this end the phase space representation of quantum mechanics is introduced, based on the Wigner function. This is the simplest of phase state distribution functions which allow quantum mechanical expectation values to be calculated using the concepts of classical statistical mechanics (other possibilities are discussed in a later chapter).

The effectiveness of the phase space treatment is demonstrated for the harmonic oscillator, and squeezed states are illustrated. Then the semiclassical theme is continued with a discussion of the WKB approximation and the Berry phase. By this point enough mathematical machinery has been established to treat wave packet dynamics.

Tony Harker
Department of Physics and Astronomy
University College London
Gower Street
London WC1 E 6BT
April 2003

Quantum Optics in Phase Space



From the publisher...

Quantum Optics in Phase Space
Wolfgang P. Schleich.

Based on a two-semester graduate course, this book provides a concise introduction to quantum optics. Modern in style and didactically skilful, it prepares students for their own research.

3-527-29435-X 696pp 2001 •79

For the second half of the book the viewpoint switches to concentrate on the quantised nature of the electromagnetic field, and discusses the photon number representation, including such arcana as Schrödinger cat states. Classical interferometry is described in terms of phase distribution functions. The interactions of a two-level atom with an electromagnetic field (the Jaynes-Cummings-Paul model) is discussed in detail, both in the case in which the atom is assumed to be stationary and when it is allowed to move (giving rise to the possibility of laser cooling and the excitation of atomic wave packets). There are useful sections on entanglement, decoherence, the single-atom maser, and atom traps.

The book is generally very carefully produced, with a selection of challenging problems at the end of each chapter. Some more mathematical details are elaborated in about a hundred pages of appendices. It is not possible to recommend this book as “further reading” for an undergraduate course, but for a researcher in quantum optics it would be invaluable: a comprehensive text-book for the beginner, and an excellent reference volume for the more experienced.

Reactions and Characterization of Solids - Chemistry Tutorial Text

Subject area
Materials and Solid-state Chemistry.

Description
An introductory text to the synthesis and characterisation of materials in the solid state.

Authors
Sandra E. Dann.

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

Date/Edition
2000.

ISBN
0-85404-612-7.

Level
Undergraduate.

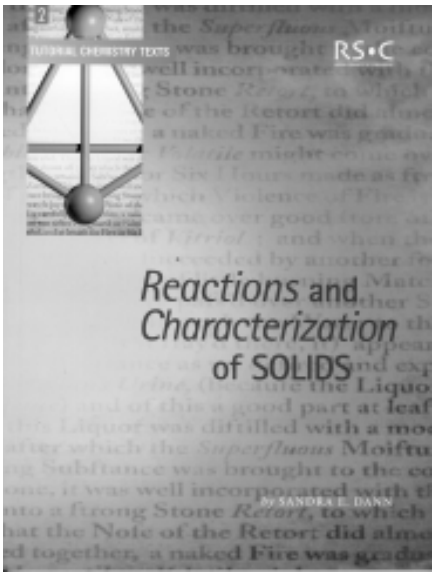
Price
£9.95.

This book provides a concise and clearly written account of solid state chemistry, which is well suited to an undergraduate course on this subject. The seven chapters include worked problems, and additional problems are provided at the end of each chapter, with the solutions at the end of the book, making it truly self-contained.

Summary Review

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

Topics covered include solid state structure, energetics, characterisation techniques, materials preparation, electronic and magnetic behaviour and non-stoichiometry, and the final chapter focuses on selected topics of contemporary relevance, including magnetoresistance and C_{60}.



The book is very clearly laid out, and is at an appropriate level for a second or third year undergraduate course in solid state chemistry, although it will also be a useful reference source for postgraduate students beginning research in solid state chemistry.

The closest alternative book on this subject (in terms of price and coverage) is probably *Inorganic Materials Chemistry* by Mark Weller[1]. Both books cover similar ground, with Dann's book having the benefit of being slightly more up to date. However, neither book attempts to cover all aspects of the subject, and I normally recommend that students consult a more detailed treatment, such as *Solid State Chemistry,* 2nd edition by Lesley Smart and Elaine Moore[2] , when further information is needed.

In conclusion I recommend this book - it covers the subject well in a way that is accessible to students, and represents excellent value.

References

1. Weller, M., *Inorganic Materials Chemistry* , (1994), Oxford Chemistry Primer (no. 23).
2. Smart, L. and Moore, E., *Solid State Chemistry,* 2nd edition, (1995), Chapman and Hall.

Rob Jackson
Lennard-Jones Laboratories
School of Chemistry and Physics
Keele University
Keele
Staffordshire ST5 5BG
May 2003

Separation, Purification and Identification – The Molecular World

Subject area
Chemistry.

Description
Book and two CDROMs divided into two main sections, one on practical techniques and the other on spectroscopy.

Authors
Lesley Smart (Ed).

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

Date/Edition
2002.

ISBN
0-85404-685-2.

Level
Undergraduate.

Price
£15.

John Leaver
10 Willow Bank Drive
Bollington
Macclesfield
Cheshire SK10 5DG
May 2003

Summary Review

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

This is an attractively presented book, well illustrated throughout with colour photographs, drawings and line drawings. The book is accompanied by two CDROMs and the materials are intended to be used in the context of independent learning.

The book is divided into two main sections, one on practical techniques and the other on spectroscopy. The first of these looks at a range of practical techniques used by the chemist to prepare, separate, purify and identify compounds. The material is concisely and clearly presented and covers a useful and interesting range of topics at a level suitable for an undergraduate embarking on a chemistry course. Some of the material would also be accessible to A-level and HNC students. A variety of practical activities is described and the material is supplemented by additional activities provided on the CDROM. For example, an early section in the book provides a diagram depicting a number of common laboratory glassware items; the linked computer activity provides a video presentation (with commentary) describing the use of a number of these items such as Hirsch funnels, Liebig condensers (including whether the water should go in at the lower or upper end!), anti-bumping granules and so on. This combination of written material, excellent graphical material and supplementary computer activities makes ***Separation, Purification and Identification*** truly multimedia. The various sections in part one cover separation techniques including chromatographic ones, purification techniques and some aspects of identification including elemental analysis and mass spectrometry. Another good feature is the use of questions throughout all sections, these are subsequently discussed in detail and intended learning outcomes are clearly stated.

Part two of the book, *Spectroscopy* introduces the range of spectroscopic techniques available for the elucidation of chemical structures, the material for this section being almost entirely on the second CDROM. This provides an introduction to spectroscopy and sections on theoretical and practical aspects of infrared and nmr spectroscopy. The CDROM has an *Integrated Spectroscopy Console* to test the structure elucidation skills gained from the learning material. This presents spectroscopic information such as details of UV, MS, ir and NMR spectra and then allows the learner to interpret the information. It even includes a Java-based molecular editor so that the molecular structure may be drawn. Feedback is then provided on how closely the structure drawn by the student matches the intended structure. The concluding section of the book looks at several case studies from forensic science, highlighting the importance of spectroscopy in this field.

Overall, despite initially seeming to be a rather slim volume, ***Separation, Purification and Identification*** is an excellent supplement to the existing books available on these topics. It has a very effective multimedia approach, likely to be attractive to today's students. The supplementary material on the CDROMs is very well thought out, easy to use and effectively covers a useful range of topics. Also included on the second CDROM is a pdf file summarising the material in the context of revision of the activities on the CDROM, this amounts to over fifty pages of revision notes that may, of course, be printed out as well. This book with the accompanying material on CDROM may be thoroughly recommended as an introduction to chemical separation, purification and identification techniques at a level and in a format very well suited to the intended audience of a first year undergraduate on a chemistry or chemistry related course.

Stereochemistry - Chemistry Tutorial Text

Subject area
Organic chemistry.

Description
A text concentrating on stereochemistry from an organic chemistry viewpoint.

Authors
David G. Morris.

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

Date/Edition
2001.

ISBN
0-85404-602-X.

Level
Undergraduate.

Price
£9.95.

Summary Review

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

This is a very well laid out text, logically presented and finely illustrated. Stereochemistry is a topic that many chemistry students find difficult, mainly because of the very real difficulties in representing three-dimensional structures in two dimensions on the page. It begins by considering stereochemistry from the point of view of molecular orbital theory and hybridization, so that the student comes to the subject refreshed by a clear idea of the origin of molecular shape from fundamental principles. The ideas presented are reinforced by excellent illustrations and the use of different projections to show how two dimensional representations can in fact be quite meaningful.

Conformation and configuration are then introduced before, in the second chapter, dealing with chiral molecules and optical activity. Good everyday examples are given throughout the text: left and right handed circularly polarized light for example uses helpful comparisons and illustrations of symmetrical and asymmetrical objects, including the often-cited idea of “handedness”. Each chapter begins with a set of aims and ends with a good set of problems. There is also a useful summary of the key points covered, chapter by chapter. Answers to problems are given in the back of the book.

References, as well as suggestions for further reading are also given at the end of each chapter and these are highly appropriate for a tutorial text being not too numerous, so that the student is neither daunted nor left high and dry. There is a separate chapter on molecules with more than one stereogenic centre, so that the student is either led gently in OR can select the appropriate topic for study, with ideas from the previous relevant chapters summarised in the introduction, so that each topic is quite self-contained. We then go on to look at C=C and C=N stereochemistry followed by a particularly good section on chirality in molecules without a stereogenic carbon, including molecules without a stereogenic centre.

A treatment of stereoisomerism in cyclic structures completes the first three-quarters of the text which then moves to introduce the vital area of stereochemistry in relation to reactions, using the familiar SN2 example. The final chapter concerns NMR spectroscopy in relation to prochirality, enantiotopic and diastereotopic groups and faces. This is both interesting and highly relevant but does tend to assume a good grasp of the fundamentals or NMR spectroscopy.

There is probably a lot more that could be added to the text – stereochemical control of reactions for example but this might render it too long for purpose and indeed one could easily dedicate an entire tutorial text to the stereochemistry of reactions, especially if related to green chemistry. Perhaps another for the future? Another possible improvement would be the use of a CDROM but this would presumably put up the cost of this tutorial text unreasonably and furthermore, there are excellent texts which employ such technology and readily accessible web sites, so that as a tutorial text, this slim volume does its job extremely well.

This is a well written text and a very useful addition to any undergraduate’s book list. The style becomes a little drier as the book progresses, perhaps partially due to the higher level of the material but the earlier chapters are very accessible and particularly student friendly. A good read? I think so!

David J. Harwood
Director, Institute for Science Education
School of Environmental Sciences
University of Plymouth
Plymouth PL4 8AA
March 2003

Structure and Bonding - Chemistry Tutorial Text

Subject area
Chemistry.

Description
A textbook intended for courses given in the first two years of UK chemistry degrees.

Authors
Jack Barrett.

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

Date/Edition
2001.

ISBN
0-85404-647-X.

Level
Undergraduate.

Price
£9.95.

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

Jack Barrett's book in the RSC ***Tutorial Chemistry Text*** series is intended as an in introductory text on molecular structure and chemical bonding for use in the first two years of UK Chemistry courses. Each chapter (seven in all) starts with a summary of content, followed by a list of aims. Chapters end with a summary of key points. Worked problems are given within chapters and further problems are given at chapter ends, with answers to some of these collected at the end of the book. Further reading suggestions are given after each chapter, with the occasional reference after some.

Chapter 1 is intended to remind the reader of the foundations of atomic theory. (Another book in the series by the same author, *Atomic Structure and Periodicity*[1], is suggested as preliminary reading for this text and another one, *Quantum Mechanics for Chemists*, by D.A Hayward[2], may be a useful companion text). A treatment of molecular symmetry and group theory follows, leading on to four chapters on covalent bonding (the dihydrogen molecule-ion and molecule; diatomic molecules; triatomic molecules and polyatomic molecules respectively) and the final chapter on metallic and ionic bonding.

Molecular orbital (MO) theory is used as the main vehicle for explaining bonding and interpreting photodissociation spectra. Valence bond theory treatment of the dihydrogen molecule is given for comparison with MO theory in chapter 3 and is also used in chapter 5 with the valence electron pair repulsion (VSEPR) theory in discussing bonding and bond angles in triatomic molecules. MO theory is used principally though, and in chapter 4 is used for both homonuclear and heteronuclear diatomic molecules. The step-by-step approach in chapter 5 to the application of MO theory to the triatomic molecule examples already subjected to VSEPR and valence bond theories earlier in the chapter works very well. Similarly, chapter 6, on small polyatomic molecules has VSEPR/valence bond theory and MO theory applied to NH_3/CH_4, BF_3/NF_3/ClF_3 and B_2H_6/C_2H_6. The concluding section, *An Overview of Covalency*, is a very good end to this part of the book. The final chapter deals with why elements are metals or non-metals and introduces the theory of the metallic bond and electrical conduction properties. The energetics of ionic bond formation is presented and the chapter concludes with a short discussion of the ionic/covalent transition.

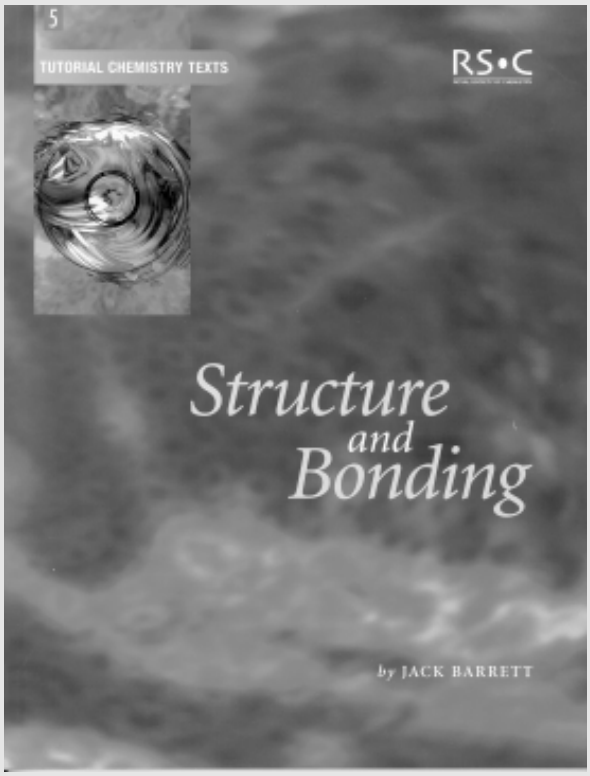
An appendix provides character tables for the relevant point groups and the answers to the problems at the end of the book are detailed. In what I personally regard as a difficult subject area, the collective worked problems and boxes given within the chapter and the answers to chapter end problems are very helpful. The text is very reasonably priced and well produced. The use of one colour (red) in different shades, light for box backgrounds and dark for headings, clearly helps to keep costs down. The result is eminently suitable for the simple diagrams needed in this subject area.

From the student viewpoint, I found the use of colour to highlight words in the text occasionally distracting. There is no glossary and so presumably the highlighting is to point out "important words". However, in one introductory paragraph of 13 lines, only 5 of them did not include such emphases. More importantly, I think I would have felt let down by the lists of key points provided at chapter ends. Mostly, they seemed to simply reiterate the lists of aims at chapter beginnings, rather than summarise key facts. For instance, chapter 7

Continued on page 28

David Perry
School of Biosciences
University of Westminster
115 New Cavendish Street
London W1W 6UW
May 2003

Structure and Bonding - Chemistry Tutorial Text



From the publisher...

Structure and Bonding - Chemistry Tutorial Text
Jack Barrett.

Structure and Bonding covers introductory atomic and molecular theory as given in first and second year undergraduate courses at university level. This book explains in non-mathematical terms where possible, the factors that govern covalent bond formation, the lengths and strengths of bonds and molecular shapes.

0-85404-647-X 182pp 2001 £9.95

Continued from page 27

aim 2 is given as …You should understand ..'The factors which ensure that some elements are metals and others are non-metals' and becomes the key point summary 'The factors which determine whether elements are metals or non-metals were discussed'. As a student I would welcome some further amplification in the key points sections (although naturally, not enough to make me not want to read the chapter!). There are also a few typos; the RSC web site provides a correction to one of the problem answers. Additionally I noticed one word with a letter missing and two rather more confusing instances, one involving incorrect designations of an MO orbital in a figure legend and one in the text and the other involving $Na(s)$ going to $Na^{+}(g)$ when it should go to $Na(g)$. Given the large number of equations and formulae here it is perhaps not surprising that there are a small number of errors present in this first edition. Overall, I found this a rigorous treatment of the subject with a lot of help provided for the student in the worked problems and text box explanations/amplifications.

References

1. Barrett, J., *Atomic Structure and Periodicity*, (2002), Royal Society of Chemistry.
2. Hayward, D.A., *Quantum Mechanics for Chemists*, (2002), Royal Society of Chemistry.

The Chemistry Style Manual

Subject area
General chemistry.

Description
Describes the techniques of scientific communication with an emphasis on chemistry.

Authors
Kieran F. Lim, School of Biological & Chemical Sciences, Deakin University, Geelong, Victoria 3217, Australia.

Publishers/Suppliers
Deakin University (http://www.deakin.edu.au/).

Date/Edition
2003/2nd Edition.

ISBN
0-7300-2569-1.

Level
Undergraduate, Research.

Price
Free to download for personal use (see copyright and permissions in text - http://www.deakin.edu.au/~lim/KFLim/books/Style_Manual_2003.pdf).

Summary Review

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

The title of this publication is perhaps misleading. It could be taken to suggest that it is concerned with the precise details of journal preparation, when in fact its remit is far wider and includes the various means of communication in which a chemist may be engaged. Although there is naturally an emphasis on chemistry, many of the materials and references are from other disciplines and so the potential readership is somewhat wider.

Chapter 1 replaces the conventional preface, consisting as it does of only three paragraphs to set the context for this publication. The reader is then straight into details of report writing in Chapter 2, where at the outset a useful distinction is made between scientific readers, and others such as managers and directors. Although there is specific mention of the Instructions to Authors in the Journal of Analytical Atomic Spectrometry, the author works through each section of a typical paper without reminding the reader to consult the Instructions to Authors for their own specialist publications. There are however a number of helpful checklists for each section and more generally which will be of particular use to less experienced writers. A detailed and informative section on fonts will also be of interest to those with more experience.

Scientific English is covered in Chapter 3. Although there is a distinct Australian bias here, tables of (amongst others) 'pretentious verbosity', commonly confused words and terms, commonly mistaken plurals and clichés to avoid are invaluable. More specifically related to chemistry are tables of IUPAC preferred and non-IUPAC preferred nomenclature, and common abbreviations that can be used without explanation. Among other "odds and ends" in this chapter are a discussion of the term billion and the symbol to use for litre. All in all this chapter contains a great deal of useful information and is a very valuable resource.

Chapter 4 considers the use of references in chemistry. Potentially the most useful feature here is advice on referencing internet sites with a number of representative examples. Graphs are covered in Chapter 5, which has several examples and an interesting flow chart whose purpose is to provide an answer to the question "Should I use a best-fit line or best-fit curve?"

Chapter 6 provides a reprint of an article entitled 'How to Make a Great Poster' and has some useful advice which is supplemented by the author's own footnotes. One of these suggests the use of particular fonts for headings and a different set for the body of text. It is also noted however that a more recent version of the article with more detail and photographs can be found at a specified website. Oral presentations are covered in Chapter 7. Again there is a certain Australian bias here, but of more general use are lists of nervous sounds and superfluous phrases and clichés to be avoided. Those who are keen on sound educational practice will be pleased to see a reference to constructivist theory in this section. Perhaps a surprising inclusion is that of a reprint of an article on what clothes to wear, which addresses this issue for both men and women. Readers may regard this advice as somewhat too prescriptive, such as only needing one suit, but nevertheless it may stimulate some thought on this topic even if the advice isn't followed.

Paul C. Yates
Staff Development and Training Centre
Hornbeam Building
Keele University
Keele
Staffordshire ST5 5BG
April 2003

Continued on page 30

The Chemistry Style Manual

Continued from page 29

Chapter 8 purports to cover writing for assignments and examinations. However, much of what is included is actually more specific to problem solving. The final table lists ways of losing marks in examinations. While these are useful, they do suggest that the author has not yet encountered anonymous marking. Ethical conduct is discussed in Chapter 9, although the chapter consists mainly of the Statement on Plagiarism from the Faculty of Science and Technology at Deakin University. Of more use are the two checklists that follow – one for individuals and one for teams.

The final part of the book consists of appendices of varying degrees of relevance. *Appendix A* deals with SI units and is a useful summary of material found in the *Green Book*. *Appendix B* looks at non-Roman alphabets, and most usefully contains practical tips on how to insert selected symbols into documents on specific computer systems.

We then come to *Appendix C*. For me this was the most useful section of this book. It is intended to provide some hints on the use of the Microsoft Word Program, and specifically to provide a brief overview of how to customise the more annoying features and to locate the more elusive useful features. Examples include customising autocorrect, reformatting standard styles and how to override existing styles.

Other appendices cover use of the EndNote program and, somewhat obscurely, the Vancouver style of referencing for biomedical journals. *Appendix F* gives detailed examples of the different parts of reports, but these are confined to synthetic chemistry and physical chemistry. A reference is given to information on reports of computational chemistry but, given the material from other sources which has been included in this book, it seems strange that an example hasn't been included for consistency. *Appendix G* contains a list of abbreviations of journal names. However, the listing of full journal names is described as 'incomplete' and there are several gaps.

Overall, I found a lot of useful information in this book and it also serves a secondary purpose in collecting together material from a number of diverse sources. It will be useful both to those starting out on their careers in chemistry and to those with more experience in communicating the subject. An electronic version is available, one copy of which may be downloaded for personal use.

Physics Discipline Network Workshop IX

September 11th and September 12th, 2003
Department of Physics & Astronomy, University of Leeds

'Learning Networks & Learning Environments'

The ever-increasing presence of networks in Higher Education at regional, national and international levels is beginning to radically affect the delivery of teaching and the accessibility of knowledge and image data. These networks are beginning to offer the potential for diverse modes of student learning (far removed from the passive world of 'talk and chalk') and new ways are being explored for persuading more students to study science.

The PDN IX team will be inviting speakers on these twin topics of Learning Networks and Learning Environments but will also provide the opportunity for university physicists to discuss new T&L initiatives and LTSN-sponsored development project outcomes during designated poster sessions.

All this and more to be held in a convivial atmosphere at Leeds with an interesting (usually off-beat) evening speaker and good food thrown in too - what more could you want to recharge your batteries before starting the 2003/2004 academic session!?

Further information will be posted at
http://www.physsci.ltsn.ac.uk

Thermodynamics and Statistical Mechanics - Chemistry Tutorial Text

Subject area
Physical Chemistry.

Description
This short book aims to provide a grounding in both classical and statistical thermodynamics.

Authors
John M. Seddon and Julian D. Gale.

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

Date/Edition
2002.

ISBN
0-85404-932-1.

Level
Undergraduate.

Price
£9.95.

Summary Review

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

This short (160 pg) book is one of the series of books published by the RSC under the general title of ***Tutorial Chemistry Texts***. These are designed to be single-subject texts – 'concentrating on the fundamental areas of chemistry taught in undergraduate science courses. Each book provides a concise account of the basic principles underlying a given subject, embodying an independent learning philosophy and including worked examples'.

The text covers two topics which most undergraduate students find challenging. It is rare to see both covered in a single book of this type but the approach allows students to see the connections between the two main approaches to thermodynamics, although the links could have been emphasised more clearly in places. The style is quite "student-friendly" and good use is made of examples to illustrate principles rather than formal definitions where these would interrupt the flow. The text contains a number of worked examples and most chapters also contain a few problems to provide practice, full answers being given at the end of the text. Some of these problems are quite challenging and will certainly allow students to see whether they have understood the material.

One perennial problem in teaching these subjects is the mathematical background and confidence - or lack of - of many students embarking on Chemistry and related courses. Where necessary, background notes are placed in the margin to remind students of mathematical techniques, formulae etc. but a certain level of algebra and calculus are assumed and some students may find the approach quite daunting.

The first seven chapters deal with classical thermodynamics. The expected topics are covered although treatment is limited to ideal systems. This allows the basic principles to be introduced without too much distracting material to lead the unwary student astray. The treatment is fairly theoretical and, while applications are explored in some of the problems, there is little applied or wider contextual material to show how the methods might be used.

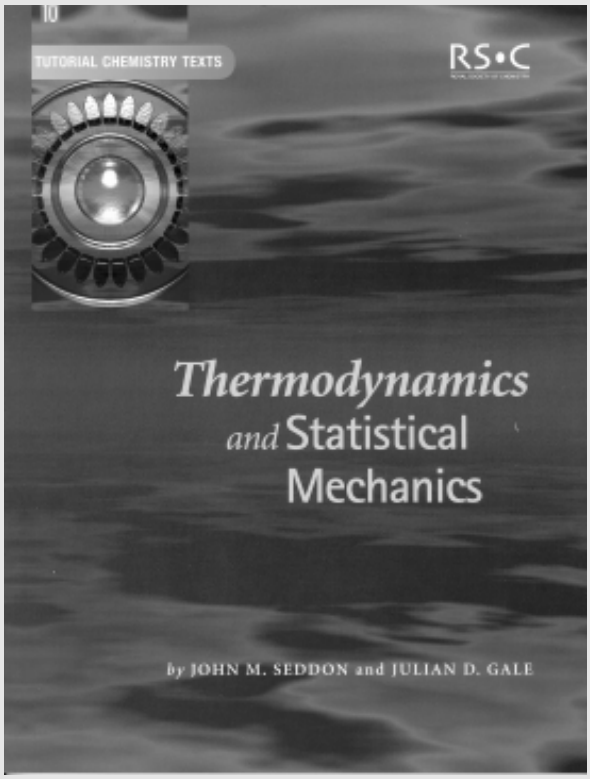
The same can be said of the remaining six chapters which deal with the statistical approach. The reader is led primarily through the analysis of small systems (e.g. boxes containing small numbers of particles) to how statistical methods can be used to account for entropy in chemical systems. This leads to a definition of the partition function and the link to classical thermodynamic quantities such as free energy. I felt that this section of the book moved rather quickly from the basics. For example, I am not sure that, at this level, a description of rotational symmetry of diatomics in terms of bosons and fermions is strictly necessary.

In my opinion, this is a useful book for additional or background reading to support a lecture course. It is well written and clearly laid out. It will serve the good student well. However, I am not convinced that it would serve as a primary text for large cohorts of students studying degrees in chemistry or chemical sciences. While all students (probably) will cover the material in the first half of the book, not all will use all of the material in the second half. It moves rather quickly and many students will need more detailed explanation and perhaps some mathematical support. I also feel that students get to grips

Gareth Price
Dept. of Chemistry
University of Bath
Bath BA2 7AY
April 2003

Continued on page 32

Thermodynamics and Statistical Mechanics - Chemistry Tutorial Text



From the publisher...

Thermodynamics and Statistical Mechanics - Chemistry Tutorial Text

John M. Seddon and Julian D. Gale.

Thermodynamics and Statistical Mechanics provides undergraduate chemistry students with a grounding in both classical and statistical thermodynamics. Thermodynamic quantities and relationships are introduced and developed in a coherent way, enabling students to apply thermodynamic analysis to chemical problems with confidence. Each stage in the development is well illustrated with examples.

0-85404-932-1 162pp 2002 £9.95

Continued from page 31

with this type of material primarily by *doing problems* and so a source of more questions would be needed to supplement those in this book. That said, if this support is available, the text could be a valuable teaching aid for many courses. I am less convinced of its usefulness in - 'an independent learning philosophy' as the series is described to do. In this context, many more graded problems would be needed and some fuller explanations provided.

The layout is attractive and the book is competitively priced. I would be happy to recommend it as supplementary material to my own students. However, whether students will purchase a book of this type whose material will probably be spread over two or even three years of an undergraduate course, I am not so sure. However, it should certainly find its ways into Libraries.

The Third Dimension - The Molecular World

Subject area
Chemistry.

Description
This book gives a fundamental view of crystals, crystal structure and molecular shape and comes with two CDROMs. There is also a Case Study on Liquid Crystals.

Authors
Lesley Smart and Michael Gagan.

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

Date/Edition
2002.

ISBN
0-85404-660-7.

Level
Undergraduate.

Price
£23.50.

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

This is an excellent and very readable volume, tackling a subject which chemistry students traditionally find difficult. However, unlike the infamous OU video on *Stereochemistry*, this book does not begin with an apology to the student about the difficulty of the subject matter! Instead, we are led to consider the solid state from first principles in an excellent and well illustrated introduction which quickly grabs the reader and makes one eager to read on.

The various possibilities for crystal structure are well illustrated with schematics, photographs of models in full colour, and backed up by some excellent video clips, animations and software on the accompanying CDROMs. The software required (WebLab Viewerlite and ISIS/Draw) is all contained on the CDROMs and this is helpfully explained on the last page of the book which faces the CDROM envelopes. Personally, I think the CDROM content is so good that this ought to be up front, especially as the reader is quickly drawn to them by the text, however this is a very minor point. The time taken to load the software (about 20 minutes on my laptop) quickly rewards the reader as we are guided to various parts of the CDROM to illustrate the text.

I was particularly intrigued and impressed by the way in which models and diagrams are related to crystal structure and also that the reader is invited to explore various features of the crystal packing, in order to gain a thorough understanding. Visualisation of the molecular world is key to a deeper understanding of chemistry and this book certainly achieves that.

Another pleasing feature of this text is the historical context used to introduce or reinforce ideas. As well as the scientific biographies of great contributors such as Hooke, Hogkin, Van't Hoff and Pauling, to name but few, there are historical asides on Roman Glass, quartz watches, the tetrahedral carbon atom and many more. These add greatly to the interest of the book and some sections I found I was reading like a novel.

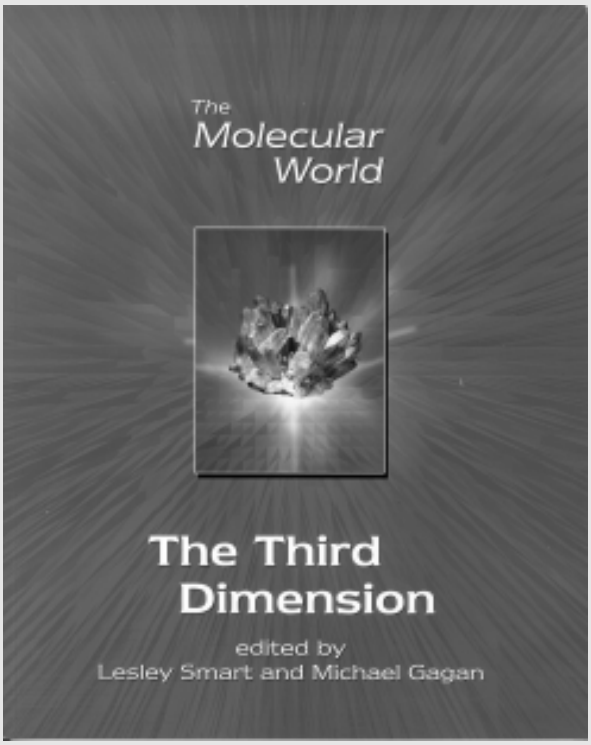
The factual information is presented in a clear but not over-simplified manner, as is appropriate for a text predominantly aimed at second year undergraduates. Difficulties in assigning accurate ionic radii for example, are not skirted around but properly discussed.

The first section, edited by Lesley Smart, entitled *Crystals*, really is a gem (no pun intended!) and as well as the various structures mentioned above she tackles quantitative atomic and ionic data, intra and intermolecular forces and the importance of defects. Each section is well summarised, like a good course text this includes learning outcomes and has comments as well as answers to questions which are text as well as computer based. The second section, edited by Michael Gagan, begins with the tetrahedral carbon atom and considers stereochemistry in some detail. Diagrams, excellent photographs of models and CDROM based exercises once more combine to give a very thorough understanding of the subject and how to relate the molecular structure to the diagrammatic forms one can use on paper. I particularly liked a simple exercise with a model of a chiral molecule and a mirror: showing by discovery the non-superimposability of enantiomers - this works wonderfully well.

David Harwood
Director, Institute for Science Education
School of Environmental Sciences
University of Plymouth
Plymouth PL4 8AA
March 2003

Continued on page 34

The Third Dimension - The Molecular World



From the publisher...

The Third Dimension –
The Molecular World
Lesley Smart and Michael Gagan.

The three-dimensional aspects of molecular shape can be crucial to both properties and reactions. The Third Dimension explores the arrangements of atoms in molecules and in different types of solids. Initial chapters describe the common crystal structures and how they are related to close-packed arrangements of ions. Metallic, ionic, molecular and extended covalent crystals are covered; major types of crystal defects are also discussed. The book then introduces isomerism, and explores the stereochemical consequences of the tetrahedral carbon atom. Chirality is also investigated. The book concludes with a Case Study on Liquid Crystals, which describes structures, properties and applications. As visualisation in 3D is an important part of this book, the accompanying CD-ROMs provide video material, interactive questions and exercises using models to aid understanding of crystals, organic molecules and stereochemistry.

0-85404-660-7 254pp 2002 £23.50

Continued from page 33

The book ends with a *Case Study* only some 33 pages long on liquid crystals. The story of Reinitzer's original discovery in 1888 is well told and "the fourth state of matter" is very well summarised with an emphasis on some of the more interesting applications. It is again beautifully illustrated and its depictions of the nematic mesophase and the differences between smectics A and C are among the best I have seen.

This is an excellent book, and very fit for purpose. If I have one criticism then it is a sin of omission rather than commission: the liquid crystal "case study" is too short and deserves elevating to the status of the other two sections. These fascinating molecules have much to teach us about structure/property relationships and their applications (especially their potential applications) are much wider than this short account portrays. Why not expand this is the next edition? This text is of such good quality that I am sure there will be one!

Calorimetry

Subject area
Physical Chemistry.

Description
A CDROM based resource for pre-laboratory teaching of calorimetry.

Authors
Don Brattan, University of Central Lancashire, Tony Rest and Oliver Jevons, University of Southampton (with the support of ICI, the Educational Techniques Group Trust of the RSC and Project IMPROVE).

Suppliers/Distributors
CVC c/o Dr A. J. Rest, Dept of Chemistry, University of Southampton, Southampton SO17 1BJ (http://www.soton.ac.uk/~chemweb/cvc/)
Viewtech, 7-8 Falcon's Gate, Northavon Business centre, Dean Rd, Yate, Bristol BS37 5NH (http://www.viewtech.co.uk).

Date/Version
2001.

Level
A-level, access, undergraduate.

Type of package
Computer aided learning.

Price
£49.95 each or £149.95 for full set of 4 CDROMs.

Hardware required
A PC with Pentium 200MHz processor, 8X CDROM, 800x600 resolution with small fonts, 64000 colours and a sound card.

Software required
Windows 95, 98 or NT 4.0.

Tina Overton
Department of Chemistry
University of Hull
Hull HU7 7RX
May 2003

This is one of a series of four CDROMs entitled ***Physical Chemistry Experiments*** and is a collaborative project between the Educational Techniques Group Trust of the Royal Society of Chemistry and the CVC.

The list of topics covered includes:

Basic Chemical Kinetics
Basic Phase Equilibria
Gases and Gas Equilibria
Basic Calorimetry

Summary Review

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

The package is written using the Asymetrix Toolbook authoring system (http://www.asymetrix.com/).

Installation
There is no auto install facility but installation was easy and straightforward with details provided with the CDROM and adequate screen prompts.

Introduction
This being a pre-laboratory teaching package there is a general safety warning with respect to laboratory work. Before you can start you must click 'I have read and agree…' to the warnings or quit the program.

Once in the program, navigation is easy. One just clicks on the section/subsection you want and use the Main/Menu and the other self-evident buttons to move around. I worked through the package in a linear way which worked well and followed a logical structure but non linear use would also be very easy. Each subsection could be used individually.

The teaching materials
The package comprises the following sections:

Background theory
This is the text-based, teaching part of package. It is pretty standard text book stuff although the use of "hot words" enables students to obtain further elucidation of key terms.

The section covers:
definitions, background to calorimetry, ΔH, ΔU, data, effect of temperature

Glossary of terms and definitions
This is in addition to the pop-up words mentioned above and provides a series of definitions for a number or terms related to calorimetry.

Video tutorial
The CDROM must be in place to view this option. All the other features are present without the CDROM.

The video materials cover all aspects of practical calorimetry with a focus on bomb and Dewar calorimeters with sections such as calibrations, equipment, preparing and firing the bomb, plotting results, interpreting results.

Continued on page 36

Calorimetry

Continued from page 35

As expected from the CVC "stable" the presentation here is of very high quality video. The Windows Media player is used for the display and uses familiar "video" icons for play, pause, stop etc. When started the layout is set to show the video in a small window but a full-screen option is available and the quality is still acceptable for this magnification. The accompanying text "keeps up" with the spoken commentary and is highlighted as the commentary proceeds. In addition, the size of text may be changed upwards/downwards if required.

Sample data/worked examples
There are 8 examples in this section. As quantitative problems provide many students with real challenges in physical chemistry this section is very useful and guides students though each step in the calculations

Final test
There are 15 questions in the test. The test is potentially set up to record results for each user and you can print the results. Feedback is given for both correct/incorrect responses. There are true/false, multiple choice and calculation type questions and eighteen questions in all. The same questions are presented each time and there is no randomisation in terms of question or response order. You only get one chance at a question within a session. Second attempts produce a 'This question is locked' response.

Overall
This package does not use a standard Windows interface – the layout is customised to the needs of the application. That said it is simple to use and navigate. Much of the tutorial is not interactive but the use of the video does enliven it as does the final quiz. The material covered would give pretty comprehensive coverage of calorimetry and so could be used by students for independent learning or revision. The material would also work well as a pre-laboratory stage exercise and would also help at the post lab stage when students come to write an experiment up as data handling is discussed.

Interactive Physics 2000

Subject area
Physics and Mathematics - Mechanics.

Description
A package for creating simulations to model the time evolution of systems using Newtonian Mechanics.

Authors
Fable Multimedia.

Suppliers/Distributors
Fable Multimedia - in UK (http://www.fable.co.uk/ip_he.htm)

Date/Version
Version 5.1.

Level
A-level, access, undergraduate.

Type of package
Simulation.

Price
Single-user licence £95, 50-user £650.

Hardware required
PC capable of running Win95 (or later) or Mac OS7+ (or later).

Software required
Win95 (or later), Mac OS7+ (or later).

Bruce D. Sinclair
School of Physics and Astronomy
University of St. Andrews
St. Andrews
Fife KY16 9SS.
May 2003

Summary Review

range: * very poor to ***** excellent	
Ease of use	***
Ease of learning	****
Documentation quality	*****
Academic content	*****
Usefulness to student	****
Usefulness to teacher	****
Portability	not assessed
Meets objectives	*****
Accuracy	****

This is a powerful package for creating simulations to model physical systems using Newtonian mechanics. It is sold into the UK market by Fable Multimedia, who suggest that 'Interactive physics is a complete motion lab on a computer that combines a simple user interface with a powerful engine that simulates the fundamentals of Newtonian Mechanics'. Their web pages suggest that they aim this product at A-level and Advanced Highers students. While I can see it being suitable there, I think that the material could well be useful in the early stages of university physics and maths courses, and possibly beyond.

Teachers or students can put onto the screen a wide variety of objects, including masses, springs, ropes, motors, joints, pulleys, etc. Gravity and air-resistance can be included or not, and objects may be set up to have specific values of static and kinetic friction, elasticity, etc. Starting values can be assigned via a properties box for each object, or by putting control bars on the screen. Some input parameters may be input in the form of time dependent equations. Pressing run then allows the system to develop with time under the various constraints, and many parameters of the system can be plotted on graphs or read out on meters. Some electrostatic possibilities are also present. The disc came with a wide range of example scenarios, which were well worth a look through.

The possibilities are so large that it means the program took me a wee while to learn to drive, but the electronic tutorials that came with the package were very helpful (I wish the narrator sounded a little more enthusiastic though!). I had modelled, from scratch, a version of a driven inverted pendulum within an hour of starting to install the package. After a couple more hours work I was confident that the program was giving me results comparable to those I was expecting. An initial problem I faced was that the automatic time-step calculator in the program had chosen too large a step size, resulting in a rather unphysical development of the motion of a simple pendulum. The US support site replied usefully to my query on this within 12 hours, though by this time I had found the solution to the problem myself. Once this was sorted I was able to play with the parameters to get to the scenario shown in fig 1. Here a motor turns a wheel on which is a push rod that gives the vertical black bar an oscillatory vertical motion. The small grey rectangle at the top is the pendulum, and it is the motion of this pendulum that is plotted in the top two graphs. The box on the right of the screen shows the various properties of the pendulum at the start of the motion. It is possible to make the screen much prettier by importing images to stick onto objects, and the use of other formatting controls. Fig 2 shows one of the supplied scenarios showing some of the ideas associated with terminal velocity. I have added a velocity vector to the jumping frog.

I have already commented on the highly useful electronic tutorials. There is also an inbuilt help package, and a wide selection of pre-prepared scenarios covering various areas of mechanics under both a maths and a physics banner. I referred infrequently to the inch-thick user manual.

Continued on page 38

Interactive Physics 2000

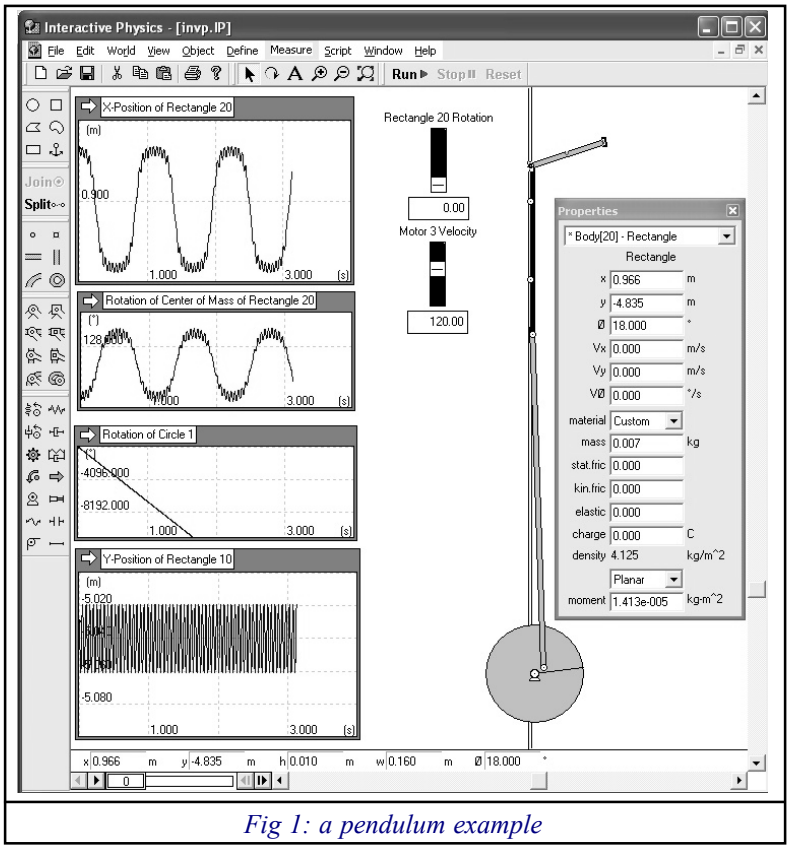


Fig 1: a pendulum example

they should, but the ability to graph almost everything allows a designer to check what is happening at each stage in the development of the simulation.

The program has not yet crashed my computer, and the one time it reported an internal application error the program kept on working happily. So I feel it is doing well on this score, though I note a reviewer on another site was concerned at how often his Mac had problems [http://www.scienceman.com/pgs/rev_int_physics.html].

I can see this being widely useful in introductory mechanics courses, though a not insignificant investment would be needed to licence the software for a number of computers. If you want an applet to illustrate some very specific bit of mechanics, and either have the applet or the Java programming ability and time to create one, that may be the way to go. But if you want the ability to construct a wide range of mechanical systems allowing open-ended exploration, without any conventional programming, ***Interactive Physics*** is looking pretty good.

Continued from page 37

The package installed easily on my Pentium 4 Windows XP Pro laptop. The manual indicates that Windows 95/98/2000/NT or Mac OS 7.1 or later should work, and that Windows users need 12 MB of physical RAM while Mac users need 32.

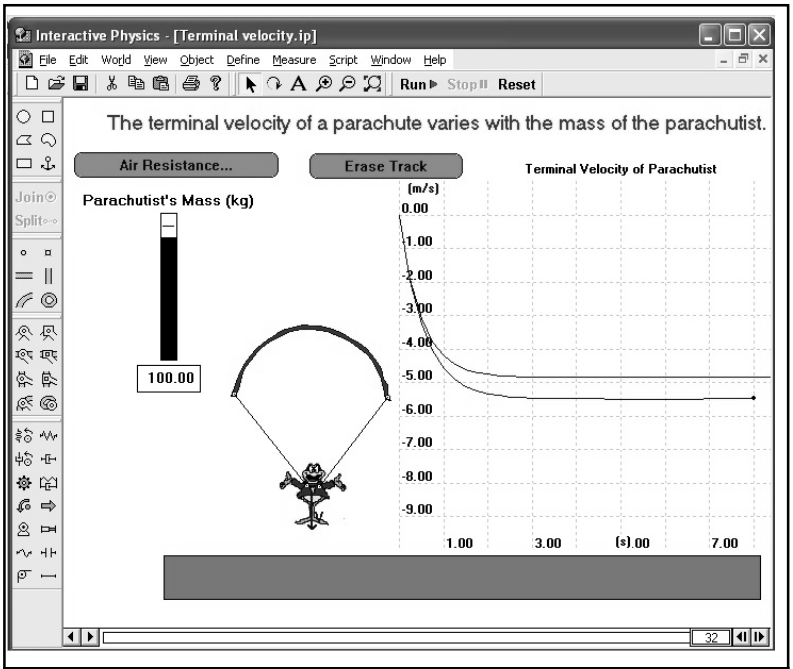


Fig 2: a terminal velocity example

I can see this program as being useful in two ways. In the simpler one, students can be given files illustrating various scenarios and guided to explore aspects of the physics. In the more complicated one, students could be given some training in creating their own scenarios, and then use ***Interactive Physics*** to build and explore an interesting physical system. No formal programming is needed for this, as the interface is largely graphical, but I would suggest that some initial guidance on how to use the program would be useful. The flexibility of the system is its strength, but does also lead to a significant learning curve. The output is smartly presented, and subject to getting the "accuracy" controls set appropriately it seems to be giving sensible answers. I had some initial problems with getting the controls doing what I thought

Finally, I understand that Fable in the UK are in the process of implementing University site and single department licences available via the CHEST site.

Introductory Chemistry

Subject area
General chemistry.

Description
General chemistry CAL multimedia teaching program on CDROM.

Authors
Professor Bryan C. Sanctuary, McGill University, Canada.

Suppliers/Distributors
MCH Multimedia, Inc., Suite 210, 372 Ste. Catherine Street West, Montreal, Quebec, H3B 1A2, Canada (http://www.mchmultimedia.com).

Date/Version
Version 3 (Latest version of program is 4.2).

Level
A-level, access, undergraduate.

Type of package
Computer aided learning.

Price
US$79.99 for single licence (US$39.99 for student). Contact supplier for multiple licence prices.

Hardware required
PC with minimum 486/66 processor, 50 MB free hard drive space, minimum 16 MB RAM, Multimedia, SVGA graphics, Sound Card.

Software required
Windows 95, 98 or NT 4.0.

Brian Murphy
Department of Chemistry
Faculty of Science
United Arab Emirates University
PO Box 17551
Al-Ain
United Arab Emirates
April 2003

Summary Review

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

This CDROM on ***Introductory Chemistry*** is part of a suite of excellent tutorials on *General Chemistry, Organic Chemistry, Physical Chemistry and General Physics* published by MCH Multimedia in Montreal, Canada. In a previous review in this Journal,[1] J. D. Ruddick reviewed the *General Chemistry* CDROM and commented in his conclusion on the overall stimulating nature of the package, the use of the wide range of teaching styles and stated that the recurring theme of the program was in getting the user to think. In this review on the ***Introductory Chemistry*** CDROM I can only concur one hundred percent with Ruddick's evaluation. The package is written in APW, and is suitable for most high school (in either Europe or North America) and Advanced Placement (AP) (in the US) chemistry programs, as described by the authors. However, after going through all twenty-four-subject modules in the tutorial, I would even extend this intended audience to first-year undergraduate University students, where chemistry is their non-major. The package itself consists of twenty-six units, commencing with a Quick Tour, describing explicitly on how to use the program. I found this both concise and clear, and all the wonderful features of the program were well explained in terms of their functionality and description of their respective icons. On the right-hand side of the screen, the author has a range of facilities available to him for navigation purposes, including, a main-menu button, a restart section button, a table of contents button, a notebook, a word search facility, a quiz icon and a voice activation facility. This is coupled with a main-menu at the top of the screen, where a screen shot can be printed and a host of useful utilities such as a calculator, notepad, Periodic Table, glossary, references and 3D structure visualization can be used.

The overall user interface is extremely professional, and due care and precise detail has been employed by the instructional design team in all units. The program itself covers the following subjects: introductory chemistry, measurement, matter, atoms and ions, chemical nomenclature, chemical stoichiometry, chemical reactions, ideal gases, gas kinetics, solids, solutions, equilibrium, acids and bases, electrochemistry, energy and entropy, chemical kinetics, electromagnetic theory, quantum mechanics, bonding, main group elements, transition elements, organic chemistry, the nomenclature of organic compounds, biochemistry and nuclear chemistry. The last unit of the package features a series of practice problems based on all the topics. The authors have used the multiple features of APW to maximum effect, and the net result is a dynamic package, with multiple-choice questions, text-based interactions, animations, click-and-drag exercises, interactive graphs and clickable hypertext. The text in each unit is kept to a minimum and the overall result is one of the most professional chemistry programs I have evaluated to date, from an instructional design perspective. Each unit is introduced with a set of short objectives, introduced one at a time. This is then followed by a series of sub-units in each module, concluding with a short quiz. In each module, the main chemical principles are introduced, and it is a breath of fresh air to go through a software program, where the authors have the user constantly interacting with the material, which is the hallmark of active learning.

Continued on page 40

Introductory Chemistry

Continued from page 39

In terms of the content itself, I found the introductory material on dimensional analysis, units and conversion of units excellent. Far too often, many students are lacking in these basics, and this serves as an appropriate assessment of their ability in this area. In each interaction, an attempts function was available. However, I was somewhat disappointed in some of the questions at the lack of positive feedback, getting the customary, 'No try again' response. It is this introduction of positive feedback that needs to be worked on by the authors in future versions, as the facility is readily available in APW.

There is some discontinuity in the content however. For example, in the matter, atoms and ions unit, orbitals are introduced, or rather assumed by the narrator, whereas in reality their true meaning is explained later on in the section on quantum numbers. It is probable that several authors were used in developing the various units, but new versions should address this aspect from the overall teaching perspective. I was extremely pleased to see the drag and drop facility in chemical nomenclature, with a host of examples including Fe_2O_3, SrI_2, Ba_3N_2, KCl, MnO_2 and Hg_2Cl_2. I did feel however that more examples on how to name transition metals species would have been helpful, and would have liked to see the use of names such as iron(II) chloride etc. rather than the use of older Latin names such as ferric and ferrous etc. in examples. A small section on more common names such as hydrogen peroxide, methane, ammonia etc. would also be helpful. With such a powerful program, the authors could easily introduce some nice graphics such as natural gas and a student with peroxide blonde hair to illustrate such names. One of the nicest sections of the tutorial was on the treatment of orbitals, wavefunctions and radial distributions. I really liked the example of the wavefunction being rotated about the axis, and how the positive and negative polarities of the p-orbital were illustrated. In addition, the gradual build-up of orbital diagrams was excellent. Both these features show how CAL can be used to optimal effect in the teaching of these areas, something that is difficult to illustrate using a "chalk and talk" approach or even using static overheads in the lecture. I did feel however, that shielding was poorly explained and in addition, the characteristic dogtooth plot of ionisation energies (IE) was more or less explained in terms of the stability of the half-filled and fully filled sublevels. I would have liked to see, a more in-depth approach as to why the IE of oxygen is less than nitrogen and why the IE of boron is less than beryllium.

In the section on chemical bonding, there was a lovely dynamic interaction on the influence of electric field on the dipole moments, again showing the strength of CAL in the teaching of this area. One surprising feature however was that the authors introduced molecular polarity before geometry! In addition, I felt the examples on the deduction of geometry from VSEPR were particularly weak, and feel that the tutorial would benefit from an increase of questions in this area, where the students have to work out the geometry of a series of molecules and ions such as ammonia, sulfite, nitrite etc.

Two units I also found to be particularly nice were those on solids and ideal gases. In the former, the gradual build-up of CCP and the HCP arrangements was excellent. In the latter, the effect of pressure on volume was illustrated effectively, and the ideal gas equation derivation from the individual laws proved to all designers of software how concepts can be introduced on a computer, without overloading the user with blanket text.

In summary, I think this is a wonderful and professional package, and I would highly recommend it to students as a vital back-up to their core text and lecture program and to instructors for illustrating some superb dynamic visual material in lectures. If there is one key characteristic aspect of this overall program it is that active learning and interactivity is at its core, or to quote the old Chinese proverb: Tell me and I will forget, show me and I MAY remember, involve me and I WILL UNDERSTAND! In this respect MCH Multimedia and its respective authors must be congratulated for getting it so right!

Reference

1. Ruddick, J.D., *Physical Sciences Educational Reviews* (2001) **3** , 42-43.

The Chemistry Tutor II+

Subject area
General chemistry.

Description
CDROM containing a number learning/teaching resources.

Authors
Chemistry Courseware Consortium.

Suppliers/Distributors
Chemistry Courseware Consortium, Chemistry Department, Liverpool University, Liverpool L69 7ZD (http://www.liv.ac.uk/ctichem/c3intro.html)

Date/Version
2002/Version II+.

Level
Undergraduate.

Type of package
Computer aided learning.

Price
£30 for single licence, £100 for site licence.

Hardware required
PC capable of running Windows 3.1 or Windows 95 or later. Some sections also available for Macintosh systems. See web site for full specification.

Software required
A Java-enabled Web Browser, MDL Chime and QuickTime plug-ins plus other software provided on the CDROM. See web site for full specification.

Ron Cole
School of Applied Medical Sciences and Sports Studies
University of Ulster
Jordanstown
Newtownabbey
Co. Antrim BT37 0QB
February 2003

Summary Review

range: * very poor to ***** excellent

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

When you put the disc into your drive you are immediately presented with a welcome screen which leads you into the installation. "Install.doc" is certainly essential but I am not certain it is a riveting read. ***Chemistry Tutor II*** runs from either Internet Explorer or Netscape Navigator 4.01 or Communicator 4.5 although I found that it ran better in Internet Explorer. All computers will have one or other of these browsers but a number of plug-ins and downloads are required and so a web connection is also necessary. The installation was straight forward and then ***Chemistry Tutor II*** can be run either from the CDROM or the hard drive depending on the choice you have made at installation.

Chemistry Tutor II
Entry to the program is not ideal as you have go through the file 'contents.htm' found either on the CDROM or the hard drive rather than from an icon or the programs menu. There must be many who teach a general chemistry course and find that the "General Chemistry" texts are lacking in organic chemistry. This program will more than adequately cover such deficiencies. It is however much more than this. It has been authored by the C^3 Consortium and I am sure those familiar with their previous programs will realise that the ***Chemistry Tutor II*** has built upon the previously laid foundation and has drawn from the previous work. Having entered the program you are presented with the screen shown in fig 1 which makes navigation extremely easy. As can be seen from the menu, the program is comprehensive but not totally inclusive.

Where do you start?
At the beginning with Section 1, *Chiral Molecules*?
But perhaps *Atomic Structure* might be more appropriate?
But again you might wish to use the program to study organic chemistry and is *Chirality* the most appropriate starting point?
One might think that *Basic Chemistry* is the starting point. But the first topic in this section is *Introduction to Spectroscopy*?
Is this the most appropriate start?

For revision and reinforcement the student can make his or her own choice but if used as a teaching resource, guidance would be needed. If you start with either Organic Chemistry or Basic Chemistry the format is similar. Information is provided often with an animation to further illustrate the point. This is then followed by questions to reinforce the teaching. And finally a summary of the teaching.

Each Topic provides a good balanced account of the subject matter with appropriate questions to reinforce the teaching with perhaps the only criticism being that some of the examples chosen are rather obscure.

There is a third section, *TOOLS* which provides much useful information to support studies in chemistry. i.e. The Periodic Table Database, where you can select an element and then look at its general properties, its Physical Data etc. Additionally within this section the perennial problems of algebraic manipulation, drawing graphs and SI units are tackled. Maybe not all the problems will be solved but this final *TOOLS* section should be a great help to many students.

Continued on page 42

The Chemistry Tutor II+

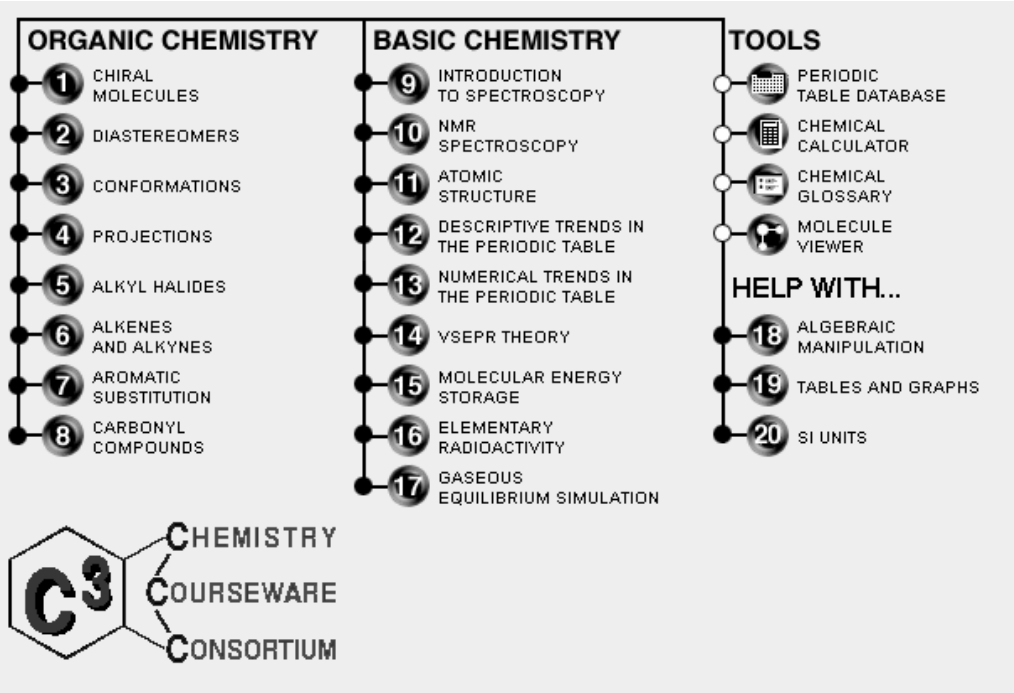


Fig 1: The navigation screen

Continued from page 41

The program provides an enormous amount of information and will be a very useful resource for students and will find considerable use by teachers. The program is however let down by a number of significant errors. These are in the process of being rectified and patches will be available on the web (*see Editor's note below*).

This is however not all that is on offer. Installation has given you the programs, Chemical Calculator, Spectroscopy and Kinetics (the "plus" of ***Chemistry Tutor II+***).

Kinetics
This program contains 6 Sections:
Concentration –Time Curves, Instantaneous Rates, Initial Rates, and Half Lives, which provide an introduction to the techniques used in the analysis of kinetic data and then provides practice exercises.

Integrated Rate Laws:
The Help section makes the following statement.
'The form of the integrated rate equations is sufficiently different for reactions of different order that an unambiguous conclusion can be reached if the experimental data fit one of the equations'. It then goes onto discuss the various equations. Apart from this introduction in the *Help*, this section is really an introduction to the *Analysis Tool* that is used with the sections mentioned previously.

The final section is entitled *Mechanisms* and allows you to study the kinetic of a range of reactions (theoretical and actual) from data provided.

Spectroscopy
This provides an introduction to NMR, MS and ir and is followed by a range of useful problems that will provide excellent practice in analysis.

The initial screen tells you about the Videos that are available and having studied the other sections on Spectroscopy they provide a very useful resource to reinforce the learning.

Start the *Spectroscopy* program with the CDROM in the drive, make sure the drive letter is selected and you are able to access the videos on NMR, ir and MS. The three videos take the same format with the tutor discussing the subject with a student. The discussion assumes prior knowledge of the subject and so is being used to reinforce the learning. The video clips do not fill the screen and so in some cases the spectra that are shown are not as clear as they might be. Despite this drawback I would consider the videos a useful addition to the total package and an add-on to the other spectroscopy resources.

Conclusion
Chemistry Tutor II provides a great deal of information that would be useful to students of chemistry and could also be used as a teaching resource.

The programs on the CDROM I received need a number of "patches" which may be available when you read this. With these changes made I would consider that ***Chemistry Tutor II*** will be an excellent learning/ teaching resource. (*Editor's note*: these patches are available at ftp://ftp.liv.ac.uk/pub/chemistry/c3/updates/)

Database of Practicals

Contributions wanted!

One of the problems of designing new experiments for students is the time required for development or a lack of practice someone has in a particular experimental method. This can come about if the academic does not have the time to dedicate to develop and test a new practical or if that person belongs to a small department or unit that lacks in-depth experience of running a particular experiment.

Therefore, in response to a call for help from the physical sciences subject community, we have initiated a project to develop a database of practicals that academics can use in their teaching activities. The aim for this project is to allow someone interested in running an experiment to be able to download a practical from the database and use it with their students.

To contribute, go to our web site at:

http://www.physsci.ltsn.ac.uk

and click on the link *practicals* under *Involvement*.

To make this database a valuable and extensive resource which all academics can tap into, we are looking for help from the community to provide examples of experiments which they are willing to have included in the database. Even if most people only offered one example from their own work, this could soon add up to several hundred practicals which the whole community could benefit from. Anyone submitting a practical that is accepted for inclusion in the database will receive £50 in book tokens.

If you would like to submit a practical for inclusion in the database we have produced a short web form which asks you to provide us with an outline of your work. After submission we will also ask you to provide an electronic copy of your practical script, which other academics could use or adapt for their own teaching activities. We will be encouraging users to offer feedback on the success of any practicals used, to help future development of this service and the resources contained within it.

Visit our web site...

http://www.physsci.ltsn.ac.uk

to find out more about the
LTSN Physical Sciences Centre.

Latest...

- Database of practicals
- FDTL phase 4
- More development projects
- New Directions in the teaching of physical sciences
- Employability project