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Reviewed in this issue...

2 software packages

2 web sites

17 books



Physical Sciences Educational Reviews



The journal of the LTSN Physical Sciences Subject Centre

LTSN Physical Sciences

*...supporting learning and teaching in
chemistry, physics and astronomy*

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Physical Sciences Educational Reviews



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

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Editorial

Welcome to this the second issue of Physical Sciences Educational Reviews, the journal of the LTSN Physical Sciences Centre. This issue is dominated by reviews of books, particularly by those from the publisher J. Wiley and Sons, Inc. We are grateful also for sponsorship from J. Wiley and Sons, Inc. which has helped fund the production of this issue.

We have tried to ensure a better balance between the elements of the physical sciences for the reviews in this issue (compared to Volume 1 Issue 1). Thus we have 2 reviews of general physical sciences resources, 2 reviews of resources for astronomy, 6 reviews of physics materials, 10 reviews relating to chemistry and 1 to biochemistry.

As always we are pleased to receive materials to review and to hear from those wishing to join our team of independent reviewers.

Roger Gladwin
Editor

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Astronomy Web Simulations



Subject area

Astronomy.

Description

Astronomy Web Simulations.

Authors

Terry Herter.

Last updated

no data.

Level

Foundation.

Plugins required

none.

Other features used

Java.

Reviewed using

Sun Ultra80 and PC, 256+ MB running Solaris and Linux with Netscape Navigator 4.75 over a LAN.

Web address

instruct1.cit.cornell.edu/courses/astro101/java/simulations.htm

Web simulations includes three java applets intended for courses Astro 101 and Astro 103 at Cornell University, USA. Although these courses are for non-science majors the simulations should serve as useful material for introductory stellar astrophysics and stellar evolution courses. The applets are as follows.

1. Eclipsing Binary Stars

This shows two stars revolving about one another and the light curve for the system. The user can change the angle, separation and the spectral types of the two stars and see what effect this has on the resulting light curve. After a few minutes of playing, it should be possible to understand most light curves that one might come across. This includes showing different depths of light curves depending on the temperatures of the stars involved. This simulation does not include limb darkening which would be a useful addition for use with Physical Sciences students.

2. Binary Star System

This shows the orbits and velocities of two stars revolving (orbiting) around one another. One can adjust the eccentricity, separation, inclination angle, node angle and masses of the two components. The simulation includes a 'Privileged' and an 'Earth' view of the orbits as well as views of the spectrum and doppler velocity of both objects. This simulation needs significantly more playtime than the eclipsing binaries simulation to understand, particularly because the font size of the text labels is difficult to read and not included in the accompanying description key. Nonetheless this represents a powerful tool to explain all manner of observed velocity curves although it would need modification to explain the doppler velocity evidence for extra-solar planets.

3. Stellar Evolution

This shows the evolution of stars in the Hertsprung-Russell diagram from main sequence to the red giant phase. The user decides on the mass and age step for the evolution of their chosen star on the diagram and then watches the stars' size, colour and position evolve. After a few minutes with this simulation one should pickup many of the fundamentals of stellar evolution and particularly would be disavowed of the common notion that a star evolves from one end of the main sequence to the other. However, it is a simple simulation. I became quickly frustrated that I couldn't watch loops on the giant branch or make white dwarfs.

Although the simulations claim to be unstable I had no problems with a few different browser and machine combinations. On balance I found them remarkably robust for java simulations. The stated aim of the simulations is to allow 'play' with the concepts represented. They certainly fulfil this important role. I could easily envisage their easy and very productive integration into discussions, exercises and tutorials. Although I don't think they are suited for use in a straightforward lecture.

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	***

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April 2001

Virtual Laboratory (Physics Applets)



Subject area

Physics.

Description

Physics applications.

Authors

Physics Dept, University of Oregon.

Last updated

no data.

Level

Undergraduate.

Plugins required

Acrobat.

Other features used

Java.

Reviewed using

Sun Ultra 10 running Solaris and Netscape Navigator over JANET.

Web address

jersey.uoregon.edu/vlab/index.html

This is a general web site that many Physics and Astrophysics undergraduates would find of interest. The site has a large number of applications from different areas of Physics, which are usefully grouped under 5 main headings: astrophysics, energy and environment, mechanics, thermodynamics and a final section labelled 'tools'.

Each grouping then consists of a list of applications, themselves also split into sub-headings. So for example astrophysics is subdivided into spectroscopy, photometry, orbital mechanics and cosmology. The first two of these use real data to demonstrate the points they are making.

The topics covered within the site are certainly pretty diverse. The environmental science section deals with various aspects such as the greenhouse effect, population growth and the weather. Mechanics has inclined planes, potential energy and other such basics. Thermodynamics covers the first law, pistons and balloons. The final miscellaneous section includes a spreadsheet and graph-drawing.

In a typical astrophysics application for example a student is invited to click on various spectral features. Then their wavelengths and identifications are provided. In some of the more advanced applications the student identifies the full width of a spectral line together with a nearby continuum measurement so that the depth of the spectral absorption feature can be calculated. As an example of how it might be used within a degree course, I would probably use the astrophysics section as part of the background reading list I give to undergraduates studying a course on observational techniques in astronomy.

The site is professionally put together and easy to navigate. However, I have a few reservations about the nature of the material contained within it. Firstly, the level is certainly no higher than first year undergraduate, and it could be used by schools. Secondly, the level is far from uniform. Some of the applications are trivially simple, whilst others require a little more thought from the student. Furthermore, there is no sense of a progression to lead you from the simplest to the more advanced. My other main criticism is that some of the applications kept crashing my web navigator.

There is no explanation of why certain topics are covered and others are left out. It seems to be simply a compilation of the authors' favourite topics. This is not necessarily a criticism, as the site does not pretend to be comprehensive. However, a student searching for assistance on any given topic is more likely to be disappointed than to find their topic covered.

In conclusion, this is an interesting site that could be used as part of a background reading list to give to prospective students to look at before coming to university. Alternatively, specific applications can be used as additional background to a first year undergraduate course. It provides some useful illustrations of a number of topics in Physics.

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	***

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April 2001



Basic mathematics for the physical sciences

Subject area
Mathematics.

Description

This book covers basic mathematics for all students post O-level, in the physical sciences be they in physics, chemistry or engineering.

Authors

Robert Lambourne and Michael Tinker (editors).

Publishers/Suppliers

J. Wiley and Sons, Inc.
(www.wiley.co.uk)

Date/Edition

2000.

ISBN

Cloth: 0-471-85206-6.
Paper: 0-471-85207-4.

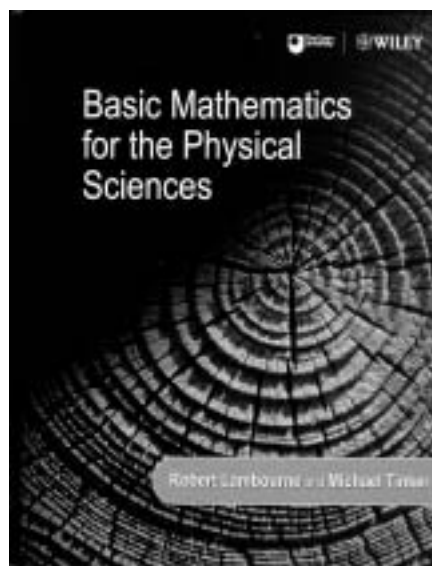
Level

Undergraduate.

Price

Cloth: £65.
Paper: £19.99.

This book is one of many to emerge from the FLAP (The Flexible Learning Approach to Physics) project but is addressed to all students post O-level, in the physical sciences be they in physics, chemistry or engineering. With such a wide customer base problems inevitably arise as to what the various areas regard as basic or essential materials. The problem herein is one of exclusion, as all the topics included namely, basic arithmetic and algebra, basic geometry, basic vector algebra, basic differentiation and lastly basic integration, are needed by 1st year students in physical science, however this is defined. The authors have recognised and tackled the problem all groups of students and their teachers now face due to the diverse prior learning of students within a given class. For those teaching chemists it would be helpful to have sections on series, partial differentiation, circular and solid angles and matrix algebra included in the basic text, other subject areas teachers could argue these topics are "further mathematics".



Each topic area is self contained and carefully structured to introduce the need for each mathematical technique within an applied environment. They can each be studied in a self-paced manner. The style of material and content helps to build in relevance and thus sustain and encourage, that which is often lacking in modern students, a keen willingness to learn. All sections start with lucid explanations of the need for the technique going to be introduced, then fast track questions permit students to identify areas they need to study before dealing with the essentials or core material. The chapters are well illustrated with clear figures and diagrams, lots of worked examples, appropriate applications and

graded problems with full answers including comments on key points, and each end with excellent summaries.

The text concludes with a most useful and cross-referenced summary of the main items in an appendix, A Maths handbook.

The authors have provided a high quality text of class tested material, which makes it suitable for course use, distance learning, revision or home study. For the topics it deals with, this is the best student orientated text I have come across.

Summary Review

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

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

Chemical Analysis: Modern Instrumental Methods and Techniques



Subject area

Analytical chemistry.

Description

General introduction to chemical analysis in 21 chapters covering separation, spectroscopic methods and other techniques. Includes theory, instrumentation and applications.

Authors

Francis Rouessec & Annick Rouessec.

Publishers/Suppliers

J. Wiley and Sons, Inc.
(www.wiley.co.uk)

Date/Edition

2000.

ISBN

Hardback: 0-471-98137-0.
Paper: 0-471-97261-4.

Level

Undergraduate.

Price

Hardback: £70.00.
Paper: £24.95.

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BT37 0PF
February 2001

This book aims to provide a working knowledge of all the important methods of chemical analysis in 21 chapters and a little over four hundred pages. It is based on courses delivered over many years at the authors' university to under- and post-graduate students and specialist technicians. This is based on the fourth French edition, but it is the first one that has been translated into English.

Summary Review

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

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

Each chapter gives the basic principles of a technique, describes commonly used instruments and techniques, then shows some applications. There is extensive use of diagrams, and always a set of problems to work through (answers are provided). In order to cover such an extensive field as chemical analysis in a limited number of pages, the accounts of some of the more complex methods have been curtailed, but (with the exception noted below) a good balance has been achieved.

The first eight chapters cover Separations. There is a general introduction to Chromatography (theoretical plates, retention factor, resolution, Gaussian curve characteristics) followed by Gas C, HPLC, Ion C, Planar C (TLC), Supercritical Fluid C, Size Exclusion C and Capillary Electrophoresis. The relative advantages and disadvantages are considered, and the sections on detectors are cross-referenced to later chapters. Explanations, with diagrams, of what occurs at the molecular level make the discussions of the choice of stationary and mobile phase easy to follow. There are good schematic diagrams of pumps, injectors, flow cells, etc. All the relevant algebraic equations are developed.

Seven chapters of Spectroscopic Methods follow: NMR, IR, UV/visible, Fluorimetry, XRF, Atomic Absorption, Atomic Emission. I felt that the theoretical treatment of NMR was over-ambitious; for instance, references to pulsed "two- and three-dimensional NMR" will be confused with the following paragraph on Magnetic Resonance Imaging in the three dimensions of space. The useful appendix on quantitative NMR can be understood with a relatively low level of theoretical knowledge. The other chapters are extensively illustrated with detailed schematics of the optics and examples of spectra. Again, the relative advantages of each method in real applications is made clear.

The next four chapters cover Mass Spectrometry, Labelling Methods, Potentiometric Methods and Coulometry/Voltammetry. Again, there are plenty of diagrams and examples. "Labelling" includes isotopic and enzymic labels. The latter is a rapidly developing area; it is a pity that the emphasis has been placed on competitive techniques and the increasingly popular Sandwich ELIZA and IRMA have been omitted. The electrochemical chapters are new, and contain some errors/imprecise explanations, but have good coverage.

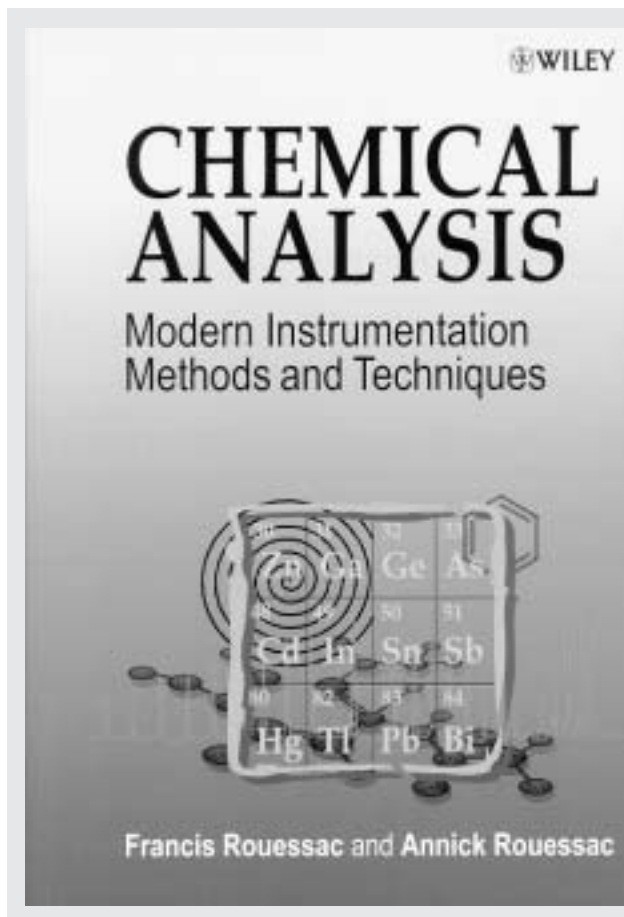
The last two chapters are a useful addition, looking at Sample Preparation (eg extractions and headspace analysis) and Statistics.

This is the first edition of the book to be translated into English. The translators work in North America, but have produced very well phrased British English. There are inevitably a few strange phrases, but the meaning is usually clear. I was irritated by silicon being called "silicium" and the appearance several times of "reticulated" which doesn't appear in my science dictionary, and seems to have a range of meanings including cross-linking of polymers and planes in a crystal. There are a small number of factual errors, eg permanganate's colour is not from a d-d transition; haptens are not antibodies; triplet states do not have three electrons, but this is not excessive.

Chemical Analysis: Modern Instrumental Methods and Techniques

So will I use this book for teaching? I shall certainly keep it close to hand on my bookshelf, since it is a good source of information and examples. However, I cannot recommend it as a student text or even as a library reference book because it has an unacceptably large number of printing

whole diagrams are actually in the wrong place! Examples: the thermocouple referred to in the text as “Fig 10.16” appears beside fig 10.15, and Fig 10.16 is something different; Fig 14.10 belongs to section 14.5.2, but is in the middle of section 14.6; the lower diagram in Fig 15.1



Chemical Analysis Modern Instrumentation Methods and Techniques

F. ROUESSAC and A. ROUESSAC

Assuming little prior knowledge, this text guides the reader through a range of different, yet essential instruments and techniques needed for a thorough knowledge of the field. Carefully structured, the text clearly differentiates between separation and spectral methods, and includes a third section containing more specialised methods that students may well need to know about. Unlike the many analytical chemistry texts available, this book focuses on the instrumental side, rather than attempting to cover all the background theory associated with the field of analytical chemistry.

0471972614 470pp 2000 Pbk £24.95

errors, particularly in the diagrams. In many cases this seems to have resulted from the translation of French into English; the text has been amended, but remnants of French remain in the related diagram or table. Examples: Absorbance of Internal Standard labelled A_{IS} in the text but A_E in the table; “mobile phase acetonitrile/eau” in a figure; slits referred to as E_1 and E_2 in the text but labelled F_1 and F_2 in the figure; “Hg vap. froide” in a figure. A more serious problem arises when English labels have been substituted, but inaccurately placed, eg Fig 8.3 schematic. Some

belongs to Fig 15.8; the diagram referred to as “Fig 16.21a” in the text appears as part of Fig 16.19. Then there are inaccurate references in the text: “Figs 14.1a, 14.1b & 14.1c” actually refer to parts labelled 1, 2 & 3 in Fig 14.1; the legend to Fig 16.21 (second part) refers to numbers which are in the wrong places in the diagram; etc.

All these spoil what is potentially an excellent book. I look forward to the second edition in English!

Chemical Modeling: From Atoms to Liquids



Subject area

Physical chemistry.

Description

This book attempts to show how the properties of matter can be represented and understood through mathematical models.

Authors

Alan Hinchliffe.

Publishers/Suppliers

J. Wiley and Sons, Inc.
(www.wiley.co.uk)

Date/Edition

1999.

ISBN

0-471-99904-0.

Level

Undergraduate.

Price

£27.50.

Science can often start as a seemingly childish game. Why is the sky blue? Why is water wet? Of course, science goes beyond mere curiosity and attempts to provide self-consistent answers to questions such as these. More often than not its explanations are based on models of the visible world around us. By thinking about the properties of everyday objects, such as an elastic band, one can

come up with a model for molecular polarizability that neatly explains why high frequency light is scattered in the atmosphere more than low frequency light and hence why, on sunny days, the sky appears to be blue, although it has to be said that my six year old daughter was less than impressed by this particular story!

What Alan Hinchliffe attempts to do in his book "Chemical modeling from atoms to liquids" is to show how the properties of matter can be represented and understood through mathematical models. The scope of the book is reminiscent of Tabor's classic "Gases, liquids and solids", and is also intended as an introduction to the author's previous "Modelling molecular structures" (see p. 19). In the current book, we are taken on a whistle-stop tour of the major landmarks of physical chemistry, starting with the van der Waals equation of state, past thermodynamics, classical and quantum mechanics and statistical thermodynamics to quantum chemistry and the description of many particle systems such as solids, liquids and polymers. This is probably too much for a text of just short of 400 pages, although there is much here of interest and the frequent examples and applications scattered throughout the more formal text help to hold the reader's attention. The writing style is "chatty" and engaging, frequently written in the first person. I imagine that students will find this a friendly approach even if they find the material itself is a little indigestible. To help the less mathematically knowledgeable an 18 page mathematical "toolkit" outlining some of the more important results and techniques is included as an appendix. This touches on vectors and matrix multiplication, vector calculus and the properties of determinants. Since many undergraduates reading chemistry have a rather poor mathematical background I think rather more of this material might usefully have been included, particularly the appendix contains nothing on complex numbers even though they naturally crop up in the introductory chapter on quantum mechanics. On the other hand there is also merit in a succinct list of key results that more adventurous students can follow up in a mathematics primer.

My main criticism is that the narrative thread is a little thin. The text tends to jump from subject to subject and application to application in a rather haphazard fashion. This is perhaps understandable given the breath of the subject matter and the student is more likely to dip into selected chapters rather than read the book from cover to cover. The illustrations are rather poor and crudely drawn, and one, at least, is just plain wrong. The figure captions are also abbreviated to a point that they are misleading, for example fig. 3.1, which represents a dumbbell is captioned "Force of gravity between two bodies", or fig 13.1 which represents the energy levels of a particle in 1D and 3D potential wells (and from which the level $n=2$ is for some mysterious reason missing) is captioned "One- and three-dimensional wells". On the whole the book has been adequately proofread although almost inevitably in a book with this number of equations some annoying typographic errors have crept through the net.

Summary Review

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

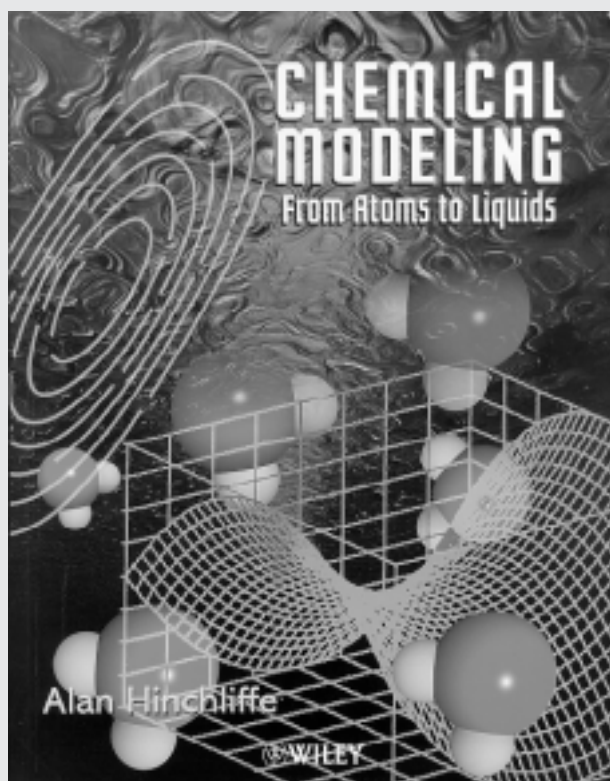
Academic content	****
Usefulness to student	****
Usefulness to teacher	****
Meets objectives	*****
Accuracy	*****

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January 2001

Chemical Modeling: From Atoms to Liquids

That said this book contains a lot of interesting information. The fundamental ideas and basic postulates of quantum mechanics and statistical thermodynamics, essential to a molecular explanation of the properties of matter are clearly and succinctly laid out. The formalism is engagingly

suitable as a primary text to accompany an advanced undergraduate courses in molecular modelling or the properties of matter. It complements more specialised texts such as F. Jensen's "Introduction to computational chemistry", and I. W. Hamley's "Introduction to soft mat-



Chemical Modeling From Atoms to Liquids

A. HINCHLIFFE

Examines materials in terms of the basic properties of atoms, molecules and polymer chains. Carefully structured, the text starts by introducing classical, quantum and statistical mechanics, before moving on to cover the modelling of solids, gases and liquids. To bring the subject alive, many real life examples and applications have been included.

- Develops classical and quantum mechanical theories from basics.
- Avoids unnecessary mathematical rigour.
- Includes a detailed mathematical 'Toolbox' as a ready reference.
- Includes brief descriptions and web addresses of key software packages.

0471999040 314pp 1999 Pbk £27.50

illustrated with applications and examples, which hold the interest. The book will serve as a useful primer to an undergraduate or postgraduate student interested in molecular dynamics simulations or computational chemistry. The subject matter covered is wide ranging and so the book is most useful as a background reference but is also

ter", and provides a mathematically detailed background to J. N. Murrell and A. D. Jenkin's "Properties of liquids and solutions" (all also published by Wiley). With a bit more attention to detail and production values this would be excellent book. Sadly it is not quite up to the mark.

Colour and the Optical Properties of Materials



Subject area

Physics, Chemistry.

Description

An exploration of the relationship between light, the optical properties of materials and colour.

Authors

Richard Tilley.

Publishers/Suppliers

J. Wiley and Sons, Inc.
(www.wiley.co.uk)

Date/Edition

2000.

ISBN

Hardback: 0-471-85197-3.
Paper: 0-471-85198-1.

Level

A-level, undergraduate.

Price

Hardback: £70.00.
Paper: £24.95.

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March 2001

Notwithstanding the Preface, it is difficult to establish the probable effective readership: there are sections which deal with elementary and general features of the subject, and others which are highly specialised. Since the text covers such wide ranges of sophistication and topics, the reader's expected background seems uncertain: some elementary matters are not always explained sufficiently, e.g. the neat trigonometric derivation of the net path difference for reflection within a thin film (p. 84), and yet other particular details are pursued at length, though often without any rigour. One consequence of the wide range is that for many of the details one might expect to see one is often simply referred to the "Further Reading" bibliographies.

Summary Review

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

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

There are a number of errors:

some of these indicate insufficient proof-reading and editing

e.g. the expression for the reflectivity of a single interface, p. 88, rendered meaningless by the absence of essential brackets

e.g. the caption "...hexagonal.." to Plate 2.1

e.g. the white-light interference table Appendix 4.1 (some jumbled and missing column entries, and misplaced column headings)

others indicate perhaps an over-loose terminology, or an imbalance between detail and over-view, or a failure to anticipate possible misunderstandings

e.g. in the caption to Plate 1.1 : what IS the reflection in question (blue appearance of the sky as reflected in a stream on a cloudless day) if not SOME sort of interaction (i.e. "elastic") between blue (not white) light and the water ?

e.g. " The sequence of colours (for incident white light) seen will be repeated in a cyclical fashion as the film thickness increasesEach sequence of spectral colours ..." (p. 85)

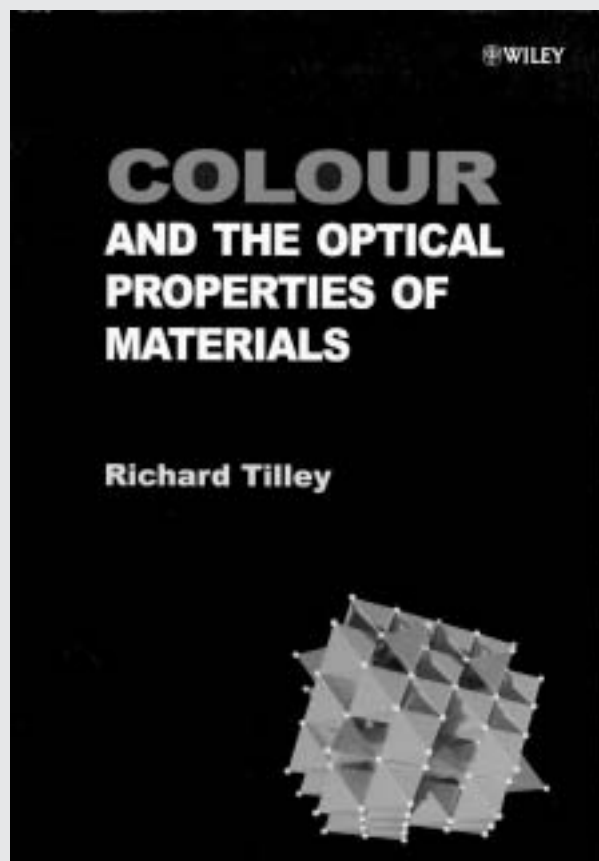
The repetition of perceived colours is not really cyclical, given the range of component wavelengths present, and the colours are certainly not spectral (which I take to mean "monochromatic"), each being necessarily a continuous mixture from across the whole spectrum.

e.g. "... ordinary white light is emitted in bursts which undergo a sudden change of phase every 10^{-8} s.[10 ns] or so" (p. 85). This dubious statement needs much qualification and explanation, especially when discussing the visibility of colour effects for white light reflected in a thin film. The word "coherence" is here surely called for, in order to discuss the limitations, as a result of finite coherence lengths, on the visibility of thin-film interference effects for even so-called monochromatic light (e.g. from a single atomic species - hence the indicated time-scale: the coherence-time), but "coherence" is NOT in the Subject index, and is discussed only in the much-later chapter on Lasers. The white-light interference colours for a thin film need a discussion which clearly distinguishes between (a) the effects of the coherence length for normal "monochromatic" atomic light emissions, and (b) the effects of the set or band of such component "monochromatic" (spectral) wavelengths present, and the consequent superposition (colour-mixing) of the interference fringes of these different spectral colours.

Colour and the Optical Properties of Materials

Perhaps a second issue will see these errors rectified. The “novice” will be misled and puzzled by these, and will probably need to refer to standard textbooks on Physical Optics. The “expert” will be annoyed at the implicit lack of necessary care, and may perhaps as a result then doubt

Essentially, this book will probably be of value only to those who both share the author’s undoubted and eclectic enthusiasm for the subject and have sufficient knowledge and expertise: they will greatly appreciate the breadth of discussion, and will be able to fill in the missing essential



Colour and the Optical Properties of Materials

R. TILLEY

Written for students taking an introductory course in colour, this book carefully introduces the science behind the subject, along with many modern and cutting edge applications, chosen to appeal to today’s students. For science students, it provides a broad introduction to the subject and the many applications of colour.

CONTENTS: Preface; Light and Colour; Colours due to Refraction and Dispersion; Crystals and Light; The Production of Colour by Reflection; Colour due to Scattering; Colour due to Diffraction; Colour from Atoms and Ions; Colour from Molecules; Colour from Charge Transfer and Luminescence; Colour in Metals; Semiconductors and Insulators; Fibre Optics and Data Transmission; Displays; Lasers and Holograms; Answers to Problems and Exercises; Index.

0471851981 348pp 1999 Pbk £24.95

those less-familiar topics where he is invited to “trust” the writer, who, I suspect, knew very well what he wanted to say (and this of great interest to many of us), but - faced with the enormous target range of topics - gave insufficient reflection to some sections, especially where there was an (unconscious) temptation to presume a particular minimum level for the reader’s familiarity with certain basic but crucial considerations and results.

details and correct many of the more obvious errors - though perhaps they should be spared both!

I look forward to an improved, and even more enjoyable, second edition.

Essentials of Semiconductor Physics



Subject area
Physics.

Description
A discussion of semiconductors from the point-of-view of the solid-state physicist.

Authors
Tom Wenckebach.

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

Date/Edition
1999.

ISBN
0-471-96540-5.

Level
Undergraduate.

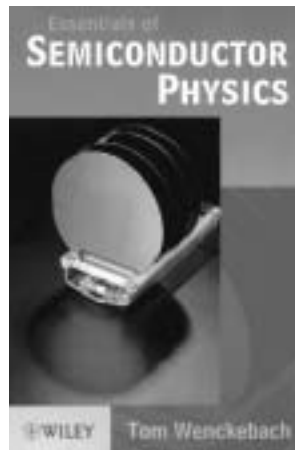
Price
£29.95.

Wenckebach's title is accurate - this is not a book for engineers or device designers. There is barely a mention of a p-n junction or a bipolar transistor. Instead Wenckebach gives a thorough and well-structured discussion of semiconductors from the point-of-view of the solid-state physicist, indeed the author is a spectroscopist by training. The main thrust of the book is determination of the band structure and the Bloch functions which are used to represent the carriers, and their coupling to the lattice. Topics such as transport and optical properties are added at the end, not so much as an afterthought, but can be thought of more as consequences of the core material. These are of course the functional properties of the materials that are of interest in applications - I'd like to think that a complete course in semiconductors ought to leave a physics undergraduate able to explain the workings of transistors and important semiconductor devices. Coupled with a more device oriented book such as the classic by Sze¹, a complete survey of the field from fundamentals to applications ought to be possible.

Summary Review

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

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



Much of the development of the general formalism is not specific to semiconductors, and the book could be used to accompany an advanced course on solid-state physics. The development of the concepts of crystal lattices, reciprocal space, energy bands, Bloch states, and electronic and lattice excitations could easily be transplanted to a book on metal physics, or indeed one on condensed matter physics in general. Even though I personally don't work on semiconductor structures there is plenty of useful reference material here for me.

The treatment is unashamedly mathematical: as it has to be, given the subject matter. It's hard to find many pages without the type of multi-line equations that strike fear into undergraduates, especially in these days of declining mathematical confidence in many students. A familiarity with such formalisms as Dirac notation, vector calculus and the representation of magnetic fields as a vector potential is a prerequisite for following many of the arguments. As a result, although graduate students ought to find the book digestible, I expect that most undergraduates (but for the brightest finalists) will be outfaced, despite the recommendation on the book's cover that it would be suitable for an undergraduate first course in semiconductors. I doubt that I would recommend this as a course text to any undergraduates I was teaching. It's always useful to have rigorous derivations of key results to hand, though, when preparing a lecture course.

Wenckebach describes the book as an extended version of the lecture notes from his course at TU-Delft. I'd be surprised if this course wasn't delivered to quite senior undergraduate students, of course a Dutch degree lasts much longer than its UK equivalent. So to summarise: a well-written book, with a rigorous treatment of many areas of solid-state physics useful beyond semiconductors, but more useful as a graduate text or researcher's reference than as a book to accompany an undergraduate course.

Reference

1. S.M. Sze, Physics of Semiconductor Devices, Wiley, 1981.

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University of Leeds
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March 2001

Fundamentals of Acoustics



Subject area

Physics.

Description

A text to support the teaching of courses in acoustics to undergraduate students.

Authors

L. E. Kinsler, A. R. Frey,
A. B. Coppins and J. V. Saunders.

Publishers/Suppliers

J. Wiley and Sons, Inc.
(www.wiley.co.uk)

Date/Edition

2000/4th edition.

ISBN

0-471-84789-5.

Level

Undergraduate.

Price

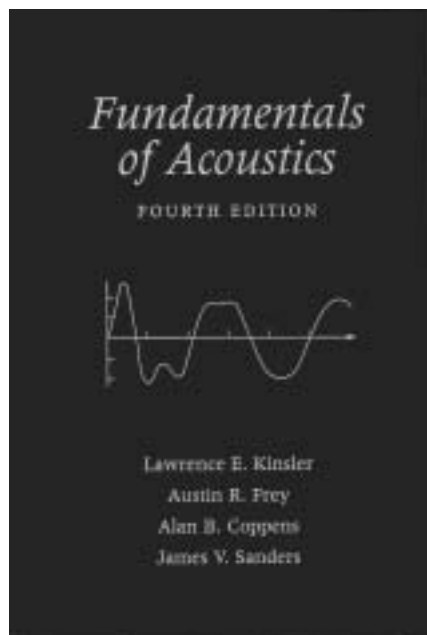
£34.95.

The fact that a book has gone into a 4th edition over a 50 year period says something about the importance of this text in the field of acoustics. I entered acoustics research over 30 years ago when the second edition was available and this became my firm friend and support for the teaching of courses in acoustics to undergraduate students. Over this period, undergraduate stamina is not what it was, but this book is still a flagship text.

Summary Review

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

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



It seemed to me that the text and mathematical content always struck the right balance between mathematical complexity and practical problem solving. It has always carried the flavour of its now deceased original authors and considers the propagation of ultrasound underwater in some depth. However, it considers the basic propagation of sound, vibrations, sound radiation, detection, absorption, attenuation, propagation in pipes, resonators and filters, architectural and environmental acoustics, transduction, non-linear propagation and shock in sufficient depth to be considered a serious text.

Any undergraduate course based on this text, in whole or in part, will have created a new generation of well grounded acousticians.

I am pleased a respected friend has come back to life again. It will join its father and grandfather on my shelves.

Roger Hill
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Nottingham NG11 8NS
January 2001

Fundamentals of Biochemistry



Subject area

Biochemistry.

Description

Biochemistry textbook with CD-ROM.

Authors

Donald Voet, Judith Voet and Charlotte W. Pratt.

Publishers/Suppliers

J. Wiley and Sons, Inc.
(www.wiley.co.uk)

Date/Edition

1999.

ISBN

0-471-58650-1.

Level

Undergraduate.

Price

£34.95.

Ron Cole
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BT37 0QB
March 2001

When browsing the shelves of a bookshop you will see any number of books with the titles such as, Biochemistry, Principles of Biochemistry and Fundamentals of Biochemistry. A look at the contents page will not help you select a suitable text. A dip into the introduction and a look at the illustrations will not be much more help. The truth of the matter is that there are a large number of textbooks that are very similar. The titles certainly do not differentiate the books because one with the title biochemistry may contain less than another titled fundamentals of biochemistry.

Summary Review

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

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

Fundamentals of Biochemistry by Donald Voet, Judith Voet and Charlotte Pratt is one of the texts you will find.

It is organised in five parts:

- Part I. Two introductory chapters.
- Part II. Eight chapters discussing bimolecular structure.
- Part III. Two chapters concerned with enzymes.
- Part IV. Ten chapters discussing metabolism.
- Part V. Five chapters describing the biochemistry of nucleic acids.

When you first dip into the book you find it to be well presented and well illustrated with one additional item that is becoming more and more common, the CD-ROM. The CD-ROM when placed in the drive starts automatically and provides all the instructions needed for installation and so presented no problems.

If you do not bother with Part I you soon realise that a basic knowledge of chemistry and biology is needed to use the book to its full.

However Part I provides you with an essential background in the areas of basic cell structure, thermodynamics, water, acid and base chemistry and buffers which would serve as a useful reminder but would not be sufficient for a full understanding of all the kinetics and thermodynamics discussed in subsequent parts of the book.

Having started with Part I you will find that not only is the book well structured but that it is easy to read and the concepts being introduced are well explained, but does indicate that a study of chemistry and biology (although to a lesser extent) is a pre-requisite for the study of this text. If you are not sure of the necessary background a visit to the "On-Line Student Companion" at <http://www.wiley.com/college/voetfundamentals> and the student quizzes will provide a useful guide

The remaining four parts are arranged to provide a logical teaching pattern.

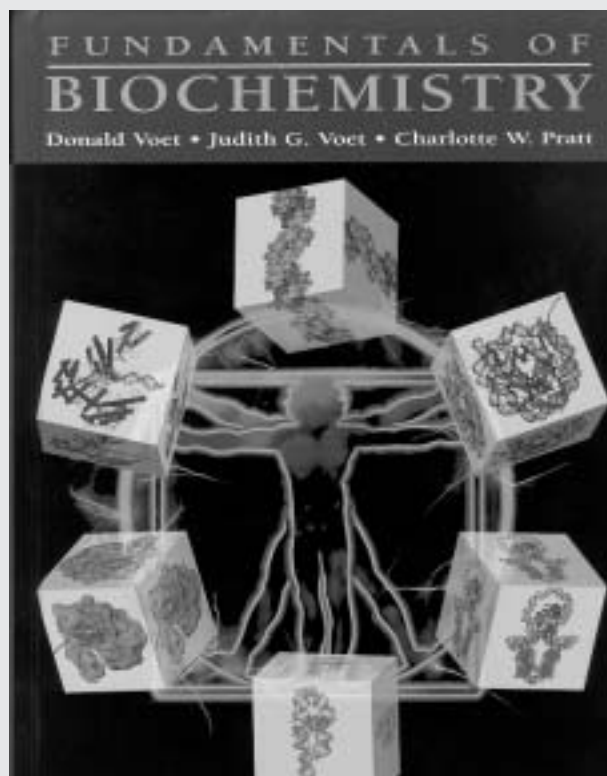
Examples of this are:

1. The chapter on enzyme mechanisms precedes the discussion of enzyme kinetics so that it can first be seen how enzymes work.
2. Central metabolic pathways are presented in detail while others, e.g. some lipid and amino acid pathways consider key enzymatic reactions.
3. DNA replication, transcription and translation are considered together so that their interrelationship can be appreciated.

Fundamentals of Biochemistry

The complete text would provide an appropriate study of biochemistry in undergraduate courses although additional material may well be needed for specialist biochemistry programmes.

The CD-ROM (which runs in Netscape and uses Quicktime, MDL Chime and Shockwave - all supplied on the disk) provides additional insight into the contents of the chapters and the referencing in the text makes information readily accessible. The ability to access the CD-ROM to view 3-



Fundamentals of Biochemistry

D. VOET, J.G. VOET and C. PRATT

Donald and Judith Voet, authors of the widely respected *Biochemistry*, have been joined by Charlotte Pratt, to provide a new streamlined text for biochemistry courses. This new textbook continues the chemical and structure-function approach of *Biochemistry* but covers topics in less detail so that students can readily grasp the core concepts. This book is by no means an abridgement of *Biochemistry*, rather it is a new work with its own organisation and style. The book presents the subject with chemical rigour focusing on the structures of biomolecules, chemical mechanisms and evolutionary relationships.

CD-ROM multimedia supplement, packaged with the text, contains 60 rotatable figures of proteins and nucleic acids, 20 more detailed interactive visualisation exercises, 10 animations of biochemical processes and 21 kinemage exercises.

0471586501 1056pp 1999 Hbk+ CD
£34.95

The presentation of the topics and their overall understanding is enhanced by the addition of the broadening topics, "Biochemistry in Focus", "Biochemistry in Context" and "Biochemistry in Health and Disease".

Examples of these topics from the chapter on enzymatic catalysis are: Catalytic Antibodies ("Biochemistry in Focus"). Observing Enzyme Action by X-Ray Crystallography ("Biochemistry in Context") Nerve Poisons ("Biochemistry in Health and Disease").

Each chapter also has the very useful addition of a chapter summary, a list of key terms, a set of study exercises, a set of problems (that include calculations where appropriate) that require application of the principles introduced in the chapter and a few appropriate references.

Solutions to the problems are provided at the end of the book, together with a glossary of terms and a table of contents for the CD-ROM. The problems presented at the end of each chapter are certainly appropriate and challenging.

dimensional structures and to manipulate them greatly enhances the discussions where stereochemistry or molecular binding is important and the animations certainly aid clarification.

There are only one or two minor errors in the text but the CD-ROM does present a few more. These problems do not markedly detract from the presentation of the material and certainly do not negate its usefulness. The problems appear in the presentation and/or disappearance of information in some of the animations where labelling is applied.

Overall the textbook together with its CD-ROM provide an excellent biochemistry study resource which is further enhanced by use of the quizzes presented at the web site. It would be possible to use the quizzes for summative assessment but I would consider formative assessment more appropriate although the style and presentation of the questions would be equally suitable for both types of assessment.

Laboratory Manual for Principles of General Chemistry



Subject area

General chemistry.

Description

A manual for carrying out experiments in the chemistry laboratory.

Authors

Jo A. Beran.

Publishers/Suppliers

J. Wiley and Sons, Inc.
(www.wiley.co.uk)

Date/Edition

2000/6th Edition.

ISBN

0-471-31452-8.

Level

Undergraduate.

Price

£31.95.

General Comments

The book provides an excellent compilation of experiments, covering organic, inorganic, physical and analytical chemistry. It would be helpful if the reader had some basic knowledge of chemistry before using the manual. However, the author does explain and demonstrate the theoretical concepts in a readable and easy-to-understand fashion. The people who could make best use of this book are new undergraduate students in chemistry or a related subject area, and their tutors. The book would also act as a training course for new and inexperienced laboratory workers.

Structure

A clear preface introduces the manual and describes its format and use.

Sections on laboratory safety, keeping records of practical work, laboratory equipment and laboratory techniques are all included.

Each experimental chapter is clearly and logically structured, as follows: objectives; techniques; introduction (including chemical principles); experimental procedure; pre-laboratory assignment; report sheet with questions. Experiment 4 on Paper Chromatography exemplifies the benefits of this style of presentation and confirms the appropriateness of the author's approach. The section begins by clearly stating the objectives of the experiment. The reader is then informed of the techniques and safety measures involved, by a system of recognisable icons. Further information on these aspects can be found by turning to the appropriate, and well-referenced, sections of the manual. All the relevant technical terms are clearly defined and explained. Experimental procedures are listed in a scientific yet user-friendly style. The student users are encouraged to seek advice from their instructors. They are advised of any hazards or safety measures related to the chemicals and operations being employed. At all times, the written text is supported by a range of suitable illustrations - assorted photographs, diagrams, tables, graphs and other figures are chosen according to the nature of each experiment. The pre-laboratory assignment is a useful way of testing student understanding. The section concludes with a report sheet that includes questions for reflection and/or assessment purposes.

Appendices provide supportive information, such as the relationship between trivial and IUPAC nomenclature for chemicals, and the inter-conversion of units.

Safe Working Practices

Particularly impressive are the author's guidelines for working safely and appropriately in a laboratory environment. These are extremely relevant for new chemists learning how to carry out a variety of methods and techniques. The need for careful preparation and planning is emphasised; this includes identification of the protective measures required, the safe ways of handling hazardous materials and the procedures to deal with accidents.

Basic Laboratory Operations

Clear descriptions are provided for all the common laboratory processes, for example: cleaning glassware, handling chemicals, chemical disposal, preparing solutions, use of balance, transfer techniques, separation and filtration methods, heating solids and liquids, titrations, qualitative tests.

Summary Review

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

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

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March 2001

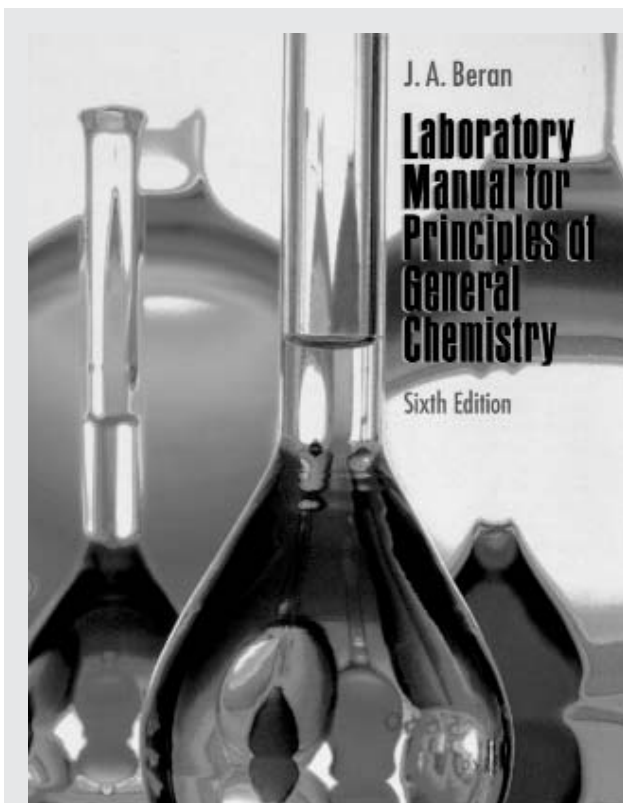
Laboratory Manual for Principles of General Chemistry

Recording and Analysis

Tips are provided for recording experimental data and keeping a laboratory notebook. The Appendices include an illuminating section on the statistical analysis and graphical presentation of data.

Recommendation

This text will provide a useful aid for newcomers to the chemistry laboratory. The user is given a real hands-on experience of chemistry that fully demonstrates theoretical concepts.



Laboratory Manual for Principles of General Chemistry

6th Edition

J. A. BERAN

A lab manual for use in the general chemistry course, Beran has been popular for five editions now because of its broad selection of topics and experiments to choose from, and for its clear layout and design. Containing enough material for two or three terms, this lab manual emphasizes techniques, helping students learn the time and situation for correct use of the appropriate techniques.

0471314528 480pp 2000 Pbk £31.95

Additional Comments

The author is committed to updating and improving the content and presentation of the manual. "Users of the manual, the students, prompted most of the changes that were implemented to enhance the presentation of laboratory techniques". This philosophy should be applauded. The interested reader is further directed to a number of informative Web Sites.

Microscale organic laboratory



Subject area

Organic Chemistry.

Description

An organic laboratory manual concentrating on microscale techniques and experiments.

Authors

Dana W. Mayo, Ronald M. Pike and Peter K. Trumper.

Publishers/Suppliers

J. Wiley and Sons, Inc.
(www.wiley.co.uk)

Date/Edition

2000/4th edition.

ISBN

0-471-32185-0.

Level

Undergraduate.

Price

£67.95 (special offer to education - £34.95 - contact the Centre for details).

Stephen Breuer
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Lancaster University
Lancaster LA1 4YB
April 2001

This is the fourth edition of a pioneering book that started the revolution in practical organic chemistry teaching, the dramatic reduction of the scale at which preparative student experiments are carried out. Presenting the arguments in favour of the change is no longer seen to be necessary as two thirds or more of US universities are including microscale in their students' laboratory experiences. In the UK the proportion is about a third, although the benefits of greater safety, speed (therefore a wider range of experiences) and lower environmental cost are equally valid. People considering such a change for their courses could very usefully start here.

The book is a complete introduction to the scheme; it describes the recommended equipment, the necessary preparative, separation, purification and characterisation techniques and some of their underlying principles. This is followed by a series of thirty-five basic experiments dealing with a wide range of preparative reactions, typically on a 15-150mg scale. In addition there are seven more advanced preparations and six multi-step syntheses starting on the half-gram scale to ensure that the end product is reached. There is a wide range of chemistry covered both in terms of the functional groups involved and in the changes they undergo. There are examples of oxidation, reduction, addition, elimination, substitution (both aliphatic and aromatic), rearrangements; one cannot fault the selection.

Innovations in this edition include the introduction of a kinetic experiment (dehydrobromination of bromocyclohexane) with GC analysis of the products and a modest nod towards larger scale preparations, although very few are carried out on more than a gram of material. There are sections on spectroscopic techniques and tables of data, procedures for qualitative identifications of organic compounds and in the text here and there, short biographies of notable chemists associated with the chemistry described. A further innovation is the setting up of a Web site (www.wiley.com/college/MOL4) containing some more background material, discussions of the factors governing IR group frequency shifts and melting point tables for common derivatives of particular classes of compounds. The web site also has information for the instructor to aid the running of a course based on this book.

Each experiment is well introduced with a full discussion of the mechanism, any associated hazards, the required equipment and its use, full operating procedure, the physical and sometimes the spectroscopic properties of the expected product and extensive references to the source of the preparation and to related published work, often in Organic Syntheses.

The book sets out to be a complete lab manual, to eliminate the need for consulting a basic organic text, an introduction to spectroscopy and a text on qualitative analysis and in this aim it inevitably fails. Owing to pressures on space the spectroscopic discussions are too brief (although some more is on the Web), the tables of data too sparse and in the analysis it sends the reader to other sources or to the web site for the tables of data. It would have been better just to concentrate on the practical chemistry and accept that the students have to consult other literature sources as well. Another reason for it falling short as a complete lab manual is that there are very few larger scale preparations, not nearly enough to give the students the full range of experiences.

Summary Review

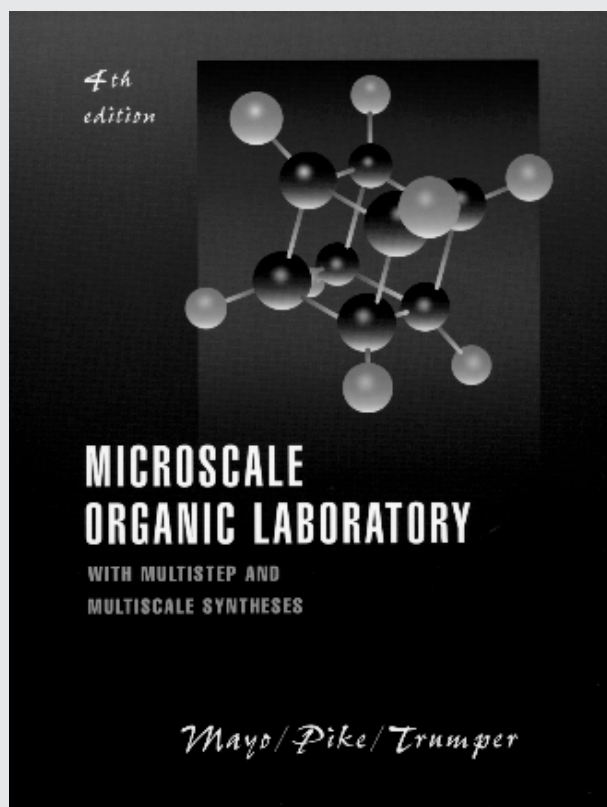
range: * very poor to ***** excellent

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

Microscale organic laboratory

This is very much an American book, designed to be bought by the students on a course and used day after day. It is easy to read, very detailed in its instructions and has a nice set of 'lollipops' about bits of chemistry, biochemistry, biography or history relevant to the topic under

In the UK system it is most likely to be used by the person designing a laboratory class and wishing to introduce some microscale working. In such a situation I suggest a very careful look at the equipment recommended (quite expensive in the UK) to see if simpler and much cheaper alter-



Microscale Organic Laboratory with Multistep and Multiscale Syntheses 4th Edition

DANA W. MAYO, RONALD M. PIKE,
PETER K. TRUMPER

This is a laboratory text for the mainstream organic chemistry course features both microscale experiments and options for scaling up appropriate experiments. It provides complete coverage of organic laboratory experiments and techniques with a strong emphasis on modern laboratory instrumentation, a sharp focus on safety in the lab, excellent pre- and post-lab exercises, and multi-step experiments. There is also another text available by the same authors entitled *Microscale Techniques for the Organic Lab, Second Edition* which has more material on techniques and spectroscopy, but has no experiments.

0471321850 688pp 2000 Hbk £34.95

discussion. It is also very American in that US contributions are emphasised and others are played down; in the discussion of sulfonamides Domagk's discovery and Nobel Prize are discussed but his name is nowhere.

natives could serve equally well. (Hint! The answer is yes). With that reservation I recommend this book since it was its first edition that persuaded me to trust the students' ability successfully to operate on this scale and to convert some of our teaching to microscale. Provided students have experience of both microscale and standard equipment during their course, the benefits of scaling down come at a negligible educational price.

Modelling Molecular Structures



Subject area
Chemistry.

Description
Readable text describing the theoretical background to molecular modelling, with up-to-date modelling examples.

Authors
Alan Hinchliffe.

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

Date/Edition
2000/2nd Edition.

ISBN
Hardback: 0-471-62380-6.
Paper: 0-471-48993-X.

Level
Undergraduate, research.

Price
Hardback: £90.00.
Paper: £34.95.

This book forms part of the "Wiley Series in Theoretical Chemistry" which aims to present the latest fundamental materials in the field to both students and research chemists. Such a remit, involving the production of a text applicable to readers with a wide range of prior knowledge and required application, would seem a daunting task. However, Alan Hinchliffe has produced a delightful, easy to read volume, written in an informal style which will enhance its appeal to undergraduates and research students. This second edition has been completely updated from the original, first published in 1995, and includes new material on molecular dynamics and solvent modelling as well as examples of the application of up-to-date software.

Summary Review

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

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

The preface contains a succinct historical overview of developments in modelling and is (unconventionally) followed by chapter 0, which covers the mathematical prerequisites for further reading. This does make some assumptions of prior knowledge and may present some initial difficulties for the undergraduate whose mathematical background, nowadays, may be limited. The committed student, however, should be able to engage readily with the text and (perhaps after a little supplementary mathematical revision) to move confidently forward to the real start of the book, molecular mechanics.

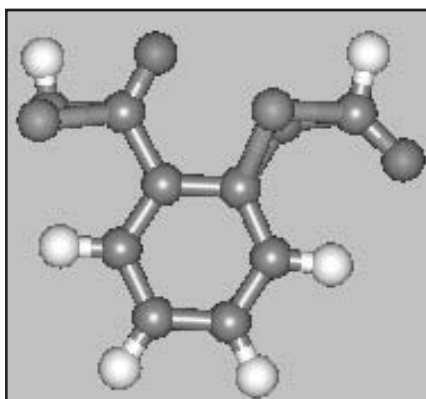


fig 1: Model of aspirin molecule

Aspirin (fig 1) is used as the example to illustrate model building and the use of graphical interfaces; the screen grabs and diagrams illustrating different ways of representing the molecule will be particularly useful for those new to modelling. Following a straightforward treatment of energy minimisation, more complex ideas of molecular dynamics are introduced; the concept that the majority of molecules exist in solution leads naturally to an examination of site-site interactions in water. Discussion of "traditional" quantum mechanics follows a fairly well-worn path - the hydro-

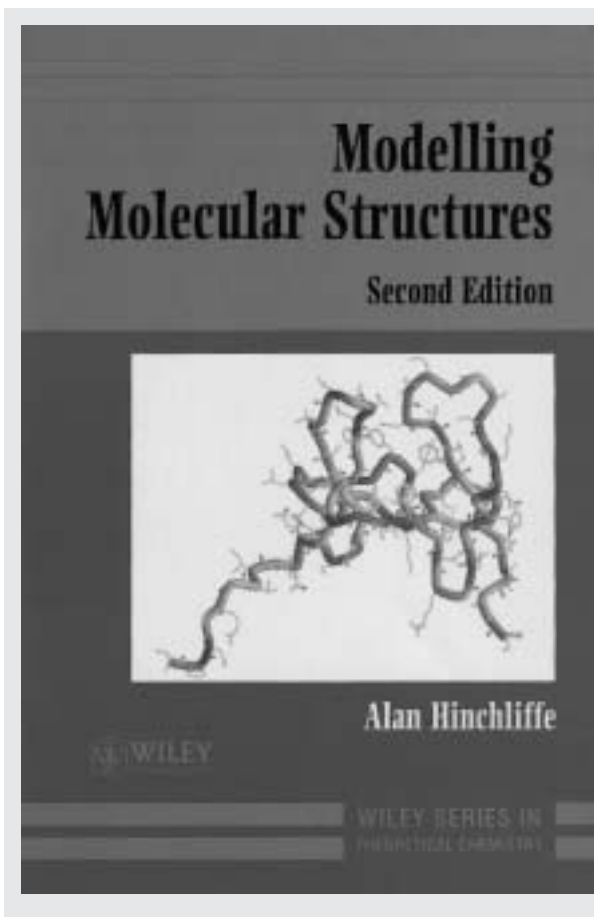
gen molecule-ion, the Hartree-Fock model, LCAO procedures, the Hückel pi-electron approach - with the usual small-molecule examples (though enlivened by the concept of distinguishable rabbits), and leads smoothly into neglect of differential overlap models. From there, the author moves to consider what for many readers will be a fundamental problem: the choice of an appropriate basis set. The various possibilities, and their underlying theories, are very clearly explained and there are a number of useful examples of ab initio calculations. The small section on resource consumption (i.e. disc and CPU usage) provides a valuable comparison of the resource implications of using different ab initio methods, including configuration interaction and perturbation theory models. Dineon is used as a simple example which highlights the fact that even the most detailed ab initio calculations only give qualitative agreement with experimentally-measured values.

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March 2001

Modelling Molecular Structures

Energy minimisation calculations and the optimisation of molecular geometry are approached via a discussion of density functions and potential energy surfaces. Hybrid methods for treating systems containing solvent are examined. The book closes with a discussion of induced

cram in too much material; the book is very usable as an undergraduate text whilst also being suitable for research chemists wishing to use modelling as part of their work. For undergraduate use, some suggestions for sample calculations which students could carry out for themselves would



Modelling Molecular Structures

2nd Edition

A. HINCHLIFFE

This is a concise introduction to the fundamental theories of molecular modelling. This new edition has been completely updated and includes many examples all using the latest software. In addition, it covers the development of molecular modelling to give a historical perspective. CONTENTS: Prerequisites; Molecular Mechanics; Dynamics; The Hydrogen Molecule-Ion; The Hydrogen Molecule; The Electron Density; The Hartree-Fock Model; The Hockel Model; Neglect of Differential Overlap Models; Basis Sets; Ab Initio Packages; Electron Correlation; Slater's X Infinity Model; Density Functional Theory; Potential Energy Surfaces; Dealing with the Solvent; Primary Properties and Their Derivatives; Induced Properties; Miscellany.

047148993X 350pp 2000 Pbk £34.95

properties and a number of applications of the modelling methods, which include the calculation of thermodynamic quantities. At relevant points throughout the text, abstracts or summaries of related research papers are provided - mostly classics in the field - and there is a full bibliography. Given the rapid development of this subject, I was a little disappointed not to see more references from the past ten years, but it is an advantage that the author has not tried to

have been helpful, though given the computer-based nature of the subject it is inevitable that the book will be used as an adjunct to a "hands-on" course or project centred around a particular modelling package, rather than as a "stand-alone" text. To conclude, this book provides an admirable introduction to modelling molecular structures and can be strongly recommended.

Optics and Photonics, an Introduction



Subject area

Physics.

Description

An introduction to the field of optics and photonics for science and engineering students.

Authors

F. Graham Smith and Terry A. King.

Publishers/Suppliers

J. Wiley and Sons, Inc.
(www.wiley.co.uk)

Date/Edition

2000.

ISBN

0-471-48925-5.

Level

Undergraduate.

Price

Paper: £24.95.

Bruce D. Sinclair
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University of St Andrews
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April 2001

This book claims to be “an essential, modern introduction to the field of optics and photonics, and will be of interest to all science and engineering students”. I can broadly agree with this statement. The book is different from many others in devoting comparable page space to conventional optics and to the lasers/photonics area. This compares with texts more familiar to me such as Hecht¹, Beynon² or Guenther³ which are mostly optics with a bit of lasers, and texts such as Wilson and Hawkes⁴, which is optoelectronics with a bit of optics. It is good to see a unified approach here with around 30% on lasers and optoelectronics and some 70% on classical and modern optics, spectroscopy, and applications. The authors, both from Manchester University, form a good writing pair. Professor Terry King is a well-established laser scientist, and Professor Sir Graham Smith’s career in astronomy has included time as the Astronomer Royal as well as being Director of Jodrell Bank and the Royal Greenwich Observatory. Their authority comes across in the links to modern applications, and in the cross-links between topics. Current developments are included, with for example comments on the use of interferometers in gravitational wave detection, and the use of periodic structures in new types of optical fibres.

Summary Review

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

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

While the book starts from Snell’s law, it soon moves on to electromagnetic wave equations, Fresnel Diffraction, and Michelson’s stellar interferometer. Thus much of the book is in my opinion above a first year undergraduate treatment, but includes material that will help more senior students remember what they ought to know. Students specialising in photonics will eventually need more than is in this book, but for others there is plenty of good stuff here. In subsequent communication with one of the authors I was advised “the book is intended for undergraduates for a course that would ideally be taken in the second year as some pre-exposure to electromagnetism and waves would be useful. Well prepared students could follow the book in the first year and the broad range of topics and applications would provide material for third year students.” This certainly fits with my feelings on the book’s applicability.

The book starts with a discussion on waves and photons, then leads into a discussion of geometrical optics; this starts with a “real is positive” sign convention, but immediately moves to a Cartesian sign convention. Optical instruments, interference and diffraction, interferometry and spectrometers are all covered in some detail. A broad introduction to lasers is followed by chapters on semiconductor lasers, laser light, fibre optics, and holography. There is little on nonlinear optics, but there is a useful chapter on photodetectors, and an interesting final chapter on optics in nature.

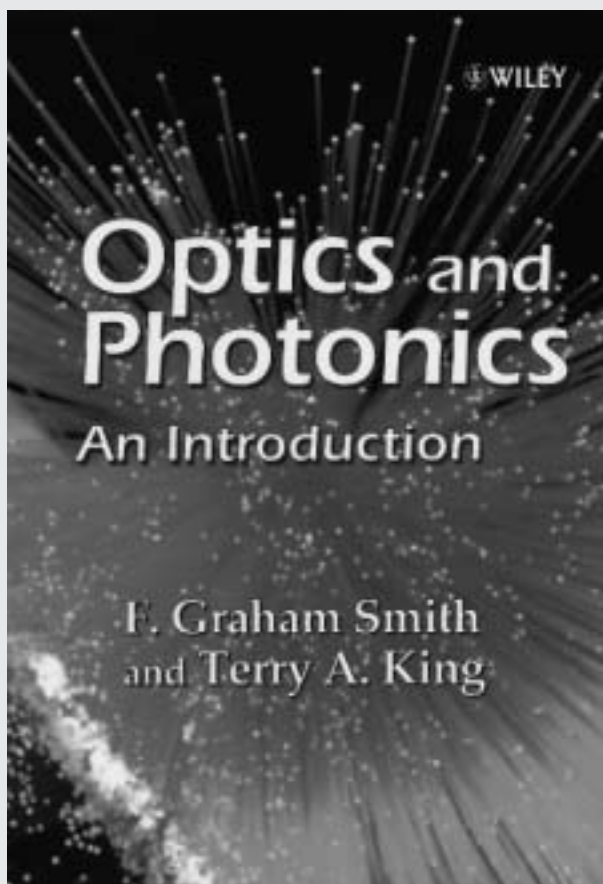
The book’s title includes the word “introduction”, and this is sensible for a book of this size and breadth. The treatments in some topics do not go as far as those in Hecht’s “Optics”, and certainly do not reach the involvement of Siegman’s “Lasers”⁵. This is fair enough, and the authors commendably give a useful reading list at the end of each chapter. There is also an admirable amount of cross-linking between chapters, and most chapters contain useful numerical examples and “problems” with worked solutions.

I found the book readable, with good explanations supported with mathematics. It is clearly laid out, with good use of line diagrams and greyscale images. There are also a few colour plates. I suspect students would share these views; there is already a favourable comment on the Amazon.co.uk web site along these lines.

Optics and Photonics, an Introduction

As indicated above, a first level optics course is probably a pre-requisite for easy progress through the book. For example, circular polarisation is something I find junior students having problems with, but the authors do not spend as long explaining this concept as Guenther (curi-

Overall, I believe this is a useful book, which could form the main reader for some courses on modern optics. Its clear explanations of relevant and current topics, coupled with solved problems and lists of further readings, make it attractive.



Optics and Photonics, An Introduction

F.G. SMITH and T. KING

Presents an introduction to the essential elements of optics and photonics that is now a core part of many science and engineering disciplines. Emphasis is placed on basic concepts to help fully develop the reader's understanding and modern applications are included to highlight the relevance and importance of optics in everyday life. CONTENTS: Waves, Rays and Photons; Periodic Waves; Electromagnetic Waves; Polarisation; Geometric Optics; Optical Systems; Fraunhofer Diffraction; Fresnel Diffraction: Interference by Division of Amplitude; Diffraction Grating and Related Topics; Interferometers; Measuring Source Size, Prism and Grating Spectrometers; High Resolution Spectrometry; Coherence; Lasers; Laser Light; Optical Fibres; Holography; Emission, Absorption and Scattering; Detectors; Optics and Photonics in Nature; Appendix: Radiometry and Photometry; Index.

0471489255 456pp 2000 Pbk £24.95

ously, in the same chapter, King and Smith do not fully explain the origin of double refraction). On the other hand, there are chapters that are certainly accessible by junior students; I particularly liked the clearly written chapter on the eye and optical instruments. While this should be suitable for junior students, it also contained interesting nuggets of information that were new to me.

The ordering of some of the material was different to what I might have expected; for example the Fabry Perot Interferometer came in between Young's double slits and the diffraction grating. Another minor quibble was on some of the graphs, where sometimes a low number of data points have resulted in a slightly jagged or uneven appearance.

References

1. Eugene Hecht, Optics, Addison Wesley, 1998.
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3. Robert Guenther, Modern Optics, Wiley, 1990.
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Organic Synthesis Workbook



Subject area

Organic Chemistry.

Description

16 chapters, 274 pages of problems on organic synthesis.

Authors

Jan-Arne Gewert, Jochen Görlitzer, Stephen Götze, Jan Looft, Pia Menningen, Thomas Nöbel, Hartmut Schirok and Christian Wolff.

Publishers/Suppliers

J. Wiley and Sons, Inc.
(www.wiley.co.uk)

Date/Edition

2000/1st edition.

ISBN

3-527-30187-9.

Level

Undergraduate, research.

Price

£22.50.

Working through synthetic problems is the key to understanding, learning, and appreciating the art of organic synthesis - for practitioners as well as students - as pointed out by Erick M. Carreira in his preface to this book. Well-designed, intriguing problem questions always reward study and Gewert et al's book contains 16 of them, each drawn from a different natural product total synthesis, presented in mutually independent chapters.

Each chapter adheres to the same format. First a short general introduction to the natural product is given, detailing its discovery and importance. The problem itself follows in a format familiar to anyone who has attended synthesis problem sessions in "group meetings" - indeed this book has grown out of such sessions held by Tietze's research group at the University of Göttingham - thus we find a reaction scheme spread over two pages with gaps where intermediate compounds and/or reagents should be. The reader can then begin to tackle the problem and should they get stuck there are bullet-pointed tips and answers on the following pages, each step being dealt with in turn. The intention of the authors is for the reader to gradually unveil the tips (covering them with a sheet of paper), which become progressively more helpful. It is a format that works very well as the reader cannot see the tips "by mistake". Indeed the layout of this section (and the book in general) is very user friendly and easy on the eye, with the part of the problem in question being reproduced in a box and the margins being used for subheadings and structures. Each chapter closes with a summary of the synthesis, including the overall yield and a retrosynthetic analysis, followed by references to the original literature.

The discussion of the solutions to the problems is thorough and includes reactions mechanisms, selectivity considerations, general principles, and relevant background information with helpful citations of textbooks and the original literature where necessary. I have a few quibbles with some of the answers provided, though most of the mistakes are minor and any confusion may be rectified by reference to the cited literature.

The book has been excellently translated from the German by William E. Russey and reads well. However the occasional oversight has occurred with a few German phrases remaining in reaction schemes and footnotes/references. This is merely a minor annoyance; more frustrating is the citation of German textbooks in a few cases - surely alternatives could have been found for English speaking readers, or the citations removed? The only other cultural barrier in the book is the use of lines rather than the more familiar (to British readers) two dots to represent lone-pairs of electrons in reaction mechanisms. These small points notwithstanding the style of the book is excellent and well suited for its intended purpose. Indeed it is a bonus to find a good index: though the book makes no claim to be a textbook, any reader may use the index to locate useful discussions of the topics featured.

Summary Review

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

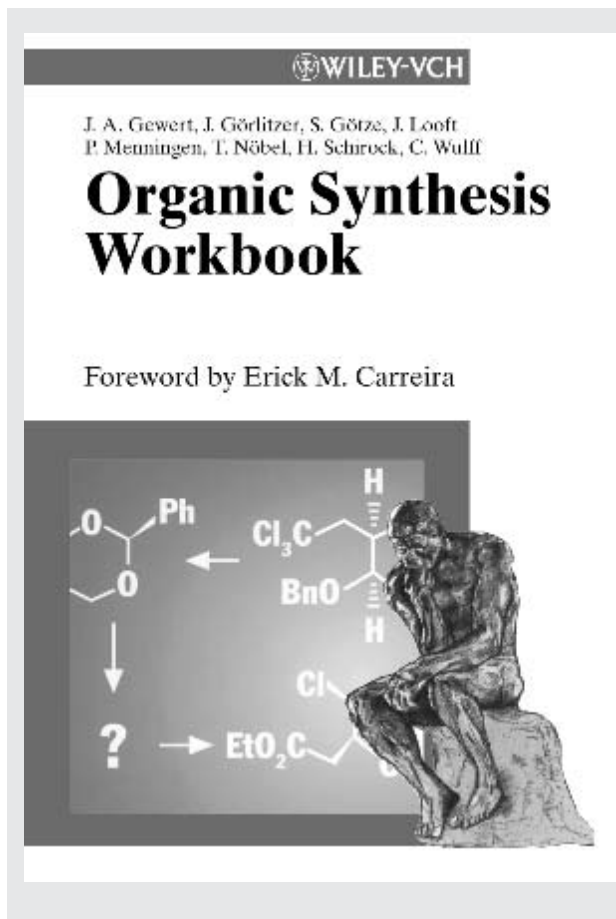
Academic content	*****
Usefulness to student	*****
Usefulness to teacher	no data
Meets objectives	*****
Accuracy	*****

Matthew D. Fletcher
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University of Wales Bangor
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March 2001

Organic Synthesis Workbook

Regarding the choice of material contained in the book, “the authors have ignored international borders”, it is thus rather disappointing that no problem derives from a total synthesis achieved by a British research group! The time frame covered is 1988 to 1997 so significant recent devel-

opments are featured and the problems include a wide range of organic chemistry. Hence there are examples of various types of asymmetric synthesis (chiral pool, chiral auxiliaries, chiral reagents, chiral catalysts, enzymatic desymmetrisation), organometallic reagents, cycloaddition reactions, protecting group chemistry, aromatic chemistry, heterocyclic chemistry, etc. A range of difficulty levels is encountered, thus each problem includes parts that are more or less difficult, and the earlier chapters serve as a



Organic Synthesis Workbook

J. GEWERT, J. GÖRLITZER and S. GÖTZE

Translated by an expert in the field of organic synthesis this book is presented in a clear and concise ‘question and answer’ format.

3527301879 286pp 2000 Pbk £22.50

discovered chemistry new to me whilst working through it), but I suspect that all but the most able and enthusiastic final year undergraduate students would find the problems daunting.

In conclusion I have no hesitation in recommending this book as a self-study resource for postgraduate students of organic synthesis and as a valuable acquisition for the library of any university chemistry department.

Physical Chemistry



Subject area

Physical Chemistry.

Description

General text on physical chemistry.

Authors

Robert J. Silbey and Robert A. Alberty.

Publishers/Suppliers

J. Wiley and Sons, Inc.
(www.wiley.co.uk)

Date/Edition

2001/3rd edition.

ISBN

0-471-38311-2.

Level

Undergraduate.

Price

£33.95.

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March 2001

Many people will already be familiar with this text in the form of its first and second editions. This latest edition has a familiar feel to it, and retains the readability which I have previously felt makes the book one of the more accessible texts on physical chemistry. The approach and layout are fairly traditional, with sections labelled thermodynamics, quantum chemistry and kinetics joined by one on macroscopic and microscopic structures. Each of these parts is introduced by means of a one page overview, which I feel goes a long way to placing the subsequent material in an appropriate context.

Summary Review

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

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

Clear text is accompanied by a reasonable number of line drawings, and is interspersed by worked examples in appropriate places. More unusual is the inclusion of a number of comments throughout the text. These note features which are more of asides than essential to the flow of main text. Examples include directing the reader to an appendix on calculus, the use of atomic term symbols and the restriction in use of a partition function to properties of an ideal gas.

One feature I particularly liked was the inclusion of ten key ideas at the end of each chapter. These generally avoid detailed mathematics, and so I felt that they would provide an ideal summary for our more mathematically challenged students. For example, at the end of the chapter on quantum theory one of the key points reads "The average value of a variable can be calculated by integrating the product of the complex conjugate of the wavefunction times the operator for the variable times the wavefunction". Purists may not like the absence of mathematical symbols here but in the real world such verbose summaries are likely to be far more accessible to students. The version with mathematical symbolism does of course appear within the main chapter in any case.

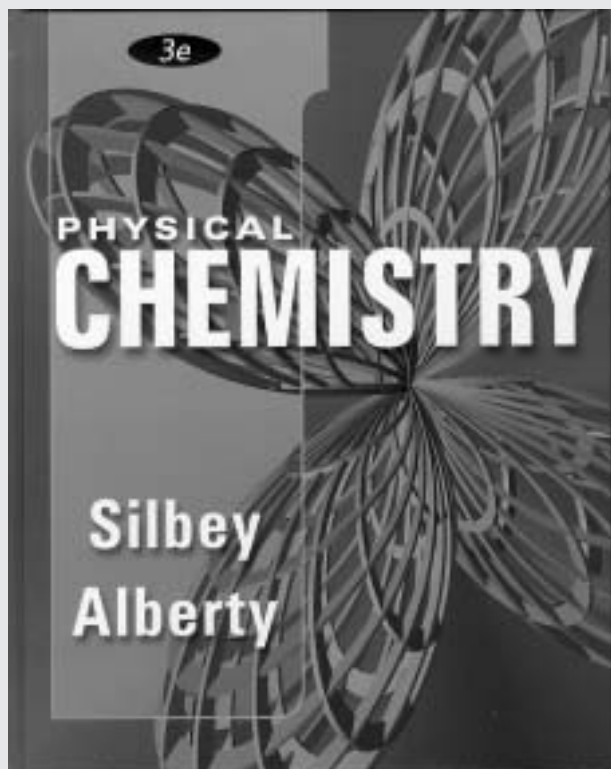
The preface to the book makes considerable play on the inclusion of 136 new computer problems, which require a personal computer with a mathematical application such as Mathematica, MathCad, MATLAB or MAPLE installed. These enable one to solve problems which were "previously too difficult or too time consuming". Solutions in Mathematica format may be downloaded from a specified web site; it is perhaps unfortunate that none of the alternative formats are supported. Inclusion of such problems will no doubt be seen as beneficial by those who have easy access to such software, while others may be less enthusiastic. Nevertheless, this has to be a move in the right direction.

Other problems at the end of each chapter are clearly marked as being "more conveniently solved on a personal computer with a mathematical program". The distinction between these and the problems described above is not immediately apparent, although it appears that such problems could be solved with a more modest combination of software and hardware, or even with just a scientific calculator with some effort. The general end of chapter problems are divided into two sets, the answers for the first set being provided at the end of the book. Those for the second set are only given in the accompanying "Solutions Manual for Physical Chemistry", which apparently contains full solutions for both sets. I find this particularly irritating as it would have taken very little effort and space to have included the bare answers for both sets in the volume currently being reviewed.

Physical Chemistry

The appendices are comprehensive, and include 12 tables of physical data in addition to the listing of 74 such tables which appear at various points throughout the text. A further appendix on Mathematical Relations covers topics such as spherical coordinates, determinants, vectors and

This contains a list of all the symbols used in the book, plus the name of the quantity represented and its SI unit. This is likely to be a great help to those students who choose to dip in to the book to find a specific topic, which is of course how most textbooks are used in physical chemistry.



Physical Chemistry

3rd Edition

R.J. SILBEY and R.A. ALBERTY

Silbey and Alberty has been a standard book for this course for many years due to its clear explanations of the concepts and methods of physical chemistry. This thoroughly revised edition combines an emphasis on problem solving by including 136 new Mathematica problems, with enhanced pedagogy and technology integration.

- Selected traditional figures have been replaced with computer created figures generated by Mathematica.
- A new section at the end of each chapter called 'Key Ideas in This Chapter' includes main concepts with supporting statements.
- There are titles on all the exercises to help students better understand what the problem is about.
- Many updated research examples are integrated throughout the text.

0471383112 980pp 2000 Hbk £33.95

complex numbers; this is probably quite a good summary for those students who have A level mathematics but these topics are generally beyond those which many students with only a GCSE qualification could be expected to master. I felt that the final appendix was particularly useful.

Overall I found the book well presented and more accessible than most in this area. It would be well worth considering as an alternative to some of the more widely used physical chemistry textbooks.

Physics



Subject area

Physics.

Description

Text book for a one year course in algebra-based physics.

Authors

J. D. Cutnell and K. W. Johnson.

Publishers/Suppliers

J. Wiley and Sons, Inc.
(www.wiley.co.uk)

Date/Edition

5th edition.

ISBN

0-471-39219-7.

Level

Undergraduate.

Price

£31.95.

This general introductory physics text has clearly been written for use by students who have only a very basic knowledge of physics and a similar background knowledge in mathematics. Like many books that are aimed at first year undergraduate physicists, it is very clearly structured in terms of the traditional division between the physics disciplines: mechanics, thermal physics, wave, electro-magnetism, optics, and some elements of modern physics concepts. Each section is covered in some detail with a logical progression starting with the most basic of the subjects.

Summary Review

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

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

There are a number of very helpful techniques that the authors have used to clearly direct the reader, whether teacher or student. First is the clear identification of formal definitions and summaries of basic concepts by the use of colour coded boxes within the text. Also in this style are key points indicating good problem solving strategies as well as a number of step-by-step guides for how to tackle specific types of problem. This kind of information is the key to this kind of text for university students who often have a very poorly developed set of problem solving skills. As new concepts are introduced, they are typically linked to ideas that have come before in a flow-diagram chart that indicates where in the book they might find further information. Although the style of this book is by no means unique, the overall impression is of a very clear text.

What is quite novel in this type of book is the use of supplementary problems/demonstrations termed “interactive learningware” available from the publisher online over the internet. Also available via this method are fully worked solutions to problems in the text, which most students would find extremely useful. However, the URL that the reader of the book is directed to does not actually contain the relevant files. Even if the reader is resourceful enough to locate the appropriate URL, the “interactive learningware” is in a form which is not necessarily accessible using university or college facilities since it requires an additional plug-in.

The text is described as appropriate for an “algebra-based physics course”. It begins with a detailed introduction to some rudimentary ideas that any physics student should be comfortable with. I am not convinced that a physics book should cover the mathematical background in this way, but many students who have difficulty with maths would probably benefit from the introduction. Despite the description, the actual level of mathematics required for the book is rather modest. Although this may well be to the liking of students, it does not represent the reality of undergraduate physics courses.

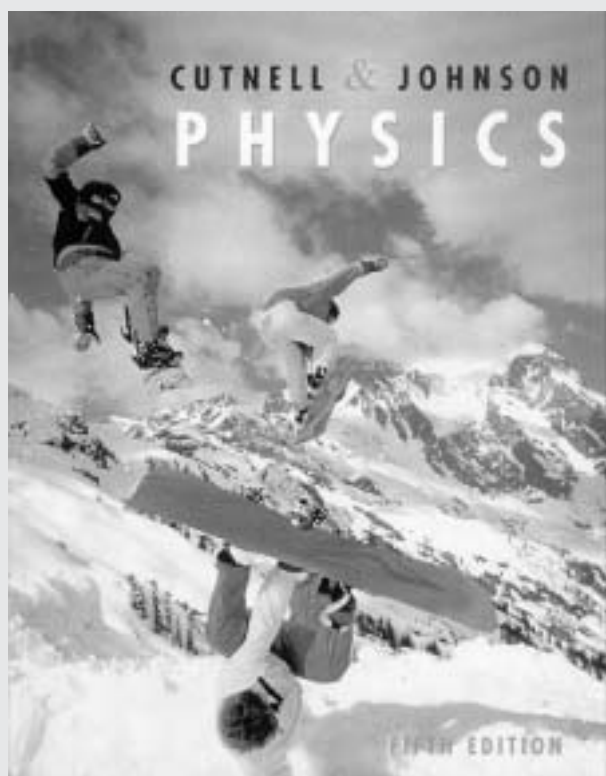
Generally, the use of questions, problems and worked examples corresponding to each section in the text is commensurate with this type of book, but there are also “group learning problems” which are intended for small numbers of students to work on together. These exercises tend to be longer and slightly harder than many of the standard problems, and could prove to be a good source of exercises for a teacher.

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January 2001

Physics

Overall, the book starts at such a very basic level, it cannot discuss many of the more complicated issues that would usually arise in, say, the first year undergraduate course of a physics degree. As an addition to the bookshelf of a teacher or supplementary source of material for the phys-

The text price at £31.95 is similar to the price of other university physics books. For a student studying for a physics degree it is probably worth purchasing only if they have a very weak mathematics background. For a core text for an elementary physics course for non-physicists



Physics

5th Edition

J.D. CUTNELL and K.W. JOHNSON

The fifth edition of this best-selling, algebra-based physics book is designed to help students develop a conceptual understanding of physics principles and to improve their reasoning ability. The authors have developed a problem-solving technique which leads students to an understanding of how physics concepts fit together to provide a coherent description of the physical world.

The Interactive LearningWare feature has been completely remodelled. This on-line tutorial consists of 60 interactive web-based calculation examples.

The Concepts at a Glance charts provide a visual representation on the conceptual development of physical principles.

The inclusion of 82 worked-out conceptual examples provide students with explicit models of how to think through a problem before attempting to solve it numerically.

0471392197 1064pp 2000 Hbk £31.95

ics-degree student the book would have a place, but the expense may prohibit this luxury.

The book would be appropriate for a course in physics for non-physicists, such as found in modular degree systems. It would also be a valuable additional reference text for physics taught at the further education level.

this book should find a place, especially given the relatively easy approach to the mathematics.

Principles of Analytical Chemistry



Subject area

Analytical chemistry.

Description

Analytical Chemistry dealt with in a generic manner.

Authors

Prof. Miguel Valcárcel.

Publishers/Suppliers

Springer-Verlag, Berlin, Heidelberg, New York. (www.springer.de)

Date/Edition

2000.

ISBN

3-540-64007-X.

Level

Undergraduate.

Price

£24.95.

Principles of Analytical Chemistry by Prof. Valcárcel of Córdoba University is an innovative text. As the author states in his preface, the topic is dealt with in a generic manner. His approach deals largely with the wider ramifications of chemical analysis in the modern context where robustness, traceability and validity are the ruling concepts. The book also categorises much about the science of analysis in a way which is applicable to far more than chemical analysis and is thus a radical departure from the traditional emphasis on chemical mechanisms and the derived analytical methods. Numerous examples of chemical analyses are described at a level of detail appropriate to the discussion in the main text and some full protocols are given as well as some detailed qualitative analysis schemes. Rather than teaching the detail of the chemistry, however, the examples serve to illustrate the principles of analysis and the concepts required for analytical thinking, planning and application. That is the author's stated aim, so I feel the title is somewhat misleading - "Principles of Analysis in the Chemical Context" might more properly represent the contents.

Style

It is not the intention of the author to give chapters on Spectroscopy, Electroanalytical Methods and the like. Each of the eight chapters deals with a general aspect of analytical chemistry; titles include Analytical Properties, Traceability, The Measurement Process in Chemistry, Quantitative Aspects of Analytical Chemistry and The Analytical Problem. [Learning] Objectives are given with a table of contents followed by the text, which contains numerous figures and boxes. At the end of chapter there is a set of about 50 (short) questions, some Seminar topics with outlines as to how they might run and a good set of Suggested Readings. Overall the coverage would seem to be very suitable for the aims of the book.

I am not persuaded, however, that the style of the presentation is helpful to the aims. There is no mention of a translator and so I presume Prof. Valcárcel has written directly in English. It reads very well but there are occasional places where the meaning is not clear (e.g. "... which use an analytical standard not containing the analyte." - even when read in context, this will probably puzzle inexperienced students). Additionally, he uses uncommon words for specialised meanings (e.g. expeditiousness, dubiousness, capital) without clarifying whether they are standard analytical terms or new ones that he has appropriated for the concepts. There is a glossary for these and the more common terms but no index. However, page references are given in the glossary.

More seriously, there are unhelpful aspects of the presentation which are independent of the language. I found much repetition between one chapter and another or between the main text and the boxes so that I was often unsure whether I had read a particular passage before or not, particularly when terms which had previously been defined were again explained. I also found the prolific use of emphasis (in bold type) and qualification of statements (in parenthesis) distracting. The numerous boxes provide much illustrative material but a significant number have no title and some have no reference to them in the text. The use of a full pagewidth format for the boxes breaks the flow of the main text and more or less forces the reader to consult them, which seems contrary to the purpose of boxes. There are also many figures in the text, which I am sure are very helpful when the material is presented in lectures but do not transfer well to the page. The various shapes, lines and arrows indicating relationships between keywords and concepts do not have a consistency from

Summary Review

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

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

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University of the West of England
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February 2001

Principles of Analytical Chemistry

one figure to another while some shapes are left puzzlingly blank. It is often difficult to be sure that you are drawing the right inference from the figure.

Accuracy

There are no answers given to the many questions at the end of each chapter but they are almost all descriptive and presumably can be found by referring back to the text. There is, however, a set of seminars at the end of chapter 2 consisting of numerical worked examples of the application of appropriate statistical methods. This is very welcome but I found a disturbing number of incorrect figures in the calculations – presumably due to typographical errors. An experienced reader might well recognise them as such but a student could find them baffling.

Errors

There are also typographical errors in the main text and in the boxes and figures – digits or letters omitted or misplaced; box numbers wrongly referred to and the wrong title to Annex V. For what is, on the whole, a very pleasantly produced book, this is unfortunate.

Usefulness of the book

Teachers of analysis will find much in this book that they can use to give reason to analytical procedures. It should also be a good workbook for final year students but new students will need to work at it closely with their tutors.

In spite of the reservations noted above, I would applaud the purpose of the book to show the coming of age of analytical chemistry, and analysis in general, as a science in its own right with its own concept and methodologies. Teachers, managers and practitioners of analysis will put a new dimension to their work by following it through. It is a book that should be on all their shelves and in their institution's library.

Variety in Chemistry Teaching 2001

Variety in Chemistry Teaching, now in its 10th year, provides a forum for the exchange of teaching practices, and of ideas about, the learning and teaching of chemistry at degree level.

Our students need to develop an understanding of chemical principles and an ability to apply their knowledge in unfamiliar situations. We can help them by increasing the variety of teaching methods we use. Many individuals have developed interesting ways of teaching, but have had little opportunity to discuss their ideas with others. Variety in Chemistry Teaching offers that opportunity for colleagues developing their own approaches to improvements in their teaching.

Participants are strongly encouraged to offer contributions describing teaching methods that they use and find effective. All offers of contributions are welcome. Remember, an idea that seems simple and obvious to you may not have been thought of by others. Ideas, which are still embryonic but with which authors have had limited but useful experience, are also welcome; experiences and ideas can be interesting to others even if they are not fully developed. Poster presentations and displays of computer software, videos, etc are all acceptable. A limited number of short oral contributions will be given on Tuesday morning. Those offered as a parallel session or an oral contribution must be received before 29th June.

Oral Communications

This session will consist of 10 minute papers followed by discussion. Speakers will not be allowed to exceed their allotted time. Papers will be selected from the range of abstracts offered in order to produce an interesting and balanced programme.

Parallel Sessions

In these 3 hour workshop sessions, groups of 20-30 will participate in activities designed to enhance student learning. Participants will gain direct experience of approaches to teaching which they may wish to use with their own students.

Posters and Demonstrations

Display boards for posters are 4' x 3' (120 x 90cm) and can be arranged in landscape or portrait format. Material must be attached to display boards with Velcro; you must supply your own Velcro. Participants wishing to present software displays or video displays must provide their own equipment. The bench space available for equipment is adequately supplied with power and poster boards.

Date/Venue 17-18th Sept 2001 at Lancaster University

Contact: Stephen Breuer,
School of Physics and Chemistry,
Lancaster University,
LANCASTER LA1 4YB
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tel: 01524 593658 **fax:** 01524 844037

Supramolecular Chemistry: a concise introduction



Subject area

Physical science.

Description

This text introduces a relatively new, fast growing discipline covering a very wide area ranging from materials science to biological chemistry.

Authors

Jonathan W. Steed and Jerry L. Atwood.

Publishers/Suppliers

J. Wiley and Sons, Inc.
(www.wiley.co.uk)

Date/Edition

2000.

ISBN

0-471-98791-3.

Level

Undergraduate, research.

Price

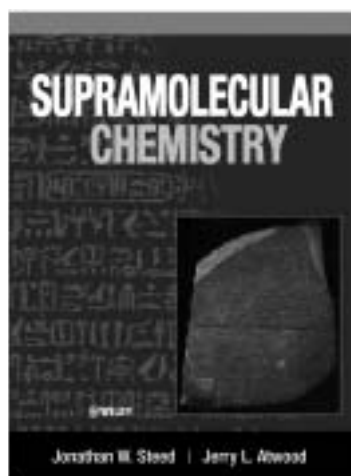
£29.95.

Supramolecular chemistry is a relatively new, fast growing discipline covering a very wide area ranging from materials science to biological chemistry. Since an introductory text is lacking in this area, this is a timely publication which would appeal to new students in the field as well as to experienced researchers wishing to venture into this field. The book assumes little prior knowledge, providing the theoretical background needed for each topic and developing this in the context of supramolecular chemistry. A book of this kind could be written in many different ways, and to a certain extent, the organisation and choice of topics represents the interests of the authors. However, the choice of topics is quite representative of a very diverse field and provides a good overview of the subject. In keeping with a relatively young field, most of the work covered is from the past 15 to 20 years, and is often very recent. This is exemplified by a topical paragraph covering the mode of action of Viagra. In line with many modern books, this text has a dedicated website which also contains links to other sites of interest to supramolecular chemists. This site also contains coloured 3-dimensional, rotating views of some of the crystal structure illustrations in the text which are generally an improvement over the black and white images. In general however, the illustrations in the text are good and contribute significantly to the clarity of the overall presentation.

Summary Review

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

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



A strong point of the book is the carefully structured development of topics such as macromolecular chemistry, and crystal engineering from the basic undergraduate concepts of chelate chemistry and hydrogen bonding. This enables students to build on their basic knowledge and readily assimilate new knowledge of current research interest. Some of the material is presented in considerable depth, probably reflecting the personal interests of the authors. One example, is crystallography where incommensurate structures are introduced. However, these more advanced sections can be ignored without distracting from the continuity and clarity of the text. Supramolecular biochemistry

is also represented although the coverage is rather sparse. This is an area which in my opinion is significantly under-represented in the book since biological structures represent the ultimate in supramolecular order. However, the chemistry behind many biological processes such as photosynthesis, oxygen transport and some examples of biochemical self-assembly are explored. Molecular devices are also discussed, but rather briefly for a very important and topical subject. Finally, the last short chapter on order in liquids contrasts the behaviour of surfactants and liquid crystals with the short-range order found in crystalline solids. Texts for further reading and references to recent research papers are found at the end of each chapter together with a selection of problems.

In spite of some shortcomings mentioned above, I can thoroughly recommend this book as an introductory text to the subject. It is probably best suited to postgraduate students just beginning research in the area, but undergraduates and more experienced workers might also benefit from this text. One minor problem is that some page listings in the contents list are incorrect.

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March 2001

The Chemistry of Pollution



Subject area

Chemistry.

Description

A reference book covering the important processes involved in pollution.

Authors

Günter Fellenberg (translated by Alan Wier).

Publishers/Suppliers

J. Wiley and Sons, Inc.
(www.wiley.co.uk)

Date/Edition

2000/3rd Edition.

ISBN

0-471-98088-9.

Level

Undergraduate.

Price

£27.50.

Martin Preston
Department of Earth Sciences
University of Liverpool
Oceanography Laboratories
Liverpool L69 7ZL
December 2000

The impact of human beings on their surroundings is becoming one of the major focal points of the 21st century. Of equal significance are the effects that damaged environments have on human populations and in particular the recognition (now almost a cliché) that pollution does not recognise international borders. Within the spectrum of commonly recognised problems such as acid rain, ozone 'holes', metal contamination and industrial waste or by-products chemical behaviour clearly plays a pivotal role.

This book is intended to provide students of chemistry and anyone else with an interest in the chemical principles of pollution, with a reference book covering the important processes involved. In practice the text is easily readable and is suitable for first year undergraduates and is certainly within the reach of interested A-level (or should that now be A/S, A2?) students. A cautionary supplement to that remark is that this book has been translated from German and whilst that has been quite successfully done there are quite a few places where one can stub a linguistic toe. For example "saltpetrous acid" (p51) is hardly a term in common usage, Biological Oxygen Demand is referred to as BNO rather than BOD (p68), acetates (rather than -oates) have the German spelling (acetat), dose is described as "dosis" (Figure 8.2). The origins of the rather whimsically termed "thin acids" (e.g. p89) seem to be in the word "dünn" meaning dilute. There are many other examples. The limited literature selection is, with only one exception, drawn from German sources and has not been translated. Given the international perspective to pollution the lack of recognition of the wider literature is particularly disappointing.

The book opens with the question "What is pollution?". This question normally pushes a mental button with me and produces an answer based around the UNESCO definitions and which starts "Pollution is....." and which goes on to describe the necessity for a causal link between human action and demonstrable harm. In this case however the author tackles the problem rather differently and relates pollution effects more to rates of environmental change (relative to evolutionary response times). This is interesting in its way but has led to rather pious statements such as "We ought to be constantly making an effort to assess all substances released as far-sightedly as possible and according to the most varied criteria". Well, one can hardly argue with that but is not the most helpful advice I have ever seen. Nor does it give the reader a clear working definition.

The bulk of the book deals with changes in the atmosphere, impairment of ground water and surface water, ground and soil pollution, generally widespread materials (Ubiquists), foodstuffs and confections, basic consumer goods and radioactivity and concludes with a very brief (half page) outlook. Some of this material is not considered much, if at all, in rival texts and is therefore quite useful. The depth of coverage of these topics is however a bit uneven with, for example, substantial considerations of atmospheric dust removal techniques and naturally occurring toxins but nothing on bioaccumulation of xenobiotics, endocrine disrupting chemicals or crude oil (a particularly glaring omission to me as someone interested in marine pollution). One or two errors have crept in. For example equations 3.3 and 3.15 don't balance.

So overall something of a 'curate's egg', good in parts. This is not a book that I feel I could use as a recommended course textbook but it certainly deserves a place on the library shelves for those interested in many of the important issues confronting the complex relationships between the chemical impacts of humans and the environment.

Summary Review

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

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

Light Speed!



Subject area

Physics.

Description

Light Speed! is an OpenGL-based program developed at M.I.T. to illustrate the effects of special relativity on the appearance of moving objects.

Authors

Richard G. Daniel, an undergraduate student of Computer Science at the Massachusetts Institute of Technology.

Suppliers/Distributors

Massachusetts Institute of Technology.
(fox.mit.edu/skunk/soft/lightspeed/)

Date/Version

1999/Version 1.2.

Level

A-level, undergraduate.

Type of Package

Computer assisted learning.

Price

Free.

Hardware required

Unix/Linux workstation running X Window System, a fast CPU, OpenGL or Mesa3D libraries.

Software required

Unix and GTK+. (www.gtk.org/)

Dr Jim S. Al-Khalili
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University of Surrey
Guildford
Surrey GU2 7XH
March 2001

Light Speed! is a simulator program developed at M.I.T. by an undergraduate student of Computer Science. It very simply demonstrates the effects of special relativity on the appearance of moving objects. When an object accelerates past a few million metres per second, these effects begin to grow noticeable, becoming more and more pronounced as it approaches c : the ultimate speed limit of 299,792,458 m/s. These relativistic effects are view-point-dependent, and include shifts in length, object hue, brightness and shape.

The package illustrates four different relativistic effects:

1. The Lorentz contraction - causes the object to appear shorter
2. The Doppler red/blue shift - alters the hues of colour observed
3. The headlight effect - brightens or darkens the object
4. Optical aberration - deforms the object in bizarre ways

Further details about the above four effects can be found on the site's web pages (<http://fox.mit.edu/skunk/soft/lightspeed/about.html>)

I teach an introductory course on relativity to first year physics undergraduates at the University of Surrey. As part of this course, I cover two of the above four relativistic effects, namely Lorentz contraction and the relativistic Doppler shift. The other two, while well-known, cannot find a place in my 15 lecture course, which also covers a little general relativity as well.

While I have not done so yet, I may well recommend this package to the students to explore on their own (after saying a few words about it). It is the sort of package with which one really needs to play around a little.

The velocity can be adjusted using a slider down the right of the window, or by typing in a value (either in m/s, or as a fraction of c).

The package runs with all four of the above relativistic effects, or any subset thereof. The object used is a geometric lattice of arbitrary size. Custom 3D models can be imported as well, and I particularly liked the Starship Enterprise, although it doesn't show the distortion effects as clearly as the basic cube lattice.

The position and heading of the camera may be interactively controlled with the mouse, or specified explicitly via numerical input. I found this quite easy to use after a little time

The simulator does have a few limitations; specifically, it makes no attempt at rendering shadows, and the lighting model it uses is not entirely accurate. These, however, are mainly a trade-off for the most important feature of the Light Speed! engine: real-time operation. With this, it is possible to explore the above effects in a fully dynamic and interactive manner.

I list below a few of its features (which I basically cut-and-pasted off its web page (after checking that, they were indeed available!)

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	*****

Light Speed!

- Real-time interactive viewing. With the click of a mouse, the camera can be moved around, allowing the viewpoint-dependent relativistic effects to be observed from any angle and position.
- 3D object importer. Interpreters for 3D Studio and LightWave 3D objects are built-in, allowing any among thousands of quality 3D models (readily available on the web) to be brought into the simulation space.
- Snapshot exporter. The camera view may at any time be saved as a PNG or TIFF file.
- Special Relativity Scene (SRS) exporter. SRS is the format used by BACKLIGHT, a specialized raytracer developed by Antony Searle also for the purpose of illustrating relativistic effects. This feature allows any scene from Light Speed! to be written to an SRS file, which can then be formally raytraced by BACKLIGHT to produce a much higher-quality image. As an added bonus, the exporter can also produce a left-eye/right-eye SRS pair, to make nifty stereograms!
- Reference geometry. Includes the all-important xyz coordinate axes!
- Independent toggles for the four relativistic effects. The overall distortion of a high-speed object is caused by four phenomena working in concert: the Lorentz contraction, the Doppler red/blue shift, the headlight effect, and optical aberration. Any subset of these may be more closely studied by switching off the others.
- Numerical camera location + target readout and input. Camera parameters may be checked and adjusted to millimetre precision, if so desired. Two input modes are supported: xyz location/target points, and xyz location with phi/theta (heading/elevation) angles.
- Switchable background colour. It is black by default, but grey and white are available, to afford better recognition of very dark objects. Also, with a white background, snapshots may be printed out without wasting toner.

On the whole I would say it is quite neat, but students will quickly become bored with it. It is a bit of a novelty really, rather than a useful teaching aid.

Physics Discipline Network Workshop VII

The Future of Physics Degrees and the latest Teaching and Learning Initiatives

We are delighted that Sir Peter Williams, who is heading the IoP's inquiry into the future of physics degrees, and Alison Holmes, from the National Coordination Team of the TQEF, have agreed to kick-start this year's workshop.

In the afternoon session we want to concentrate on the grass-roots, innovative projects that are currently being piloted within physics degree schemes. Familiar faces from previous September Workshops have agreed to present their findings this year. Dr Jim Ryder will discuss the 'Practices of Physics' project and Dr Derek Raine his 'Practising Science Practice' project – both of which are funded by the LTSN *Physical Sciences* Subject Centre.

After the break, we will look at radical new proposals for university teaching and learning: Dr Richard Turton will describe a 'minimal maths' physics degree scheme which is to be launched this year. Finally, Dr Brian Bowe will describe his experience (warts and all) of running physics courses using the currently in-vogue, 'Problem Based Learning' approach.

Our usual, superb evening meal at the University House will be preceded by a special guest speaker. This year, we have been fortunate to secure the services of Professor Russell Stannard who will be talking about the thinking that has gone into his writing of children's books on physics and his recent updating and revision of Gamow's 'Mr Tompkins' stories.

Our keynote speaker for the second day is Dr Eddie Slade who will report on the current status of the deliberations of the IoP Benchmarking Committee. Ms Maggie Boyle will describe some of the latest developments in her multi-disciplinary CONTEXT project and will no doubt be delighted if, after her presentation, delegates are inspired to create games and simulations especially for physics teaching. Prof Mike Gibbs & Dr Ashley Clarke will report on their White Rose Science Enterprise Challenge projects which seek to make students more entrepreneurial and to explore ways of commercialising new devices which have been inspired by student projects. Dr Clarke will bring up the rear with a status report on Project PHOENICS* which aims to streamline the process of finding paid industrial placements for physics students and chair the Plenary Session looking at future potential activities (and/or any last minute delegate presentation).

As usual, we shall have pro-active sessions with plenty of time for discussion and debate.

Date/Venue 13-14th Sept 2001 at University of Leeds

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Redshift 4



Subject area

Astronomy.

Description

Virtual planetarium/Astronomy information.

Authors

Project manager: Oleg Belaychouk.

Suppliers/Distributors

Focus Multimedia Ltd, The Studios, Lea Hall Enterprise Park, Rugeley, Staffs, WS15 1LH. (www.redshift.maris.com)

Date/Version

November 2000.

Level

GCSE and above.

Type of Package

Simulation, teaching aid.

Price

£19.99 or cheaper.

Hardware required

PC, Pentium II, 350MHz, 64MB, 4x CD-ROM, sound card.

Software required

Windows 95 or later, QuickTime video player.

John Lucey
Department of Physics
University of Durham
Science Labs
Durham
DH1 3LE
April 2001

There are many good planetarium-type/sky simulation software packages that are currently available. All allow a virtual view of the celestial sphere, including the Sun, Moon, planets and bright stars, to be shown for any given time and any given position on the Earth's surface. Each offer a variety of different additional features. For example, some provide the ability to directly control modern amateur telescopes like those in the Meade LX200 series (<http://www.meade.com/>) while others offer access to the latest on-line catalogues and the Digital Sky Survey (<http://stdatu.stsci.edu/dss/>). In my university teaching I've used several of these packages and without doubt they are an excellent cheap tool to illustrate what can be seen when in the night sky.

The Focus Multimedia (<http://www.focusmm.co.uk/>) RedShift 4 CD-ROM set is promoted as the "definitive Desktop Planetarium" and "has been designed to make knowledge of the heavens available to the beginner, amateur and professional astronomer alike". As well as the usual planetarium features, Redshift 4 has a sky diary, a copy of the Penguin astronomy dictionary, a photo gallery of 425 images (fig 1) and ten short video clip "lectures". As well as illustrating the night sky as seen from any location on the Earth, it also allows the night sky to be viewed from "anywhere in the Solar System from 4700BC to 9999AD". The advertising material boldly claims it is packed with scientifically accurate information. Apparently it has won numerous awards.

After spending a few evenings exploring Redshift 4 my overall impression is not favourable. In particular, I found the interface very clumsy and by far the worst of five alternative planetarium programs that I have recently used. On my computer system, that is probably not atypical, it crashed on several occasions. One frustrating aspect is that when the program is undertaking a long calculation, e.g. when the positions of a large number of asteroids is requested, no hour-glass icon is displayed and the screen freezes. This gives the distinct impression that the program has crashed.

In calculating the positions of objects, Redshift 4 claims unprecedented levels of positional accuracy, i.e. planetary positions to one tenth of arcsecond and Hipparcos stars to one thousand of arcsecond. However, when positions are listed in the pop-up windows they are only given to the nearest 15 arcsec in right ascension and one arcsec in declination. While Redshift 4 boasts that it can provide orbital positions for over 1,700 comets no information is given about which are currently bright enough to be seen. In the largest telescopes only about 50 of these will be bright enough to be detected at any given date. In order to assess the reliability of the data provided I examined a few objects that our students have recently been observing. This randomly chosen sample yielded a surprisingly large number of errors. While it is well known that RR Lyrae stars have a constant absolute magnitude of about 0.5, SW And and RR Gem are listed with the absolute magnitudes of -7.10 and 5.416 respectively! Clicking on M31, the Andromeda galaxy, yielded a panel that gave the distance as blank. Edwin Hubble would be very disappointed. The program also fails to provide direct hypertext links from objects in the planetarium section to the program's astronomy dictionary section. The search facilities for particular objects are limited.

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	**

Redshift 4

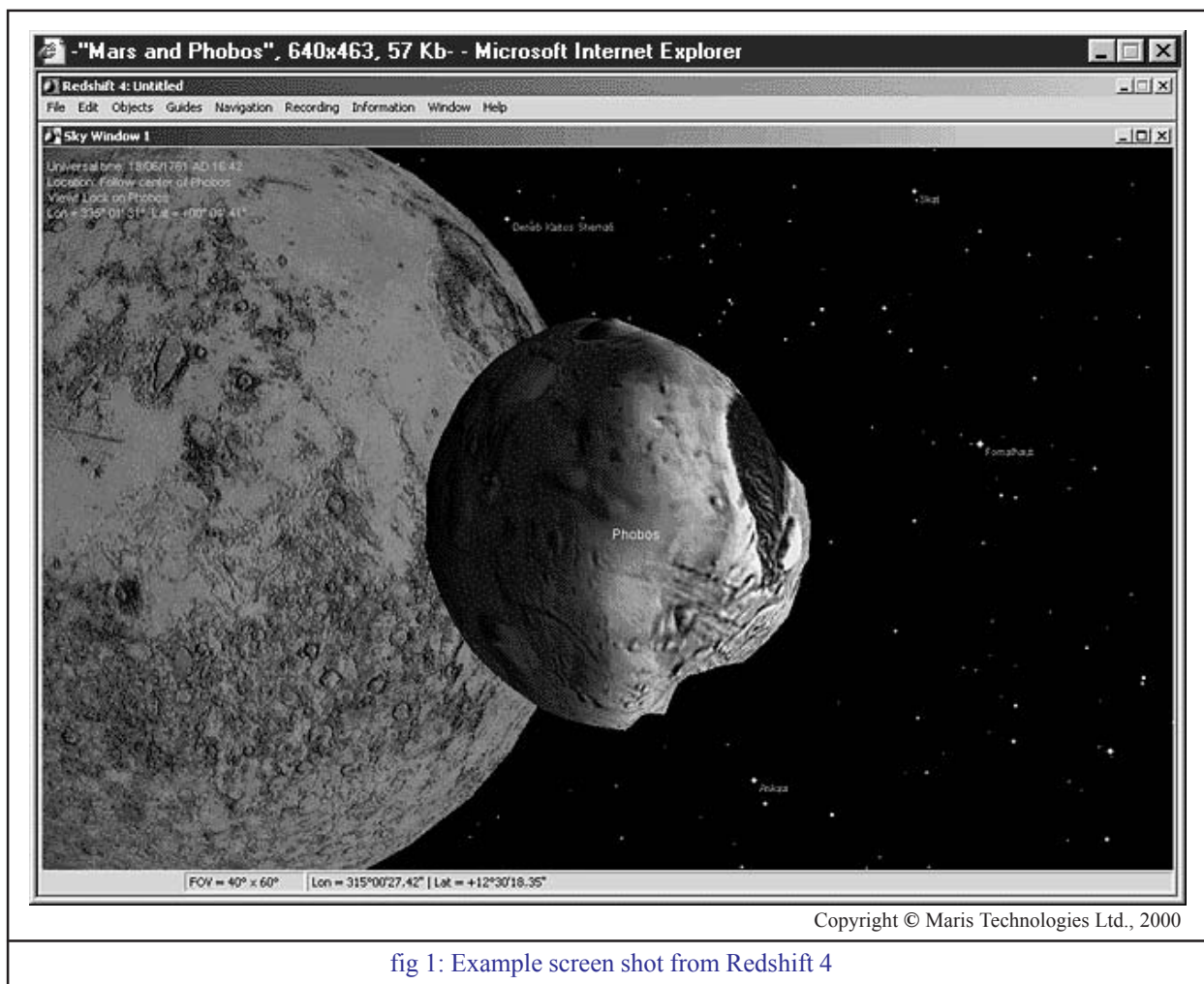


fig 1: Example screen shot from Redshift 4

There were some aspects of the package I liked, e.g. Jacqueline Mitton's hyperlinked Dictionary of Astronomy. The sky diary is a very worthwhile feature and the support web pages (<http://www.redshift.maris.com/>) are reasonably up to date and provide the latest orbital elements for new comets and asteroids.

Despite my reservations, Redshift 4 does appear to have a loyal following and other more favourable reviews can be found elsewhere, e.g. <http://www.amazon.co.uk>. These in general are very positive, e.g. "Amazing program-amazing price", "a real treasure trove of information and an absolute bargain". However, from the educational point of view, while Redshift 4 promises much, the inaccuracies and unuser-friendly interface are disappointing.

Thirty years ago budding young astronomers had a plastic planisphere disk to aid the identification of objects in the night sky. Ten years ago saw the rise in the planetarium/general astronomy information software packages. Today many aspects of such packages can now be found directly on the web. The following four sites are highly recommended:

Chris Pleat's "Heavens-Above"
(<http://www.heavens-above.com/>);

Bill Arnett's "The Nine Planets"
(<http://www.nineplanets.org/>);

Sten Odenwald's "Ask the Astronomer" site
(<http://itss.raytheon.com/cafe/qadir/qanda.html>);

SEDS's "Messier" site
(<http://www.seds.org/messier/>).

Most teachers of astronomy will probably find that these sites and others will cover most of their requirements. If these prove insufficient, 16 popular planetarium/sky simulation programmes are linked from IAU's "Minor Planet Centre" page (<http://cfa-www.harvard.edu/iau/Ephemerides/SoftwareEls.html>).

Visit our web site...

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

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