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*Reviewed in this issue...*

4 software packages

2 web sites

10 books



# Physical Sciences Educational Reviews



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

Department of Chemistry  
University of Hull  
Hull  
HU6 7RX

Phone: 01482 465418/465453  
Fax: 01482 465418  
Email: [ltsn-psc@hull.ac.uk](mailto:ltsn-psc@hull.ac.uk)  
Web: [www.physsci.ltsn.ac.uk](http://www.physsci.ltsn.ac.uk)

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*The journal of the LTSN Physical Sciences Subject Centre*

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# Physical Sciences Educational Reviews



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Support Network  
**Physical Sciences**

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

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

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

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## Editor

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

## Editorial

Welcome to this the fifth issue of Physical Sciences Educational Reviews, the journal of the LTSN Physical Sciences Centre. This edition has a variety of reviews including some of general interest, notably the series of booklets on Assessment published by the LTSN Generic Centre. There are also three reviews of materials from the Chemistry Video Consortium (one of the original Teaching and Learning Technology projects) and several books plus some web sites and software.

We are always keen to receive suggestions for resources to review, particularly those from the physics and astronomy area. If you have such resources or can point us to sources of materials then please contact the editor.

Roger Gladwin  
Editor

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## Organic Chemistry OnLine



**Subject area**  
Chemistry.

**Description**  
An Interactive Workshop for Undergraduate Organic Chemistry.

**Authors**  
Paul R. Young.

**Last updated**  
2002.

**Level**  
Undergraduate.

**Plugins required**  
Acrobat, Chime.

**Other features used**  
Java, Javascript.

**Reviewed using**  
RM PC with Intel Celeron 400MHz processor and 64 MB RAM.

**Web address**  
<http://homework.chem.uic.edu/IEMDL.HTM>

David B. Adams  
Institute of Pharmacy, Chemistry  
and Biomedical Sciences  
School of Health, Natural and Social  
Sciences  
University of Sunderland  
Fleming Building  
Sunderland SR1 3SD  
November 2002

This web site, Organic Chemistry OnLine, is exactly what it claims to be: An Interactive Workshop for Undergraduate Organic Chemistry. It provides an excellent resource for first or second year undergraduate organic chemistry courses. There are four links from the Organic Chemistry Online homepage. Those linking to the chemistry content are to an online tutorial and to the Organic Home Page. The other links are to the homepage of the Chemistry Department of the University of Illinois at Chicago and to the Brooks/Cole Publishing Company from whom a CDROM version of this web site may be purchased with an accompanying workbook<sup>1</sup>.

### 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	****

The online tutorial has a comprehensive index which links directly to the topic selected giving interactive problems or concise reviews of the topic and a library containing 1H NMR spectra, IUPAC names, boiling/melting points, degree of unsaturation and structures for fifty typical organic compounds. There are tutorials on the topics of "Structure and Bonding", "Spectroscopy" (IR, NMR, Mass), "Stereochemistry", and "Functional Group Nomenclature and Reactions". Each tutorial contains concise reviews of the topic and key concepts. These are suitable for revision but would not be a replacement for a text book or lecture. The subsequent interactive problems with immediate feedback, however, provide much more interactivity than a text book and the frequent use of Chime to display three dimensional structures is particularly effective. However, the structures for the stereochemical problems are displayed as stick models by default sometimes making it difficult to determine whether the lowest priority group is behind or actually in front. Right clicking and selecting the ball and stick display removes this difficulty. Some longer quizzes which can be submitted for online marking are also available.

The Organic Home Page contains mainly PDF files of sample exam papers containing short answer and multiple choice questions (including versions with answers), lecture handouts and lecture slides related to two organic chemistry courses. The listings of answers to multiple choice questions do not all restate the question and will only have meaning to those with access to the original test or textbook. In addition there is a Java-based SMILES Generator<sup>2</sup> which uses a simple and intuitive structure drawing routine to create the structure for which the SMILES string<sup>3,4</sup> is required.

Navigation is simple with Table of Contents, Index, Go Back and Return buttons being provided as appropriate. Response is usually very rapid although there was a short period of time when the server became unavailable. The interactivity of the tutorial and its use of Chime make this an excellent supplement to a text book while the sample exam papers would provide a good source of self testing and revision for any undergraduate student of organic chemistry (the versions without the answers are printable). The PDF files of lecture related material, while containing much that is interesting and useful, are clearly intended as supplementary material to the lectures and are not in a format which would make other students want to use them.

The academic content is high and covers many key concepts. All the material is relevant to undergraduate organic chemistry but it is quite likely

*Continued on page 3*

## Organic Chemistry OnLine

Organic Chemistry On-Line - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Background Reload Table of Contents **Organic Chemistry OnLine**

### Mass Spectrometry - Background

In mass spectrometry, a substance is bombarded with an electron beam having sufficient energy to fragment the molecule. The positive fragments which are produced (cations and radical cations) are accelerated in a vacuum through a magnetic field and are sorted on the basis of mass-to-charge ratio. Since the bulk of the ions produced in the mass spectrometer carry a unit positive charge, the value  $m/e$  is equivalent to the molecular weight of the fragment. The analysis of mass spectroscopy information involves the re-assembling of fragments, working backwards to generate the original molecule. A schematic representation of a mass spectrometer is shown below:

A very low concentration of sample molecules is allowed to leak into the ionization chamber (which is under a very

Done Internet

fig 1: Example screen from Organic Chemistry Online

*Continued from page 2*

that different sections of the material covered would be taught in different years of a degree programme. Errors are very difficult to find in this web site although the labelling of the intensity axes of IR spectra (clearly recorded in transmittance) as absorbance was rather irritating. There is much material in this web site which students could use for independent study and much which a university teacher could find useful, although most is clearly labelled as copyright of either Brooks/Cole or the author.

#### References

1. [http://www.brookscole.com/chemistry\\_d/](http://www.brookscole.com/chemistry_d/)
2. *The JMolecularEditor*© Novartis Crop Protection AG, Peter Ertl, (peter.ertl@pharma.Novartis.com)
3. *SMILES 1. Introduction and Encoding Rules* Weininger D., J. Chem. Inf. Comput. Sci. 1988, 28, 31
4. SMILES Home Page. <http://www.daylight.com/dayhtml/smiles/>

## The science of boiling an egg



### Subject area

General science.

### Description

Presents science through the concept of boiling an egg.

### Authors

Charles D. H. Williams.

### Last updated

No data.

### Level

General.

### Plugins required

Acrobat.

### Other features used

None.

### Reviewed using

PC Pentium III with 128MB RAM and LAN network connection.

### Web address

<http://newton.ex.ac.uk/teaching/CDHW/egg>

All the content is presented on one page so is easily and quickly accessible. Although the content does extend for about 8 full screen lengths it is easily printed and each section is brief, with a hyperlinked table of contents at the top making navigation to different sections quick.

In terms of intended use, it is clearly stated that the content was produced as a consequence of a New Scientist letter asking about deriving a formula to soft boil an egg. Therefore, in a similar vein to the New Scientist the tone of writing is that of a semi-informal reply with the apparent intention of expanding the reader's general knowledge into the science of boiling an egg.

Considering this approach therefore, I found the content to be at times cursory, yet at other times quite technical. The foundation of the formula for boiling an egg is based on several assumptions about an egg, with the derivation of the formula given as a separately linked PDF (portable document format) file. Having read this file I found the content far too mathematical, with several terms not being explained appropriately.

When explaining the factors that must be taken into account for the time taken to boil an egg a number of generalisations were made, partly from acknowledged second hand information. This meant that I found some statements misleading and felt that some explanations were downright unjustified from a scientific point of view.

In terms of teaching content, there were really two ways of considering this web site, one from a mathematical point of view and one from the anatomy and biochemistry of the make up of an egg.

Taking the mathematics first, the derived formula was easy enough to follow and the graphical representations were clear and concise for a general scientist to understand. However, the accompanying PDF file explaining the derivation was poor. To understand it you would have had to have had a good background understanding of the mathematics involved in thermal dynamics as many of the terms and explanations were not explained but were assumed as prior knowledge. This level of detail did not fit with the more general approach taken with other parts of the content.

When discussing the composition of the egg, fairly clear explanations were given without getting too technical. Therefore the web site gave an interesting overview of the makeup of an egg without the reader having to know too much biology. Interestingly, there was no reference to actually how eggs are boiled and turn from a semi-solid gel into a solid egg white. The term 'denaturation', which describes this process of the egg protein turning into a solid, was not mentioned in the content.

In terms of teaching it is difficult to see what purpose this web site would serve. The target audience is unclear as there is a mixture of maths and some rudimentary biology. The derivation of the formula sheet is very technical and would require detailed prior knowledge of thermodynamics.

### 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	**

Paul Chin  
LTSN Physical Sciences  
Department of Chemistry  
University of Hull  
Hull HU6 7RX  
November 2002

*Continued on page 5*

## The science of boiling an egg

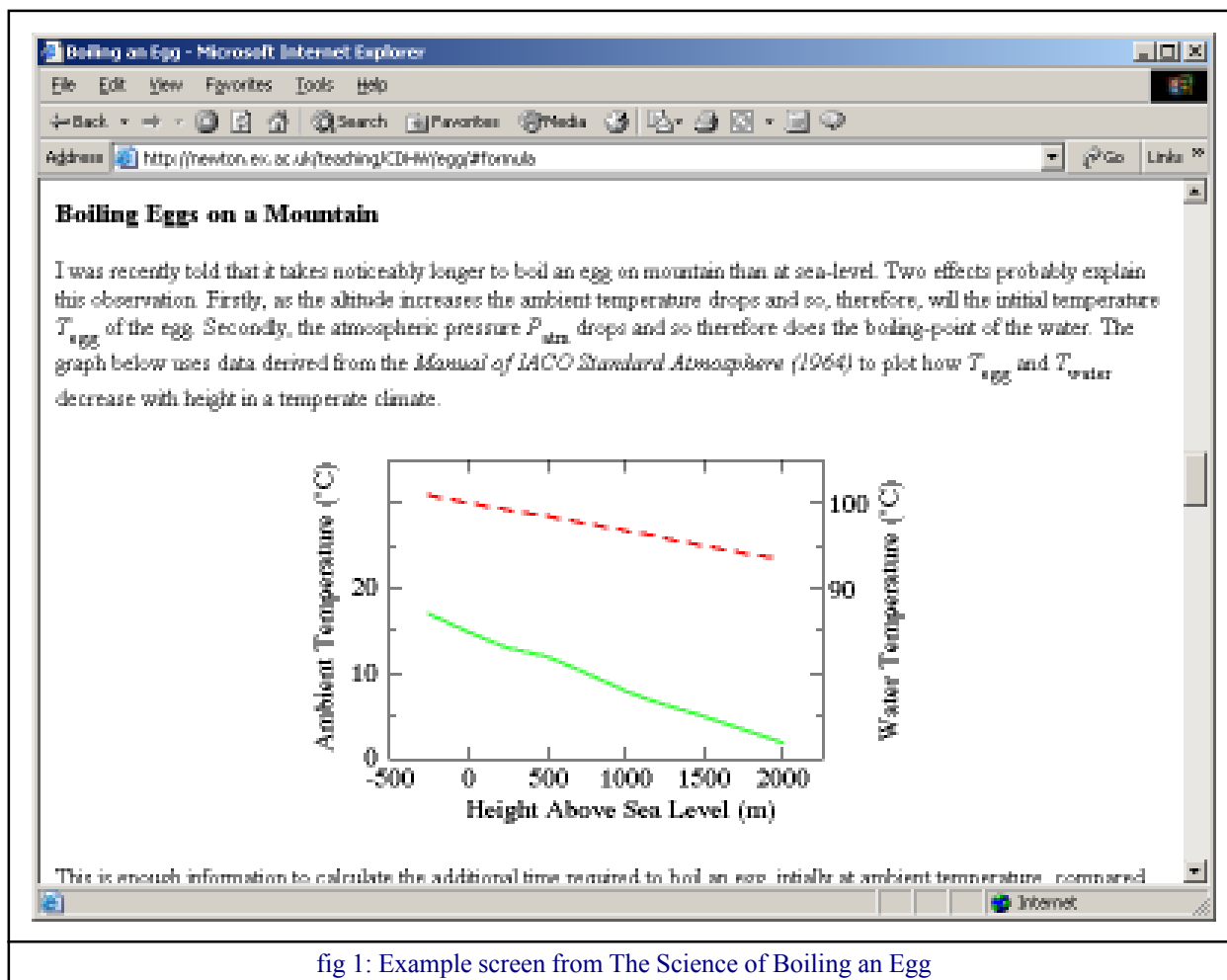


fig 1: Example screen from The Science of Boiling an Egg

*Continued from page 4*

The content also trails off into light hearted discussion about how to boil an egg in general. It would be difficult therefore, to recommend this particular site to any particular group of students or teaching staff with a clear scientific teaching aim.

In terms of a web site that introduces the reader to the science of boiling an egg the content does actually raise a lot of relevant points which must be taken into ac-

count. Unfortunately these points are not singled out specifically, such as the issues of mathematical equations, heat capacities of different materials or biology of the egg itself.

Therefore, as a scientific resource this web site is a very good general knowledge resource for the science of boiling an egg but is unclear and limited in its capacity as a teaching resource.

## Assessment Series



### Subject area

General.

### Description

This series takes the form of twelve booklets, each of about 24 pages in length, dealing with a range of aspects of assessment.

### Authors

Various - whole collection edited and produced by LTSN Generic Centre ([www.ltsn.ac.uk/genericcentre/index.asp](http://www.ltsn.ac.uk/genericcentre/index.asp)).

### Publishers/Suppliers

LTSN, The Network Centre, Innovation Close, York Science Park, Heslington, York YO10 5ZF.

### Date/Edition

November 2001.

### ISBN

1-904190-02-2, -10-3, -00-6, -03-0, -11-1, -04-9, -05-7, -09-X, -06-5, -12-X, -07-3, -08-1.

### Level

From undergraduate to senior managers.

### Price

£75 for set of 12 booklets (individual booklets can be downloaded from the LTSN Generic Centre at [www.ltsn.ac.uk/genericcentre/index.asp?docid=17219](http://www.ltsn.ac.uk/genericcentre/index.asp?docid=17219)).

Alex Johnstone  
Formerly of  
Centre for Science Education  
Kelvin Building  
University of Glasgow  
Glasgow G12 8QQ  
September 2002

### General overview

This series takes the form of twelve well produced and initially attractive booklets, each of about 24 pages in length, dealing with a range of aspects of assessment. Some are aimed at a specific readership such as Senior Managers, Heads of Department, Lecturers and Students. Others attempt to address specific aspects and contexts of Assessment: Portfolios, Plagiarism and the way of dealing with the problems of assessing the work of Disabled Students.

Each booklet attempts to be 'free standing' to some extent, but this inevitably leads to considerable overlap. *Validity* and *reliability* are treated over and over again as are other topics. This may be no bad thing, but it tempts the reader to skip these sections when they appear in later booklets and so miss subtle differences which apply in different contexts. A possible weakness of a package like this is that some readers will look only at the booklets which, at a glance, appear to affect them and not realise their ignorance of the wealth of information available in the other booklets which is also important for them. Assessment is probably the worst understood part of the whole teaching and learning process in Higher Education and so all of the booklets are important for everybody; managers, heads of department, teachers and students alike.

Each booklet needs some comment to help the reader in his approach to them.

#### 1. Assessment: a Guide for Senior Managers.

I found this a very difficult booklet to penetrate because of a severe dose of linguistic indigestion. The language is complex, opaque and pompous and I was tempted to abandon it after the first page. A quotation may serve to illustrate the point. "Its functioning is multi-centred and hence implies a collaborative approach if it is to be maximally successful". It is a pity that the good advice it contains will go unheeded by frustrated readers.

#### 2. Assessment: a Guide for Heads of Department.

This booklet is full of good general advice about what to do, but lacks any help in how to do it. It would have been more useful to use case studies to amplify the general thrust of the booklet.

#### 3. Assessment: a Guide for Lecturers.

This is a good booklet filled with common sense and well presented. It lays bare some of the nonsense of assessment practice with sharp statements like, "A common error is to use an assessment tool for one set of purposes and then assume that the results from it are appropriate for other purposes". "Assessment shapes learning so if you want to change learning, then change the assessment method". This booklet is strongly recommended for all readers.

#### 4. Assessment: a Guide for Students.

This is the pick of the bunch. It is well written in clear and acceptable language giving advice to students which they would accept as eminently reasonable and non-paternalistic. It is well set out in digestible and visually attractive sections which students will appreciate. I wish this author had written more of the booklets.

### Summary Review

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

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

*Continued on page 7*

## Assessment Series

*Continued from page 6*

### 5. A Briefing on Key Skills in Higher Education.

The title is not very informative and the author spends a lot of time trying to explain what key skills are. In the past they were called transferable skills, but that begged the question if they were really transferable. Key skills give a bland enough flavour to the idea. This booklet does not seem to get down to the problem of how, in practice, to assess these skills. From page 12 onwards there is an attempt to offer guidelines for how this might be done followed by a few feeble case studies, but it remains woolly and unconvincing.

### 6. A Briefing on Assessment of Portfolios.

This is a brave attempt to open up the topic of the use of portfolios and their assessment. This is an area which needs much more research before any semblance of robust assessment methods can be achieved.

### 7. A briefing on Key Concepts.

This is also an uninformative title, but the content of this booklet deals with key assessment concepts and deals with them well. Most of it is devoted to the large themes of assessment: Formative and Summative, Norm Referenced and Criterion Referenced Assessment, Validity and Reliability in assessment. The author sets out the normally accepted meaning of these terms and then applies a dose of healthy scepticism to each. The result is to let the reader see that it is not all cut and dried and that the concepts run into each other and inform each other. The ideas of validity are given their rightful place above those of reliability. If a measure is not valid, it can still be reliable; a fact too easily overlooked. This is a highly recommended booklet.

### 8. A Briefing on Assessing Disabled Students.

The booklet devotes the first eight pages to clearing the ground about what constitutes disablement before any attempt is made to address assessment. It is very sympathetically written and should be compulsory reading for all who organise assessment. So many things can be overlooked by the administration in making provision for disabled students.

### 9. A Briefing on Self, Peer and Group Assessment.

This is a tricky area and the author has made a valiant attempt to offer practical suggestions for improving the potential for a more general acceptance of these forms of learning and assessment. It is well presented in clear language.

### 10. A Briefing on Plagiarism.

This booklet does not fit too well with the others in the pack. Most of it is devoted to a series of definitions of plagiarism and makes some suggestions about how students should be made aware of it.

### 11. A Briefing on Work-Based Learning.

This booklet reads as if it were written for the cognoscenti rather than for those who might be coming to grips with this form of learning. The language is rather technical and turgid. However, there are very good and helpful ideas to be found in it. Assessment does not figure prominently in it.

### 12. A Briefing on Assessment of Large Groups.

The best part of this booklet is contained within the six case studies of how to reduce the load of assessment on students and teachers without damaging or debasing the assessment itself. It makes good reading for all hard pressed teachers.

## Conclusions

The pack of twelve booklets is quite expensive at £75, and readers might be inclined to select from the pack (if a lesser price could be negotiated or by downloading) to the detriment of their own education.

The pack represents much thought and expertise culled from several experienced practitioners and researchers which should be of value to those beginning the assessment process as well as to those who have been in the business for some time and need to reflect on their normal practices.



## Computational Methods in Physics, Chemistry and Biology - An Introduction

### Subject area

General science.

### Description

The main subject of the book is the introduction to Computational Methods in Physics, Chemistry and Biology. It also consists of a revision of fundamental ideas of physics and especially of classical mechanics. The book is developed for undergraduate courses of computational physics but also for undergraduate courses of computational chemistry and of computational biology. It can be used also as a refresher for graduate students of computational sciences.

### Authors

Paul Harrison.

### Publishers/Suppliers

John Wiley & Sons, Inc. John Wiley and Sons, Ltd. (www.wiley.co.uk).

### Date/Edition

2001/1<sup>st</sup> Edition.

### ISBN

0-471-49563-8.

### Level

Undergraduate.

### Price

£24.95.

This is an excellent book for undergraduate courses of Computational Sciences.

The book is divided into eight chapters.

In the First Chapter an introduction to the numerical solution of the Schrodinger equation is presented. More specifically a short description of particles and waves is introduced. The analytical solution of the Schrodinger equation is also presented and a description of the shooting technique is obtained. Initial conditions are given and computational implementation and application to parabolic potentials are presented. The technique for improvement of energy eigenvalues is presented and further tests are also included. Finally a description for the application to the three dimensional potentials and an application to the hydrogen atom are presented.

The Second Chapter presents an introduction to approximate methods with an introduction to the perturbation theory and the variational method. Finally applications to hydrogen atoms and biased quantum wells are also presented.

In the Third Chapter an introduction to matrix methods is described. Computational implementation for quantum wells is presented and convergence tests are obtained. Finally an introduction to the solution of the Schrodinger equation in several dimensions and to the degenerate perturbation theory is presented.

The Fourth Chapter covers deterministic simulations (Complex time dependent systems, classical mechanics and space rockets, simulation of launch trajectory, verification of computational parameters, fun with simulation, diffusion).

In the Fifth Chapter stochastic simulations are described (stochastic or Monte Carlo simulations, random numbers, Monte Carlo simulations of electron scattering, several tests, simulation of three-level systems, changing probabilities and Pauli exclusion).

An introduction to percolation theory is presented in the Sixth Chapter .

In the Seventh Chapter an introduction to evolutionary methods is presented (Genetic algorithms, the Fitness function, Monte Carlo generation of Genomes, reproduction of natural selection, implementation of genetic algorithm, mutation).

The final chapter presents an introduction to Molecular Dynamics (Modelling molecules and crystals, atom-atom interactions and interaction potentials, simulation of atomic ensembles, computational implementation, initial simulations and convergence tests, larger ensembles and reproducing nature, non-spherical interaction potentials and organic molecules).

### Summary Review

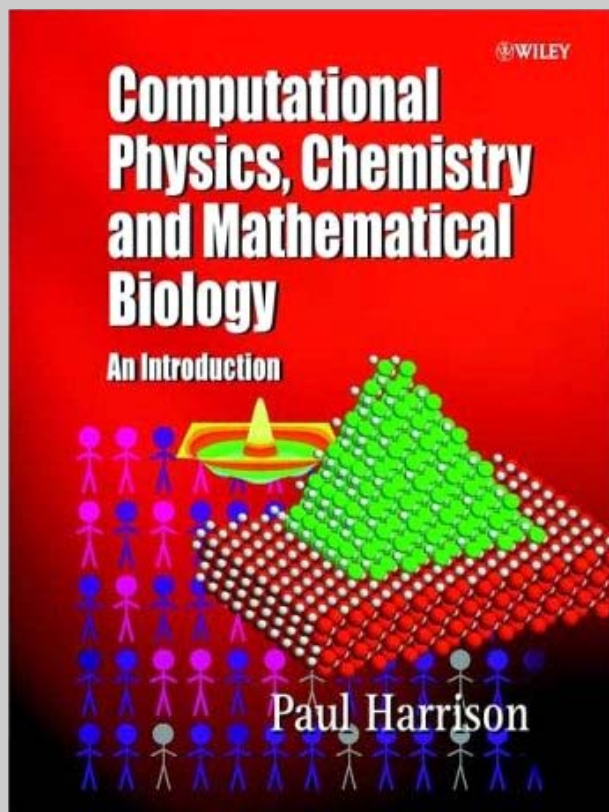
range: \* very poor to \*\*\*\*\* excellent

<b>Academic content</b>	*****
<b>Usefulness to student</b>	*****
<b>Usefulness to teacher</b>	****
<b>Meets objectives</b>	****
<b>Accuracy</b>	****

Theodore E. Simos  
26 Menelaou Street  
Amfithea - Paleon Faliron  
GR-175 64 Athens  
GREECE  
October 2002

*Continued on page 9*

## Computational Methods in Physics, Chemistry and Biology - An Introduction



From the publisher...

### **Computational Methods in Physics, Chemistry and Biology: An Introduction**

*Paul Harrison*

*Computational Methods in Physics, Chemistry and Biology* offers an accessible introduction to key computational techniques used within science, including quantum mechanics, dynamics, evolutionary methods and molecular dynamics. Assuming only a limited background in computational methods, this book provides the reader with a series of comprehensive examples, problems and practical-based tasks from the basics through to more complex ideas and techniques.

0-471-49563-8    222pp    2001    £24.95

*Continued from page 8*

There are some appendices. In Appendix A the fortran program for application of the shooting method is presented. In Appendix B,  $\nabla^2$ , in spherical polar coordinates is given. In Appendix C a comment on the computer sourcecodes is presented and finally in Appendix D, notes for tutors are presented.

As I have mentioned in the beginning the book is an excellent introduction to computational methods. The only remark I have is that it would be very useful if the sourcecodes could also be given in Matlab.



## Fundamentals of classical and statistical thermodynamics

### Subject area

General Physics.

### Description

This is a broad exploration of classical and statistical thermodynamics, extending from the very basics such as energy and temperature to a range of more involved and conceptually difficult ideas.

### Authors

Bimalendu N. Roy.

### Publishers/Suppliers

John Wiley & Sons, Inc. John Wiley and Sons, Ltd. (www.wiley.co.uk).

### Date/Edition

2002.

### ISBN

0-470-84313-6.

### Level

Undergraduate, research.

### Price

£32 (paperback), £75 (hardback).

Jonathan Goss  
School of Physics  
Stocker Road  
Exeter University  
Exeter EX4 4QL  
October 2002

Bimalendu N. Roy's "Fundamentals of classical and statistical thermodynamics" is a broad exploration of subject area, extending from the very basics such as energy and temperature to a range of more involved and conceptually difficult ideas. The author aims this book at junior undergraduates, with some sections being more appropriate for senior undergraduates and post-graduates. I feel that this aim is achieved, and the book might well serve as a core text over a full degree course, and would provide teachers with an excellent reference text.

The wide range of the book along with the style of the author leads to a book of more than 700 pages. However, within this a substantial fraction is given over to worked examples, exercises and their solutions, leading ultimately to a highly readable and useful text. Broadly speaking, the first half of the book is dedicated to classical thermodynamics followed by an account of statistical thermodynamics. The book is introduced by two chapters that set out the importance of this core area of physics, along with a handy glossary style set of definitions of terms commonly used in this field. The following chapters progress through the "four laws" of thermodynamics, at each stage clearly defining the applicability and in many areas giving concrete examples and applications. The remaining classical chapters pertain to free energy and chemical processes, and it is in the latter of these that the reader might see one of the more clear indications of application to 'real problems'. The statistical thermodynamics sections occupy slightly less space. These remaining chapters introduce in more detail statistical concepts (following brief descriptions in earlier chapters), relate them to classical thermodynamics and cover in detail concepts of phase equilibrium/changes, and heat capacities, as well as Maxwellian, Fermi-Dirac, Boltzmann and Bose-Einstein distributions.

The book generally flows logically from the basics to rather advanced ideas, with the occasional occurrence of unexplained terms that are to be visited later in the text. At the end of the book there are a number of helpful appendices, including extensive tables of enthalpies of formation, free energies and standard entropies (although there is some repetition of some values in different tables), and an appendix detailing some useful mathematical tools.

The book is well laid out with good use of diagrams and an accessible terminology. The writing style is generally very clear, although in some places the explanations are a little verbose and in others one might welcome more detail, especially in the derivations of some of the more complicated expressions where one might be left wondering how various steps are made.

A common problem with books on thermodynamics is one of the "dryness" of the necessarily mathematical description. Sometimes there are derivations of complicated quantities that are conceptually unclear. The current book does suffer to an extent of these problems, and one is sometimes left wondering what significance the derived quantities have in the general scheme of things. This is somewhat mitigated by the use of examples and exercises, and one should remember that many books in this area fail to go much beyond the mathematical concepts. These somewhat nebulous

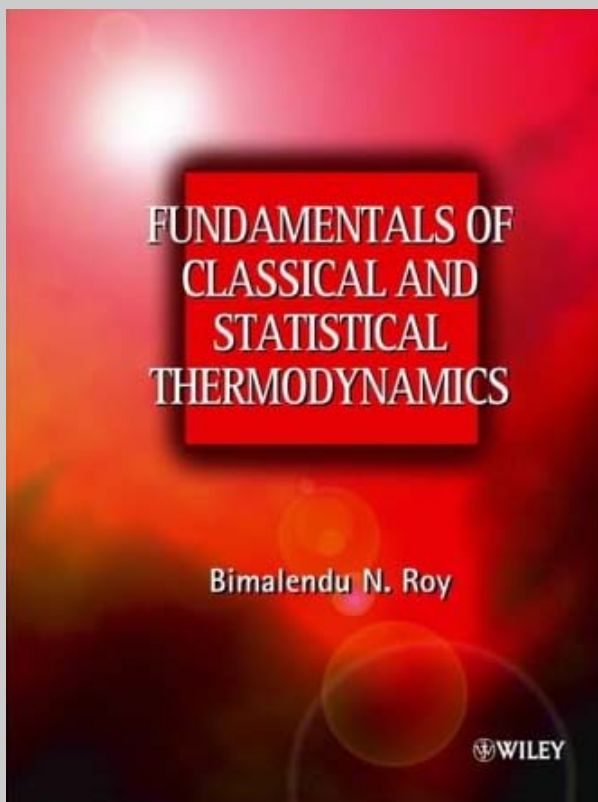
### Summary Review

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

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

*Continued on page 11*

## Fundamentals of classical and statistical thermodynamics



### From the publisher...

#### **Fundamentals of Classical and Statistical Thermodynamics**

*Bimalendu Narayan Roy*

*Fundamentals of Classical and Statistical Thermodynamics* provides a comprehensive introduction to this pivotal subject. Starting from basics, the book begins with a thorough introduction to the field, providing concise definitions and an overview of thermodynamics and its applications.

0-470-84313-6 768pp 2002 £75.00

### *Continued from page 10*

criticisms of the current book should be viewed as irritations rather than serious failings and overall this book can be described as easy to read.

To a certain extent the level of mathematics required to use this book is rather modest, with much of the derivations being simple matters of algebra. However, for anything other than a superficial use of this book one would need a fair competence in calculus, but this should be well within the scope of an undergraduate physics course, for example. Beyond the mathematical aspects, it would also be useful for a reader to have a basic knowledge of chemistry, if only to appreciate some of the more significant applications that are investigated in depth in the book.

So far as I have found, the exercises are well posed and the solutions accurate. They, along with the worked examples in the text, then form an essential supplement to the text, without which it would tend to be rather abstract.

There are a number of (presumably) typographical errors in the text, and more importantly in the mathematics, which might confuse the novice. On balance, however, the number of errors, which unfortunately seem to be inevitable in such mathematically based textbooks, is rather small and certainly not enough to form a serious criticism.

In summary “Fundamentals of classical and statistical thermodynamics” is to be recommended as a text for a range of thermodynamics courses. The content of the book is accessible and, if not a core text for a lecture course, would certainly be excellent as supplementary reading or a resource for teaching. The cost is comparable to other books in the area of thermodynamics and statistical mechanics.

## Getting the message across: key skills for scientists



### Subject area

General Science.

### Description

This is a short pocket book whose aim is to give tips and advice on how to communicate effectively and efficiently. It is targeted at science students in universities and graduates working in a variety of jobs.

### Authors

Kristy MacDonald (Ed).

### Publishers/Suppliers

Royal Society of Chemistry,  
Education Dept, Burlington House,  
Piccadilly, London W1J 0BA  
(www.rsc.org).

### Date/Edition

2001/3<sup>rd</sup> Edition.

### ISBN

none.

### Level

Undergraduate.

### Price

Free to RSC members; £1.20 to non-members.

Lowry McComb  
Department of Physics  
University of Durham  
Science Laboratories  
South Road  
Durham DH1 3LE  
October 2002

In the post-Dearing era, the development of transferable skills is becoming more important in the undergraduate curriculum. Although we probably do develop transferable skills very well in most physical sciences courses, more often than not we do not explicitly teach students how to develop these skills. While most academic staff are comfortable teaching their own subject specialism, many are not so happy developing these softer skills; a common excuse is that "I am not an expert in this area". One of the difficulties is often a lack of appropriate teaching resources; this booklet goes some way to addressing this need.

"Getting the message across" is a short (about 44 pages) pocket book whose aim is to give tips and advice on how to communicate effectively and efficiently. It is targeted at science students in universities and graduates working in a variety of jobs. It includes sections on giving an oral presentation, preparing a poster, information retrieval, note taking, keeping a laboratory notebook, writing a report, proofreading, meetings and networking, and time management. Such a short booklet can do no more than skim the surface of these techniques; however, the advice is sound and focused and should provide students (and staff) with a useful starting point.

One thing that is becoming clear is that if skills material is to be taken seriously by students, it should be well designed and professionally produced. "Getting the message across" does meet these requirements; it is well written and attractively presented with well-chosen graphics.

However, I do have a number of criticisms of the booklet; for instance, presentation packages such as PowerPoint are frequently used by students to prepare effective OHPs - these are not mentioned. There is also no discussion of how to assess the reliability of information sources on the web; this is becoming of increasing importance as students tend to accept without question anything that is on a web site. I also felt that there could have been more ideas for students to follow up when they needed more details of some of the techniques. Pointers to some of the standard print references on skills development (e.g. Northedge et al.<sup>1</sup>, Drew<sup>2</sup>) could usefully be provided.

The ultimate test must be would I use this in my own teaching? My answer here is an unequivocal yes. We use many of the skills covered here in our Level 2 physics laboratory; the low cost of this booklet means that we can seriously consider providing a copy for each of our students.

### References

1. Northedge, A., Thomas, J., Lane, A. and Peasgood, A., *The Sciences Good Study Guide* (1997) The Open University, Milton Keynes.
2. Drew, S. and Bingham, R., *The Student Skills Guide* (2001), 2nd ed. Gower, Aldershot.

*Editor's note: The 2nd Edition of this booklet was reviewed in Physical Sciences Educational Reviews no. 3 (Volume 2 Issue 2) of November 2001.*

### Summary Review

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

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

## Handbook on Information Technologies for Education and Training



### Subject area

General.

### Description

The book covers past, present and future research and applications in the area of educational technology. There are specific sections on technologies, design and development, human factors and learning settings. Examples from physics and more specifically optics are included.

### Authors

Heimo H. Adelsberger, Betty Collis and Jan M. Pawlowski (Eds.)

### Publishers/Suppliers

Springer Verlag (www.springer.de).

### Date/Edition

2002.

### ISBN

3-540-67803-4.

### Level

Research.

### Price

£91.50 (www.amazon.co.uk).

Paul Yates  
Staff Development and Training  
Hornbeam Building  
Keele University  
Keele  
Staffordshire ST5 5BG  
October 2002

This extensive work comprises 41 chapters, each written by an expert and divided into 5 sections. These are categorised as technologies, design and development lifecycle, human actors, subject areas and learning settings. The Handbook is described as “a comprehensive guide for researchers and practitioners working with educational technologies”.

Part 1 covers a range of current technologies, beginning with the role of the world wide web in education. Practitioners may on the surface find the discussion of models of implementation to be of little interest, but in fact this section is littered with references to actual examples which could be of relevance. It is good to see the current technology related to pedagogy later in the chapter, and its conclusion by considering some emerging trends such as collaborative learning and learning communities. The theme of the web is continued later in this section in a chapter on web-based 3D. A number of subject specific examples is included, for example the WebTOP system for learning optics. However, while both biochemistry and biology are each discussed in a short section, no specific mention is made of chemistry. Nevertheless, other chapters in section 1 on communication techniques, authoring systems and management systems do provide a very useful account of the current state of each of these technologies.

Issues related to design are covered in Part 2. Again, it is encouraging to find a whole chapter devoted to pedagogical design, which begins with an historical approach from which a number of implications have been drawn. The chapter finishes by considering a number of instructional design models such as student centred and assessment centred. A later chapter looks at user-interface design, providing an interesting mix of theoretical and practical material, such as the preference of sanserif fonts with a font size of 12 or larger on screen. The chapter on metadata quickly dispels any misconception that this is a simple subject. Several kinds are being developed, including that for resource discovery, content ratings, and intellectual property rights. Following this there is a detailed discussion of nine different types of metadata, including Dublin Core which represents the first attempt at creating a common standard. This is followed by an implementation case study, which serves to highlight some of the issues involved in this vast area.

Part 3 deals with an area often neglected in books on new technologies and instructional design – the people involved. A chapter on ethical considerations looks at five specific issues: student privacy, student and teacher authentication, intellectual property concerns, teacher accountability, and the human touch in teaching. In the last of these, the author concludes that while the pedagogical and technical details may be different in online and face to face classes, the underlying ethical principles should still hold. A following chapter identifies trends and implications for the professional educator regarding the use of instructional technology for education and learning. Sixteen competencies are predicted as being important for the education professional, including specialise in change and reform, meet needs of a changing student population, and break free from conventional bonds.

Specific subject areas are considered in Part 4. One chapter is devoted to physics but, of necessity, the examples cited are very selective. There is a particular emphasis on collection of data in the laboratory, by means of both

### Summary Review

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

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

*Continued on page 14*

## Handbook on Information Technologies for Education and Training



### From the publisher...

#### **Handbook on Information Technologies for Education and Training**

*Heimo H. Adelsberger, Betty Collis and Jan M. Pawlowski (Eds.)*

The handbook's goal is to enable the reader to gain a deep understanding of past, current and future research and applications in the field of educational technology. From a research perspective the reader will gain an in-depth understanding of complex theories, strategies, concepts, and methods relating to the design, development, implementation, and evaluation of educational technologies. Because it combines both the insights of comprehensive experience in the field and the vision of its emerging directions, the handbook will be a comprehensive guide for researchers and practitioners working with educational technologies.

3-540-67803-4 688pp 2002 €124.00

### *Continued from page 13*

video and computer. The author also touches upon the issue of web-based homework submission and feedback systems and the use of algebraic software such as MAPLE and Mathematica. There is consequently very little discussion of stand alone or web based packages which have a high level of physics content.

Nevertheless, chemists will feel even more neglected by this book. Chemistry is not included as one of the subjects in this part, and as noted earlier the chapter on web-based 3D also fails to include any chemical examples.

Part 5 is entitled Learning Settings. The chapter dealing with the University is very much written from a UK perspective, and anyone who was involved with TLTP will find it sobering reading. Failures to exploit new media, to integrate, and to generalise are some of the factors discussed which provide barriers to the successful implementation of IT in learning and teaching. The chapter concludes by noting that small rapid changes can be made relatively easily to individual parts of an

organisation but that these rarely impact significantly on the organisation as a whole. Other chapters in this section consider virtual corporate universities, such as the DaimlerChrysler Corporate University, the global classroom and digital libraries. A further chapter on online settings provides three specific examples of online learning systems that illustrate a number of criteria set out for such discovery learning.

Most of the chapters are well referenced with a mixture of paper and web based resources. Unfortunately a significant proportion of the latter were not accessible, somewhat reducing the book's usefulness as a source of further information.

For someone who is very involved in the production of IT materials at a high level of skill this book provides an excellent overview of the field together with best practice guidelines. However, for the subject specialist who spends less time on such development it offers far less, particularly given the lack of any chemistry and inclusion of only a small amount of physics.

## Infrared Spectroscopy - An Introduction



### Subject area

Physical Chemistry.

### Description

An introduction to the basic theory and the use of infrared spectroscopy for those experiencing the topic for the first time.

### Authors

H. Günzler & H.-U. Gremlich,  
translated by Mary-Joan Blümich.

### Publishers/Suppliers

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

### Date/Edition

2002.

### ISBN

3-527-28896-1.

### Level

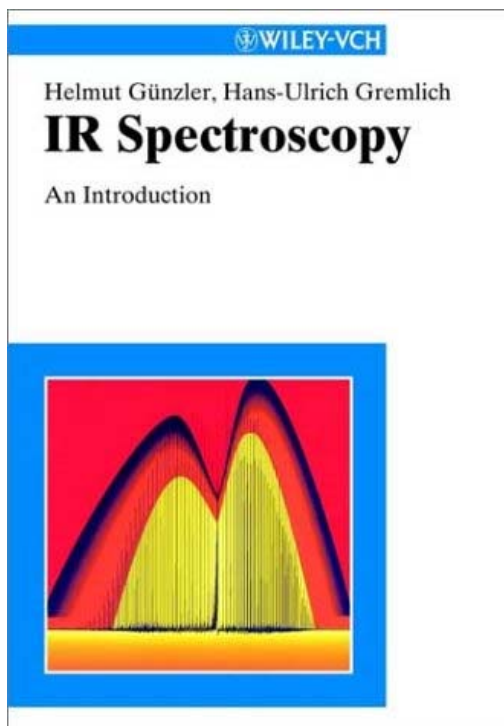
Access, undergraduate, research.

### Price

£24.95 (www.amazon.co.uk).

This book fulfils its authors' intentions to be an introduction to the basic theory and the use of infrared spectroscopy for those experiencing the topic for the first time. Such is the sweep of the subject matter that there is much to be gleaned by those who profess expertise.

Respective chapters detail theoretical aspects, instruments and their component parts, sample handling and associated techniques, qualitative and quantitative aspects, brief discussion of far infrared, near infrared and Raman spectroscopies, concluding with a discussion of reference spectra and expert systems.



### Summary Review

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

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

Each chapter is comprehensively referenced; unfortunately of the many hundreds of references fewer than fifteen relate to publications post 1995. This is a disappointment as the application of improved software packages to instruments and particularly to data handling has moved on apace in the intervening years.

Although well produced there are a number of typographical errors which could mislead initiates into the subject, e.g. [ $\nu(-C=H-)$ ] and infrared liquid cells with pathlengths of 250 - 2000 mm. There are occasional lapses in the translation but these are a minor irritation.

This is a comprehensive text giving a detailed introduction to an important area but against it must be weighed the omission of the latest advances in data handling and instrumental software. The text extensively covers infrared spectroscopy but does little to place it in relation to other techniques in terms of both qualitative and quantitative analyses.

Bill Pritchard  
Chemistry Dept  
University of Warwick  
Coventry CV4 &AL  
November 2002



## Spin Dynamics, Basics of Nuclear Magnetic Resonance



### Subject area

General science.

### Description

The book begins with a description of spin dynamics, with simple descriptions of the properties of matter, magnetic properties, and magnetic moment precessions in magnetic fields. Later chapters cover the mathematical aspects of this area.

### Authors

Malcolm H. Levitt.

### Publishers/Suppliers

John Wiley & Sons, Inc. John Wiley and Sons, Ltd. (www.wiley.co.uk).

### Date/Edition

2001/1<sup>st</sup> Edition.

### ISBN

0-471-48922-0.

### Level

Undergraduate, research.

### Price

£34.95.

Anthony H. Harker  
Department of Physics and  
Astronomy  
University College London  
Gower Street  
LONDON WC1E 6BT  
October 2002

Nuclear Magnetic Resonance (NMR) is a powerful technique which has moved outside the laboratory to have wide impact in the medical field in particular. The arrival of this book is timely in the light of current interest in quantum computing devices. Some realisations of such devices depend on nuclear spin systems, and the discussions of the dynamics of ensembles of spins and their interactions with tailored radio-frequency pulses in Malcolm Levitt's *Spin Dynamics* are directly relevant.

The book begins with a description of the phenomena, which sets the scene nicely. The starting point is elementary, with simple descriptions of the properties of matter, magnetic properties, and magnetic moment precessions in magnetic fields. The pace increases, and becomes quite mathematical, to the extent that it requires 17 pages to summarize the symbols used in the equations. Throughout, though, the author is careful to explain what the equations mean, and to give appropriate graphs and diagrams to explain the results.

There is what might be regarded as an intensive revision course on quantum mechanics, which inevitably has to deal with quite advanced topics such as the treatment of exponentials of operators, the properties of ensembles, and the time evolution of coherence. These are well explained, but perhaps the treatment is too condensed to bridge the gap between a standard undergraduate course and the applications of quantum mechanics in NMR.

The later chapters are aimed very much at the specialist. They review in considerable detail experimental techniques with such whimsical names as COSY, INADEQUATE, INEPT and NOESY. In each case there is a careful description of the pulse sequence, the resulting spectra, and the information that can be extracted from the technique. The matter of analysing the experiments is not treated in detail: there are references to computer analysis, without explaining what is entailed. This should not be regarded as a defect in this monograph. After reading the book a potential experimenter would be able to select the correct technique, and would then probably use the data processing package which came with the apparatus. Only the developer of a new experimental method would be likely to need to produce a new analysis procedure.

The diagrams are very carefully constructed and generally helpful: some of them are a little small and the lines in them rather faint as a result. A photograph of an NMR apparatus early in the book is too small for the features to be clearly visible. In view of the importance of NMR methods in medicine and biology it would be good to see these applications specifically explained. The five colour plates show brain images and protein structures, but look up 'brain' or 'magnetoencephalography' in the index and you will be referred to the colour plates, but not to any corresponding text.

The author is clearly very familiar with the NMR literature, and makes many helpful comments on the conventions used in published papers: these will be very valuable to the newcomer to the field. It may even be helpful to those with more experience to be reminded of how and why some of those conventions arose. Although NMR in the solid state, the author's own research area, is hardly touched upon, the book does cover the use of inhomogeneous magnetic fields in imaging applications, the chemical

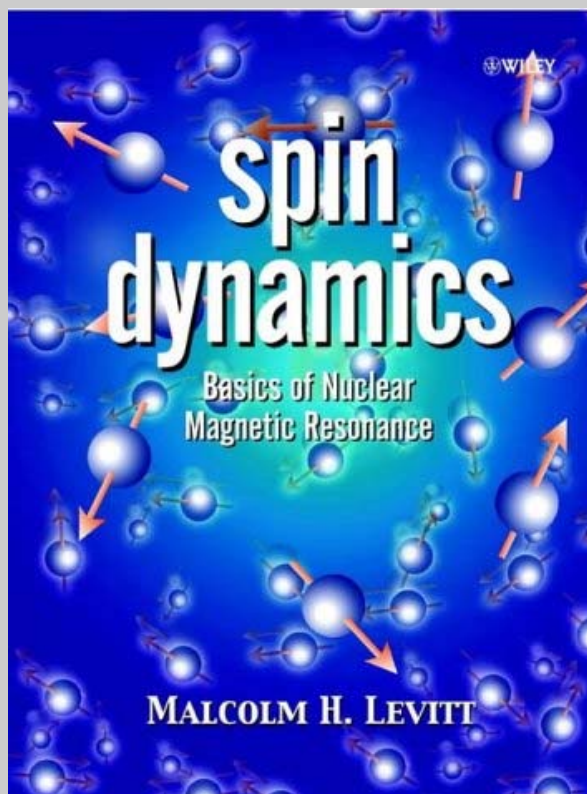
### Summary Review

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

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

*Continued on page 17*

## Spin Dynamics, Basics of Nuclear Magnetic Resonance



From the publisher...

### Spin Dynamics: Basics of Nuclear Magnetic Resonance

*Malcolm H. Levitt*

NMR spectroscopy is one of the most important and widely used techniques for the identification of compounds. Based on an established course this core text offers a truly modern and updated approach.

As a core subject in many science disciplines, this text will appeal to a wide range of students, as well as practising scientists and technicians.

Assuming only a basic knowledge of complex numbers and matrices, it carefully and lucidly aids readers to fully understand this challenging subject.

0-471-48922-0    710pp    2001    £34.95

*Continued from page 16*

information that can be extracted from NMR, and the probing of molecular motions.

It can be unwise to try to appeal to too wide an audience: by aiming itself at 'undergraduate and postgraduate students, and also active researchers in NMR, spectroscopy and quantum physics' this book is living dangerously. It is certainly true that some sections of the book are entirely suitable for undergraduates: more experienced readers will be irritated, though, to have it spelled out at least twice that  $\omega/2\pi$  is the angular frequency divided by  $2\pi$  and that formulae are written in terms of angular frequencies to make them simpler.

The undergraduate reader, on the other hand, is likely to be overwhelmed by the details of the complicated pulse sequences employed in NMR experiments. Nevertheless, the book is successful: a guide to which sections are suitable for which group of readers would overcome this objection.

Overall, this is an excellent book. The different readerships at which it is aimed will have to read selectively, but they will all find much of value, and will benefit from the clarity of the presentation.

## The Law of Mass Action



### Subject area

Physical Chemistry.

### Description

This book is a monograph in the area of statistical thermodynamics.

### Authors

Andrei B. Koudriavtsev, Reginald F. Jameson, Wolfgang Linert.

### Publishers/Suppliers

Springer Verlag (www.springer.de).

### Date/Edition

2001/1<sup>st</sup> Edition.

### ISBN

3-540-41078-3.

### Level

Research.

### Price

€ 74.95 (www.springer.de).

Kieran Fergus LIM  
School of Biological and Chemical  
Sciences  
Deakin University  
Geelong, VIC 3217  
Australia  
October 2002

The law of mass action refers to the (chemical) equilibrium expression. That is, the relationship between the amounts of reactant(s) and product(s) at equilibrium, commonly written in terms of the macroscopic concentrations:

$$K_c = \frac{[A]^a [B]^b}{[C]^c [D]^d} \quad \text{Eq (1)}$$

for the generalised reaction:



It is common in lower undergraduate levels to derive Eq (1) empirically, and in upper undergraduate year physical chemistry from minimisation of the chemical potential with respect to the extent of reaction (or reaction parameter). An alternate derivation (not mentioned in most physical chemistry texts) uses Lagrange multipliers<sup>1</sup>. This book by Koudriavtsev, Jameson, and Linert uses statistical mechanics to derive and investigate Eq (1), which is the title of the book.

The first three chapters (Maxwell-Boltzmann statistics; Ensembles, partition functions and thermodynamic functions; The law of mass action for ideal systems) establish the statistical mechanical “machinery”, leading to Eq (1), expressed in terms of chemical amounts as measured by the microscopic molecular number:

$$K_n(T, V) = \frac{(n_A)^a (n_B)^b}{(n_C)^c (n_D)^d} \quad \text{Eq (3)}$$

Deviations from Eqs (1) or (3), due to non-ideal behaviour, are commonly treated by the use of empirical fugacities or activities. In this book, non-ideality is explicitly included by statistical mechanical treatments of molecular volume, intermolecular forces, and other factors. The major part of the book — chapters 4-9 (Reactions in imperfect condensed systems. Free volume; Molecular interactions; Imperfect gases; Reactions in imperfect condensed systems. Lattice energy; Chemical correlations; Concluding remarks) — generalise Eq (3) to real, non-ideal systems.

The book concludes with a useful set of Appendices (chapter 10) and a 6-page index.

Who should read this book? I believe that it is a book for the practising researcher, or for the advanced research (graduate) student. Academics, who are teaching advanced statistical mechanics, would also find this book useful.

The mathematical treatment is clear and straightforward. The subject matter naturally leads to some very involved mathematics, which is very dense in parts.

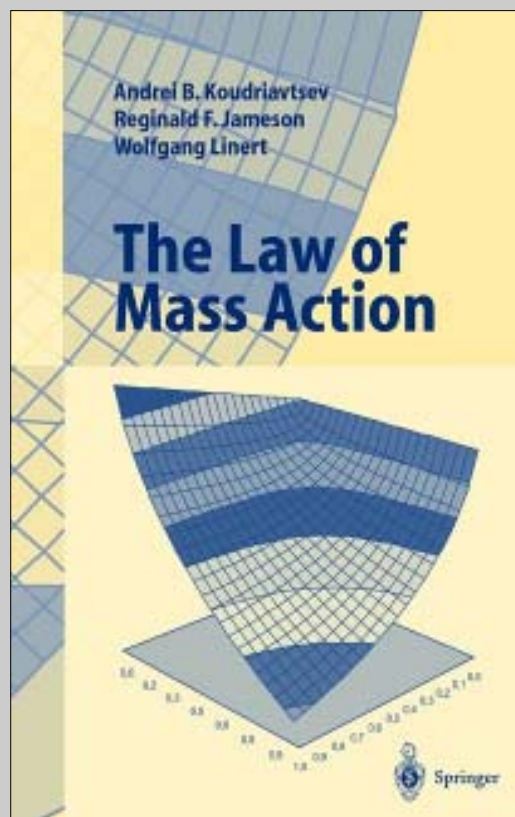
### Summary Review

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

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

*Continued on page 19*

## The Law of Mass Action



### From the publisher...

#### The Law of Mass Action

*Andrei B. Koudriavtsev, Reginald F. Jameson, Wolfgang Linert*

The theoretical basis of this book... requires dealing with several problems arising in physical chemistry including the concept of entropy as a thermodynamic coordinate and its relation to probability. Thus Maxwell Boltzmann and Gibbs statistical thermodynamics, and quantum statistics are made considerable use of. A statistical mechanical derivation of the law of mass action for gases and solids is presented, and the problems arising in the application of the law of mass action to the liquid state are addressed. Molecular interactions and how to take them into account when deriving the law of mass action is discussed in some detail... Finally, attention is drawn to the statistical mechanical background to Linear Free Energy Relationships and of Isokinetic Relationships and their connections with molecular interactions.

3-540-41078-3 328pp 2001 €74.95

### *Continued from page 18*

There are 80 diagrams. A small number illustrate concepts or definitions. The bulk of the diagrams are plots of data corresponding to key equations in the text. Many of the diagrams are of well-chosen *experimental* data.

There are some features of the book which may frustrate students: the use of non-IUPAC notation (eg  $F$  for the Helmholtz "function"), non-IUPAC units (calories), the lack of any "problems" or exercises, and the presence of some subscripting typographical errors in the occasional equation. These would present no difficulty to the expert reader.

The book provides insights into the statistical origin of equilibrium and into the theoretical prediction of non-ideal behaviour. I believe that students (even advanced students) may not appreciate the subtlety of the book. However, I would recommend it to researchers and lecturers in the field.

#### Reference

1. D. H. Sutter, *Free enthalpy, Lagrange multipliers, and thermal Equilibrium: A possibly novel way to derive the law of mass action*, Journal of Chemical Education, 1996, **73** (8), 718-721 <<http://jchemed.chem.wisc.edu/Journal/Issues/1996/Aug/abs718.html>>.

## The Science of Imaging - an Introduction



### Subject area

General science.

### Description

The book presents an introduction to the basic science - and in some areas the technology - relating to the various forms of image formation, recording and display. Marginal notes give brief illuminating asides, and appendices deal with some theoretical background matters. Useful and extensive suggestions for further reading ["Digging deeper"] are given at the end of each chapter.

### Authors

Graham Saxby.

### Publishers/Suppliers

Institute of Physics (www.iop.org).

### Date/Edition

2002.

### ISBN

0-7503-0734-X.

### Level

A-level, access, undergraduate.

### Price

£24.99 (www.amazon.co.uk).

Philip Bradfield  
School of Computing & I.T.  
University of Wolverhampton  
Wolverhampton WV1 1EQ  
October 2002

It is both a challenge and a privilege to review a text reflecting some of the wide range of enthusiasms and expertise of an esteemed former colleague. This review attempts to look only at the overall "science" content of the text - no doubt other, more appropriate, publications will comment on the more technical content.

Given the wide range of the potential audience, the author has on the whole made a very fair attempt to judge an appropriate level both of assumed prior knowledge and of scientific competence and understanding, and the "further reading" suggestions will accommodate the inevitable variances in these. However, in his Preface he does appear to go too far when, perhaps to make a point, he somewhat misrepresents some other so-called "Introductions" as being little short of intimidating monographs. I assume he is trying to reassure the kind of potential reader for whom he is writing.

The author's apparent touching faith in the ready availability of out-of-print indispensable texts via the systems of public and other libraries is, one fears, in general sadly over-optimistic: many such libraries, even in the university sector, are having to thin out their stocks relentlessly, often seemingly with no apparent sense of the potential lasting value of particular texts.

There are cases where, perhaps in order not to seem intimidating, the language is somewhat insufficiently precise, or there is an intriguing, sometimes even provocative, statement given without sufficient supporting evidence or discussion. In other cases, the examples are too "real life" for the essential general, i.e. abstract, argument to be clearly apprehended - incidental details "fog the picture", so to speak.

There are some technical errors and insufficient arguments:

(p. 2) "In order to get the right answers(,) Einstein ..." seems rather too loose for even an introductory, somewhat popularising book.

(p. 3) the uses of the term "energy" in discussing the electromagnetic spectrum seem confusing at this point.

(p. 13) "Heraklion" and "Iraklion" (Crete) both appear - which is intended?

(p.52) Perspective: Fig. 4.21 has an unusually low "horizon" line, which detracts from the effectiveness of the illustrations.

(p. 57) Fig 5.3: It is a pity that the profiles are not themselves annotated: it takes some hard thinking to establish which end must be aperture limited, and which diffraction limited, though the clues are in fact there in the  $f/n$  values. The appearance of the fine fringes at the  $f/32$  end could have been more closely tied to the Airy disc. Only a confident physicist, or such other lucky person, would have the confidence to make the correspondence - and the book is meant to be an INTRODUCTION for students who may have found, or are finding, physical optics a difficult subject. Clearly, the book is NOT meant to be used by such students without the benefit of competent guidance and support.

### Summary Review

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

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

*Continued on page 21*

## The Science of Imaging - an Introduction

*Continued from page 20*

(p. 58) Image Quality: The “sinusoidal” features referred to in the legend cannot be clearly identified in the illustrations: either larger, or actually annotated, illustrations are surely necessary.

(p. 59) “... typical of lenses that are out of focus...” surely ought to be  
“... typical of optical systems that are out of focus...”.

(p. 74) Fig 6.14: where monochrome images are used to illustrate matters relating to colour, then some appropriate annotation/overprinting might identify more definitely the features discussed in the legend.

(p. 105) The Latent Image: Fig 9.3 “unattached electron” should perhaps be “unpaired electron”, and there is no explanation as to why a “stable speck of silver”, at “a crystal dislocation or an impurity speck”, will attract further atoms to form the latent image.

(p. 134) The discussion claiming to explain the marginal illustration Fig. 12.2 [ “unsharp masking” ] - essentially a matter of convolution - is insufficient.

(p. 155) The half-tone process, the understanding of which has intrigued this reviewer for some time, is bravely presented: the process of going from a continuously varying local intensity to a discrete array of spots of uniform darkness but of varying size, effectively by using a lattice diffraction grating, possibly NOT at the Fraunhofer limit, is both scientifically intriguing and, as it happens, of considerable practical importance. However, the average intended student reader, if not a science student, might well need some support in understanding the process: the lack of an explicit zero intensity axis (horizontal) in Fig. 14.1 makes the argument less than “transparent”, notwithstanding the indicated emulsion threshold level.

(p. 167) Antennae: The “marginalia” argument about the polarisation is misleading: it is the fact that the electric field is horizontal (and thus consequently the magnetic field is vertical) that lead to the induced electric signal, for the antennae illustrated (Fig. 15.10(d)). The varying vertical magnetic field cannot itself induce any significant electric signal in the dipole shown, which is a vertical folded loop. Even if that loop were horizontal, its almost zero area would militate against any significant electromagnetic induction.

(p. 198) The Hologram: the argument is marred by a serious misprinting:

the factor

$$\cos(\Phi_1 t + \Phi_2) \cos(\Phi_1 t + \Phi_2)$$

should of course be

$$\cos(\omega t + \Phi_1) \cos(\omega t + \Phi_2)$$

The time-average of  $\cos(X)$  is ZERO, and of  $(\cos(X))^2$  is 1/2, only if X is, for example, a linear function of time: the reader would need to be guided in this implicit argument, since X is not explicitly identified other than as an angle variable in a theorem of trigonometry.

The text “The positions of the fringes are coded in the phase relationships

$$\Phi_1 - \Phi_2 \dots$$

should perhaps read

“The positions of the fringes are determined by the phase relationship

$$\Phi_1 - \Phi_2 \dots$$

Again, the target student will either, as invited in the Preface, omit such a “quarantined, boxed” theoretical discussion, or need to be guided.

Overall, this reviewer is delighted that the author has had the courage to attempt the very daunting task of presenting his illuminating account of what must be in effect a lifetime’s interest in such a wide range of exciting phenomena and technical achievements. However, we would welcome in due course a more “focused” second edition, one taking note of a wide range of thorough reviews.

In these days of the increasing use of “visualisation” in the field of information science, the practical aspects and background science of the actual increasingly comprehensive processes of capturing and reproducing images are still worth our attention. We surely all enjoy the enrichment to our lives that come from well-chosen and well-produced images of all kinds, whether captured from nature, created by artists or generated to illustrate data and concepts from many fields of experience and experiment.

## Understanding Physics Part 2



### Subject area

General Physics.

### Description

An introductory undergraduate text covering elasticity and equilibrium, gravitation, fluids, waves and oscillations and thermodynamics. Calculus is used throughout the text.

### Authors

Karen Cummings, Priscilla W. Laws, Edward F. Redish and Patrick J. Cooney.

### Publishers/Suppliers

John Wiley & Sons, Inc. John Wiley and Sons, Ltd. ([www.wiley.co.uk](http://www.wiley.co.uk)).

### Date/Edition

2002/Preliminary Edition.

### ISBN

0-471-39429-7.

### Level

Undergraduate.

### Price

£15.99. ([www.amazon.co.uk](http://www.amazon.co.uk)).

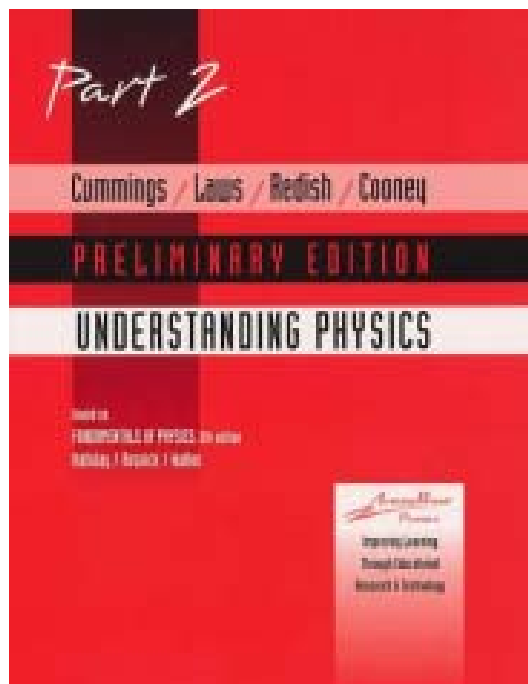
Gren Ireson  
Matthew Arnold Building  
Loughborough University  
Loughborough  
Leicestershire LE11 3TU  
October 2002

Having reviewed Understanding Physics Part 1 (*Physical Sciences Educational Reviews* no. 4 June 2002) I looked forward to reviewing this text.

The text covers, at an introductory undergraduate level, equilibrium and elasticity, gravitation, fluids, oscillations, waves, kinetic theory of gases and thermodynamics, in nine chapters.

As with Part 1 this text is based on 'Halliday and Resnick' but also as with part 1 the narrative style and implementation of research into physics pedagogy soon become apparent.

The narrative is allowed to flow and illustrative exercises are placed at the end of the chapter under the collective title of 'Touchstone Examples'. Exercises suitable for student self-assessment are placed at the end of the book and these range from the 'gentle' to the 'more demanding'.



need to look closely at the student's mathematics background, the physics would not be a problem. The student would need to be conversant with, for example, double and half angles and the derivatives of trigonometric functions to make full use of the text.

My one complaint with part 1 was the quality of the diagrams and whilst they are again small in part 2 I did find the quality better, i.e. I did not have to rely on what I knew should be in the diagram.

For anyone wishing to integrate both data logging and calculus into an introductory course I would recommend this text. Foundation courses and/or service teaching courses, for example in technology, could also be well served by this text given suitable mathematics support.

### Summary Review

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

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

The reading exercises, continued from part 1, again serve to focus the reader on the key issues and to develop physics literacy.

Where appropriate the use of data logging is integrated into the text and this is done in such a way that it is not hardware specific.

Overall I enjoyed the approach taken by the authors and found the contexts used and the development of a calculus based description very clearly laid out. In terms of its suitability as a text which follows from AS and/or A2 one would

## Gases and Gas Equilibria



### Subject area

Physical Chemistry.

### Description

A CDROM containing subject content, videos, examples and a test on the theory of gases and gas equilibria.

### Authors

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

### Suppliers/Distributors

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

### Date/Version

2001.

### Level

A-level, access, undergraduate.

### Type of package

Computer aided learning.

### Price

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

### Hardware required

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

### Software required

Windows 95, 98 or NT 4.0.

Paul Chin  
LTSN Physical Sciences  
Department of Chemistry  
University of Hull  
Hull HU6 7RX  
November 2002

Installing the software from the CDROM was quick and easy with straightforward instructions.

There was just a very minor resolution problem running the program at the recommended settings, with part of the page running off the screen and obscuring some of the navigation buttons.

When running the program you are presented with 5 sections on the main contents page. Since the content is laid out in a 'book style' navigation through each of the sections is fairly straightforward and quick to get used to. However this strictly linear format sometimes makes it awkward to browse between sections since you always have to backtrack to the main menu before moving into a new section.

The first section reviews the theory of the gas laws and some associated equations and concepts. The quality of content seems to vary, with a mixture of good and poor explanations and the target audience is sometimes unclear too due to the variability of depth of content. At times some very basic explanations are given whilst at others, terminology is used without any clarification, presumably assuming the user would know the information beforehand. There are a few typographical errors and one or two minor graphical errors with text overlapping. As with the other sections, navigation was fairly straightforward and quick to familiarise with and it is possible to print this section out for later use.

The second section covered a basic glossary of terms and the third section provided detailed videos of experimental gas experiments. The videos were quite long in running time but had good navigation tools to quickly skip to different sections of an experiment. These were accompanied by a clear audio narrative that was duplicated in text that matched the audio, rather like television subtitles. The video clips themselves were very clear, well produced and easy to follow.

The fourth section provided numerous worked examples of the various gas laws with short and clear explanations. In addition there was also an interactive part that allowed the user to input sample data which then calculated the answers based on the data given. Unfortunately the previous good menu system didn't seem to apply here as the questions were not listed clearly but simply as a series of numbers.

The final section was a multiple choice quiz based on the content. Each question provided basic feedback depending on the option chosen and an overall mark was given at the end. Whilst this could be used as a useful self test the limitations of the software meant that the quiz was not very robust in providing the user with marks if any of the questions were re-taken.

Overall this software was easy to install and quite easy to use. Although the linear structure was fairly rigid it was easy to understand the format and navigate to the various sections. Although the theory part seemed to vary in quality the video section was well designed and provided full flexibility for the user to review different aspects of the videoed experiments.

### 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	***



## Phase Equilibrium



### Subject area

Physical Chemistry.

### Description

A CDROM based resource for pre-laboratory teaching of phase equilibrium.

### Authors

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

### Suppliers/Distributors

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

### Date/Version

2001.

### Level

A-level, access, undergraduate.

### Type of package

Computer aided learning.

### Price

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

### Hardware required

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

### Software required

Windows 95, 98 or NT 4.0.

Roger Gladwin  
LTSN Physical Sciences  
Liverpool University  
Liverpool L69 7ZD  
October 2002

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

The list of topics to be covered includes:

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

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

### Installation

I installed the software on a Windows 2000 PC, with an AMD 2000+ processor with 512MB RAM – this is well above the minimum specification. Windows 2000 is not specifically supported but NT is on the list of acceptable operating systems. There is no autorun for installation. The instructions though are adequate – just insert the CDROM in the drive and run the setup.exe program then follow the on-screen prompts. The producers note that on some machines the later sub-sections are slow to load (this is being investigated we are told). No such problems were experienced in this review.

### Introduction

This being a pre-laboratory teaching package there is a general safety warning with respect to laboratory work. Before you can start you must click 'I have read and agree...' to the warnings or quit the program! Once in the program, navigation is easy. One just clicks on the section/sub-section you want and use the Main/Menu and the other self-evident buttons to move around.

### The teaching materials

The package comprises the following sections:

#### Background theory

This is the text-based, teaching part of package. The section covers:

Phase diagrams  
Tie lines and lever rule  
Thermal analysis  
Gibbs phase rule  
Simple eutectic  
Congruent melting point  
Incongruent melting point  
Binary liquid systems

As well as the general text, there are pop-up definitions of 'hot' words and for later study you can print the screens.

#### Glossary of terms and definitions

This is in addition to the pop-up words mentioned above and provides a series of definitions for a number of terms related to phase equilibrium (eg Lever rule, Tie line, Eutectic point)

### 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	*****

## Phase Equilibrium

*Continued from page 24*

### *Video tutorial*

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

The video materials cover the Liquid phase (video footage is ca 3.5min long) with sections entitled; Introduction, Preparing the sample, Assembling the apparatus, Making the measurements; and the Solid phase (video footage is ca 2.75min long) with sections entitled; Introduction, Preparing the samples, Making the measurements.

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

### *Sample data/worked examples*

There are nineteen examples in this section. A typical example presents a table of mixture composition against temperature and requires the user to draw the phase diagram. It then poses questions based on the resultant graph. There is potentially lots of work here and users could gain from the facility for practice that it affords.

### *Final test*

The test is potentially set up to record results for each user and you can print the results. Feedback is given for both correct/incorrect responses. There are true/false, multiple choice and calculation type questions and eighteen questions in all. I 'sat' the test several times and the questions came round in the same order and where appropriate the choices were in the same order. Some randomisation would be advantageous. Just occasionally, the feedback for a question was too wide for my screen set at a resolution of 1024x768 (I could not reproduce this consistently). You only get one

chance at a question within a session (and I think this is right). Second attempts produce a 'This question is locked' response. One problem I found was that Q15 came up already 'locked' (this 'bug' was consistent).

## Physics Discipline Network Workshop IX

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

### 'Learning Networks & Learning Environments'

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

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

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

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

### **Overall**

This package does not use a standard Windows interface – the layout is customised to the needs of the application. That said the operation is straight-forward and intuitive.

Often this type of video tutorial can be somewhat non-interactive – the user just sits and watches the movie and listens to the commentary whilst they doze off. In this case the video sections are short and there are plenty of other activities to keep the user's attention – not least the prospect of being tested at the end!

I can see this type of material working well in the pre-laboratory stage of a course, with students showing competency to undertake an experiment by successfully completing the test after using the teaching materials.

## Polar



### Subject area

Chemistry.

### Description

Program to analyse and simulate electrochemical experiments.

### Authors

W. Huang.

### Suppliers/Distributors

Available from [www.DrHuang.com](http://www.DrHuang.com) to download.

### Date/Version

4.5.13.

### Level

Undergraduate and research.

### Type of package

Simulation.

### Price

from US\$20.

### Hardware required

A PC.

### Software required

Windows. In some cases, additional runtime files may be needed, but these are freely available.

The software is written and designed by a former member of Alan Bard's large and well-known electrochemistry research group in Australia. It simulates a wide variety of voltammetric experiments (including polarography) from first principles and incorporates the possibility of following reactions, transfer coefficients, etc. It also contains deconvolution routines and data processing techniques such as derivatives, integrals, semi-derivatives, etc. As such, it has the capability to be a very

powerful tool as there are no limitations imposed by the program assuming parameters. The fact that the person running the software has total control over all of the parameters makes this package very suitable to post-graduate study. However, it is possible to construct materials which guide undergraduates through the program (an example from RMIT University in Melbourne, Australia is available from the homepage) so that they can simulate the effects to changing parameters. The number of electrochemical techniques available is dependant upon the configuration of the program and hence its cost.

The program is easy to use in that it uses standard pull-down menus with opening options windows. Typically, the experimental parameters are input via four separate windows (techniques, mechanism, instrument, chemicals) before running the simulation which then plots out the results. Changing one parameter and then re-running the simulation demonstrates the effect of that variable. It is possible to change the value in one entry box but discover that the option is disabled by an entry in another window. Activating the help system calls up a web page (providing you are connected to the WWW). This on-line manual is very thorough in its introduction to all of the electrochemical techniques and includes the major equations that are used in the simulations. However, the information on each of the input windows and the interaction of the parameters is sparse. This manual contains a section entitled "Playing Around" where the reader is encouraged to run the program with the default values (a simulation of a cyclic voltammetry experiment using the  $\text{Fe}^{3+}/\text{Fe}^{2+}$  couple) and then see the effect of changing individual parameters. Whilst this is not labelled as a tutorial, this is the easiest way of discovering the power of the program.

The shareware version of this package has no documentation (but see the on-line manual above). Installation was quick and very straightforward. On some systems, a required dll may be missing, but the web page that the program was downloaded from provides information on where these can be obtained.

No guidelines are given as to minimum requirements, but the results were displayed very quickly on my machine, which is not particularly fast. No particular graphics card is required, and both 16 and 32 bit versions are available. There is not a version for the Mac.

### 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	*****

Roy Lowry  
Institute for Science Education  
University of Plymouth  
Drake Circus  
PLYMOUTH PL4 8AA  
October 2002

*Continued on page 27*

## Polar

*Continued from page 26*

Data input (to compare experimental with simulated data) is via x,y ACSII data, but this is not available in the shareware version. Output to a printer seems to be a screen dump. A full sized window results in a full A4 plot, but the program does not automatically check on paper orientation, so this has to be done by the program supplied with your printer. Cut-and-paste to other applications is straightforward. There is no support for colour on either the screen or during printing.

There are few data checking routines within the program. I asked it to simulate the effect of an electrolyte (KCl) at pH -4 (yes, minus four) which it did and provided a CV plot. This can be viewed as both a weakness and a strength. This is obviously a concern whilst using the program for undergraduates new to electrochemistry, but does ensure that the program can be used for any electrochemical system and hence it's use is not limited for postgraduate use. Inputting the same limits for the start and end of a scan generates the message "No Data", but there is no indication to the user why the condition has arisen.

I have been unable to create a fatal error.

This program reminds me of many that appeared when the PC first started making inroads into the laboratory. It is a tool designed to solve a particular problem – in this case to simulate a wide range of electrochemical experiments so that experimental data can be compared to theoretical data for elucidating mechanisms, transfer coefficients, etc. However, like many tools it can be misused and the results will then bear testimony to the adage of "garbage in – garbage out". The user interface is simple with no frills. The program is totally appropriate for a PhD student to use to model their data and to learn about the fundamental electrochemistry by performing "impossible" experiments in simulation. It can be used for undergraduate work, but care will be needed in the supporting text to ensure that the results are as expected.

It is not a gentle teaching package nor is it extensive in its graphical capabilities. If sheer modelling power and flexibility are required without a flashy user interface and undue expense, this program is excellent.

### Variety in Chemistry Education

in association with

### Irish Variety in Chemistry Teaching

Dublin City University  
31st August - 2nd September 2003

Variety in Chemistry Education is one of the major chemistry education conferences for Higher Education. It provides a lively and informal forum for the exchange of ideas related to the learning of chemistry at degree level. Participants will share in the exchange of good practice and innovation and gain an insight into activities of direct relevance to their own teaching.

The conference this year will be held in collaboration with Irish Variety in Chemistry Teaching and will be held at Dublin City University (DCU), which is conveniently situated between the Airport and the City. Dublin city centre is easily accessible from the DCU campus.

Contributions of oral presentations, workshops, posters and demonstrations are invited.

Further information will be posted at  
<http://www.rsc.org/lap/confs/confshome.htm>  
or  
<http://www.physsci.ltsn.ac.uk>

## Practical Laboratory Chemistry – Disc 15



### Subject area

Analytical Chemistry.

### Description

A CDROM based resource for pre-laboratory teaching covering solution kinetics techniques.

### Authors

Don Brattan, University of Central Lancashire, Tony Rest and Oliver Jevons, University of Southampton.

### Suppliers/Distributors

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

### Date/Version

2000.

### Level

Undergraduate.

### Type of package

Computer aided learning.

### Price

£34.95 (+PP and VAT) for a single CDROM. Current deal £299.95 (+PP and VAT) for complete set of 19 CDROMs .

### Hardware required

A PC with Pentium processor, 4X CDROM, 32MB RAM and a sound card.

### Software required

Windows 95, 98 or NT 4.0 (also available for Windows 3.1 but requires additional MPEG card).

The 'Practical Laboratory Chemistry' CDROM series seems to offer an excellent and unique educational facility for both students and teachers.

The success of the project seems to lie in the simplicity of the approach. Basic experimental details and learning points applicable for both the beginner and the more experienced chemist are the framework on which the talks are based. Full control of the films through the use of the Windows Media Player, as well as each film being broken into manageable small sections also allows the films to be as user-friendly as possible.

The appeal of the discs for the student will undoubtedly lie in the multimedia aspect of the film clips, where clear experimental demonstrations are aided by a concise commentary and relevant diagrams. Another excellent facility is the availability of subtitles along the bottom of the screen, allowing both the hard of hearing, and those without sound-equipped PCs to make full use of the software. The facility to print these subtitles is another invaluable facility.

The quiz feature included with each individual presentation, gives the student an excellent opportunity to interact fully with the lesson and also offers the teacher an insight into the progress made by the student. The questions appear to be set at an intermediate level to suit all academic abilities; although improvements could be made in the marking and reviewing section of the quiz at the end. It is also true that some centres of learning may require additional questions being present to test those students at the brighter end of the academic spectrum.

Overall, the CDROMs offer an excellent facility to scientific centres of learning, especially when combined with other methods of learning, currently employed in teaching anyway.

### 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	****

Ed Metcalfe  
School of Chemical & Life Sciences  
University of Greenwich  
Woolwich Campus  
Wellington St  
Woolwich  
London SE18 6PF  
July 2002

## Advertisement feature

### Practical Laboratory Chemistry... or... Le bon geste pratique au laboratoire de chimie



The collection of CDROMs comprises approximately 60 laboratory techniques illustrated by professional quality videos.

#### Contents:

Basic laboratory techniques  
Distillation, Separation, Extraction, Purification, and Drying techniques  
Microscale Chemistry techniques  
Spectroscopic techniques (IR, UV/Vis, NMR)  
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Weighing and volumetric measurements  
Analytical techniques (Gravimetry, Electrogravimetry, Kjeldahl determination of nitrogen, Flame Photometry, AA Spectrometry, Colorimetry)  
Measuring temperatures for changes of state  
Calorimetry (Bomb, Dewar, TGA)  
Potentiometry (pH, redox, conductimetry)  
Electrochemical measurements  
Kinetics and Gas Phase Equilibria measurements  
Optical (Polarimetry, Refractive Indices) and Radioactivity measurements

The emphasis is on the practical aspects of each technique and experiment, rather than on underlying physicochemical and theoretical principles. The collection of CDROMs can be used directly by the teacher to present (full screen) the details of laboratory technique before students embark on practical work, or directly by the students for self-paced learning and trouble-shooting during a practical class.

There are 20 CDROMs in the set, one of which contains the installation program for the interface and the other 19 contain the text files, videos and commentaries illustrating the basic techniques used in a Chemistry laboratory.

#### Production:

Original Project and Videos: Chemistry Video Consortium (CVC).

English Text : Tony Rest and the CVC team (University of Southampton).

Bilingual Adaptation: Centre de Développement Informatique Enseignement Chimie (CDIEC) at Université de Nice Sophia-Antipolis

Translation into French by Daniel Cabrol-Bass with the help of many colleagues from the « Département de Chimie de l'Université de Nice Sophia-Antipolis ».

French Glossary compiled by : Commission enseignement de la Société Française de Chimie (President : Gilberte Chambaud).

Technical development and interfaces: Patrick Ribault and Jean-Pierre Rabine.

French voice recording and synchronisation: Stéphane Le-Saint.

Graphics: Alfredo Blanca

#### Distribution:

For the United Kingdom and other countries, please contact :

Viewtech Educational Media,  
7-8 Falcons Gate, Northavon Business Centre,  
Dean Road, Yate, Bristol BS37 5NH, UK.

Phone: (+44)-(0)1454-858055

Fax: (+44)-(0)1454-858056,

E-mail: [info@viewtech.co.uk](mailto:info@viewtech.co.uk)

Web : <http://www.viewtech.co.uk>

For France and French speaking countries, please contact :

Centre de Développement Informatique Enseignement Chimie (CDIEC)

Université de Nice Sophia-Antipolis

06108 Nice Cedex 2 – France

Tél. : (+33) (0) 4 92 07 61 23

Fax : (+33) (0) 4 92 07 61 25

Mél. : [cabrol@unice.fr](mailto:cabrol@unice.fr) ou [rabine@unice.fr](mailto:rabine@unice.fr) .

Web : [http://www.unice.fr/cdiec/c\\_cdrom.htm](http://www.unice.fr/cdiec/c_cdrom.htm)

#### Demonstration:

A demonstration CDROM disc is available.

Please contact Tony Rest :

E-mail: [a.j.rest@soton.ac.uk](mailto:a.j.rest@soton.ac.uk)

Phone : (+44)-(0)-2380-593595

Web : <http://www.soton.ac.uk/~chemweb/cvc/>

Visit our web site...

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

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