

Subject areas

- Biochemistry
- Biology
- Chemistry
- Geography
- Geology
- Physics
- Psychology



UniServe•Science News

Newsletter of the Science Software Clearinghouse

Vol 1, July 1995

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From the Director

Why read yet another newsletter?

If you are like many of the teachers in our universities, you would like to use the new information technologies to improve your teaching, but maybe you don't know how. You have plenty of ideas, but just not enough time to develop them yourself. It is quite possible that what you want to do has already been done somewhere else, but how do you find out about it?

That's where this newsletter comes in.

Earlier this year, the Committee for the Advancement of University Teaching (CAUT) set up a nation-wide network of clearinghouses. The idea was modelled on the Computers in Teaching Initiative (CTI) project in Britain, which in 1991 established a network of centres throughout the country, one for each of 27 disciplines taught in their university system. Our network is smaller and tighter, and groups of disciplines are collected in multi-disciplinary centres.

A clearinghouse to cater for all sciences taught at first year level Biochemistry, Biology, Chemistry, Geography, Geology, Physics and Psychology has been set up here at the University of Sydney, called **UniServe•Science**. The others in the network are: Engineering at the University of Wollongong, Health at the University of Newcastle, Law at the Australian National University, Humanities and Social Sciences at the Royal Melbourne Institute of Technology, and a coordinating centre at

UniServe•Science PERSONNEL

Director:

Dr Ian Johnston

Co-director:

Dr Mary Peat

Deputy directors:

Professor David Patterson

Professor Tony Haymet

Educational technologists:

Dr Dianne Chambers (Biological Sciences)

Mr Mick Pope (Physical Sciences)

*UniServe•Science is funded by the Committee for the Advancement of University Teaching,
the Faculty of Science and the University of Sydney*

the Australian National University.

Here at UniServe•Science, it is our brief to find out about what is going on in the area of Information Technology in university science teaching, and to let you know. As time goes on we will prepare catalogues and reviews of available teaching materials, and make them available on the WWW. But right now, this newsletter is the first of a regular series in which we will keep you up to date on what is happening in this area, as it happens.

Who are we?

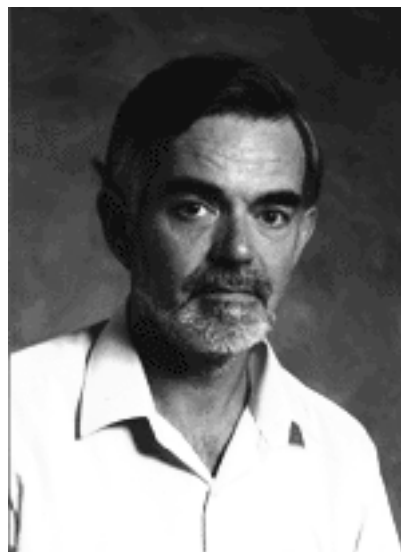
The key players in our organization are: Ian Johnston (director) who is Senior Lecturer in the School of Physics, has had a lot of experience in bringing computational physics into undergraduate courses, and has been a member of several international software writing consortiums. Mary Peat (co-director) is director of First Year Biology in the School of Biological Sciences, and has been instrumental in introducing Macintosh computers into the first year laboratories and since 1993 has been involved in the development of computer-based learning modules. There are two deputy directors, who are responsible for academic reviewing standards. They are Tony Haymet, Professor of Theoretical Chemistry and lecturer in first year; and David Patterson, Head of the School of Biological Sciences, and was recipient of a DEET Evaluations and Investigations Program grant to study the use of 'New Technologies in Biology Teaching, Nationwide'.

The day-to-day business of the clearinghouse is done by two Educational Technologists: Dianne Chambers is responsible for the biological sciences and has lectured in biology, developed

educational software for biology and was involved in the 'New Technologies in Biology Teaching, Nationwide' project. Mick Pope is responsible for the physical sciences and has been involved in teaching courses in popular science.

What are our plans?

We see our role as being very simple. We believe that you, as teachers, want to know (1) what materials are out there that you might use in your teaching? and (2) is it any good? We will try to find out answers to those questions, and in order to get the



information out to where it is needed, we have set up network of personal contacts throughout the universities of Australia. If you work in a department of biochemistry, biology, chemistry, geography, geology, physics or psychology, then there is one person in your department whom we are in contact with. They know the state of our information databases, and they will keep us informed what is happening about computers

in teaching in your department, and they will keep you informed about what we are doing. But we will also keep giving you information through these newsletters.

So, keep reading.

Ian Johnston, Director

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Aims

- *collecting and disseminating information about ...*
- *advising on and promoting the use of new technologies in ...*
- *publicizing new developments in ...*
- *encouraging communication about ...*

Information Technology in tertiary science teaching

Article:

Rob Capon is a Senior Lecturer in the Department of Chemistry at the University of Melbourne. He has been involved in the development of multimedia tools for teaching chemistry for a number of years

Teaching Chemistry with Interactive Multimedia

or... **How To Avoid Being An Information Superhighway Statistic!**

Introduction

It is interesting to speculate whether the general populace in the 1800s were truly conscious of the impact that the industrial revolution would have on their futures. Did our forbears grasp the consequences of motor cars, telephones or electricity?

The last decade has seen some remarkable advances in information technology. Homes now have fax machines, computers, modems, and media moguls compete to add interactive television. Word-processing and computer literacy are no longer career skills, but life skills!

In teaching, it is dangerous to generalise in a dynamic field like Computer Aided Learning (CAL), but it is tempting to categorise CAL packages as either (a) tools used by academics to teach in lectures, or (b) software under control of the student for self-paced instruction.



CAL in the Lecture Theatre

Commercial packages such as Microsoft's PowerPoint provide a stable and well supported mechanism for presenting lecture material. With minimum effort, they allow fully integrated text, animations, pictures, video clips and sounds. At the University of Melbourne numerous lecture venues have been equipped to support this style of teaching, and increasing numbers of academics are moving away from "talk and chalk" to interactive multimedia.

For those contemplating such a move, this can be a daunting process. Not only is it necessary to acquire and become familiar

with computer technology *per se*, but also the techniques of obtaining and effectively integrating information in multiple media formats. Transferring text and graphics to an electronic format is relatively straight forward, but gaining access to other media resources can be more difficult, though in the long term these should be available on a commercial or collegiate basis. Most importantly, individual academics will retain control over the lecture content with computer technology serving as a device to manage the teaching process. My own experience with large group undergraduate chemistry lectures over several years permit some observations;

- *Production of electronic lectures is time consuming and only practical with fulltime access to a personal computer. However, as material and skill level grow, production becomes much easier.*
- *In principle, electronic lectures could be shared between staff in the same department, university or country. This lowers the burden on individuals in producing their lectures.*
- *The electronic presentation can be made available in printed or electronic form prior to the class to enable students to prepare for the lecture.*
- *Having prepared for the lecture students pay attention to and take notes from what is being said rather than behave as 'biological photocopyers'.*

- *Errors in transcribing notes to or from the blackboard are a thing of the past.*
- *Lecture content can include more, and more complex, worked examples.*
- *Students overwhelmingly endorse this approach to lecture presentation.*

From a recent tour of major Universities across Australia sponsored by the Royal Australian Chemical Institute, it was clear that while the expertise required to “configure” lecture theatres for multimedia style presentations was commonplace, routine access to such teaching spaces was far from common. Individual departments need to recognise the potential of this technology and commit funds to support initiatives in this direction.

Self-Paced CAL

Teaching undergraduate chemistry can be expensive, particularly the laboratory. Confronted with the prospect of cut-backs in our 1st year undergraduate laboratory in 1993 we explored the CAL alternative. Although the initial cost was high in dollars and staff time, this option has proved very successful. Our first foray into this area was with the Molecular Models Workshop (MMW), which replaced an existing laboratory based exercise in which students constructed molecular models with a small model kit and answer a series of questions based around these models. Use of MMW saw support personnel reduced from six demonstrators and three technical staff per eighty students to one demonstrator, while at the same time offering a superior return to students. The MMW software managed logon through prior uploading of class attendance lists, and then proceeded to present students with >180 interactive molecular animations fully integrated with questions, answers, marking, assessment, glossary and help features. The program allowed students to explore sets of questions most closely reflecting their ability. Final assessment for >1000 students/yr was uploaded automatically into the departmental assessment data-

base. Following from this initial success, all our 1st year chemistry students are required to do 36 hrs of CAL instruction/yr, with CAL labs being a popular venue for private study during free access times. A variety of quality packages have been developed inhouse, downloaded free from the Internet, and purchased from commercial sources.

Conclusion

I trust in this short account I have caused the reader to view these new technologies as potentially valuable teaching tools. Such is the pace of development in this field that it is difficult to predict the future. What is clear is that successful discipline based CAL software will increasingly be distributed either on a commercial or shareware basis. Furthermore, as more academics move to electronic lecture presentation the scope for sharing resource material between individuals and departments will increase. Both developments will facilitate the effective use of technology in education. Students will, no doubt, access course related material either from stand alone media or via online services, whether we personally provide this material or not. The concept of specific institutions as sites for distance education will almost certainly become obsolete as students explore course material from around the world. Indeed, it may even transpire that degrees are awarded for simultaneous completion of subjects originating from multiple institutions. What is clear, is that to minimise duplication of effort and maximise our impact on the development of this medium it is essential that both users and producers of CAL material be aware of existing resources in Australia and world-wide. A clearinghouse is but one means to achieve this objective.

Rob Capon

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Article:

John Dearn is a Senior Lecturer in Biology at the University of Canberra where he has a particular interest in first year teaching

Promoting Active Learning in Introductory Science Courses

John Dearn was awarded one of two inaugural CAUT National Teaching Fellowships in 1994 and spent three months in the USA based at Harvard University. While in the USA he visited colleges and universities looking at innovative approaches to teaching introductory science courses, attended a conference 'Revitalising Introductory Science and Mathematics Courses' and visited a number of organisations including the American Association for Higher Education and the National Science Foundation.

Large introductory science classes are something of a tradition in our universities. Courses where students sit in silence transcribing information while they are spoken at, where assessment is based only on objective tests, where the major task of the course is to get through the textbook, where laboratory classes are based only on cookbook demonstrations and where there is little opportunity for students to explore and question ideas with fellow students and faculty have become commonplace. Interest in undertaking university courses is not high and even for those students choosing to study science the experience can be unsatisfying with courses perceived to be dull and with little relevance to students' lives and experiences.

The introductory university science course has to balance many conflicting objectives but the need for content coverage seems to dominate above all. The curriculum, dictated to a large degree by the text book, has become more of a hurdle to be overcome in the available time rather than a field for exploration, inquiry and imagination. Moreover, the linear sequence of topics, while making sense to expert faculty deeply immersed in the field, may not be obvious to the novice learner who often sees it as a mass of unrelated facts. The tendency of conventional textbooks to proceed from theory to examples appears to be the opposite to the way we actually learn where observation precedes concept formation.

If students are taught to be passive transcribers of knowledge then that is what they will become. Introductory courses are formative experiences that introduce students to the nature of higher education. They should be designed to not only introduce students to the way of thinking in a particular discipline or professional area but also foster the cognitive, ethical and aesthetic development. However, rather than broaden intellectual vistas they often do little more than exercise students' ability to memorise terms and definitions. More seriously, there is growing evidence that the learning we encourage is not effective and fails to affect how students view and interpret the world around them.

The presentation of course content knowledge does not automatically result in students developing thinking and communication skills. We need to teach less, pursue the connections between the material we teach and the issues and problems of the outside world and engage students in discussion, analysis and critical thinking. Helping students engage with science and achieve meaningful learning will only come when science knowledge is connected to personal, social and historical contexts and our teaching must reflect this.

Perhaps the biggest criticism of science as it is presented in most introductory courses is that it does not reflect the very nature of science. Above all, science students must be involved at a personal level with inquiry and come to develop

through dialogue and interaction with other students confidence in their own powers of investigation rather than relying on the textbook as a source of authority. Courses based on the accumulation of facts will not achieve this and another approach to teaching is needed. Learning which involves students doing more than passively listening can take many forms and the general term 'active learning' is useful to describe activities that engage students in writing, discussion and reading and which require higher order thinking skills such as analysis, synthesis and evaluation.

While these educational outcomes are readily articulated they can be difficult to translate into concrete teaching practises and the purposes of my CAUT Fellowship was to find faculty who were attempting to do just that. Many of the people who were developing effective approaches to science teaching were in the small independent liberal arts colleges, undergraduate institutions focusing primarily on teaching with an excellent record of educational achievement. In addition to recruiting outstanding faculty these colleges being relatively small in size have developed a strong sense of community which greatly facilitates good learning. Teaching innovation within the independent liberal arts colleges has been a focus of the work of *Project Kaleidoscope* examined during my Fellowship. *Project Kaleidoscope* has sought to identify what works in university science education, identify the central principles that guide these programs and disseminate this information among faculty teaching undergraduate science.

The work of *Project Kaleidoscope* shows the importance of the development of community among students as a way of facilitating active learning through discussion and collaboration. In small

residential colleges this may be easier to achieve than in large non-residential universities. However, teaching strategies incorporating various forms of collaborative learning, have been developed, even for very large lecture classes and were specifically examined as part of my Fellowship. Peer group learning and peer teaching has been shown to be one of the most effective ways to achieve meaningful learning and in addition helps to provide the social support that many students need as they embark on their university studies. The predominance of lecture centred teaching, where students are forced to adopt a passive role in the learning process, is a curious feature of university education especially in introductory science courses.

During my Fellowship I collected course material from a large number of innovative programs in biology, physics, chemistry and mathematics. Anybody who would like information on these programs or who would like to participate in a discussion about the issues raised in this article through the development of a network of university science educators is invited to contact me.

John Dearn

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Sites of Interest

Teaching and Learning Technology Project
<http://www.icbl.hw.ac.uk/tltp>
Educom
<http://www.edu.com.edu/>
ERIC (Educational Resources Info Centre)
<gopher://ericir.syr.edu:70/>

Article:

Dianne Chambers is the Educational Technologist for the Biological Sciences at UniServe•Science and undertook a study of the uses of New Technologies in Biology Teaching in 1994

Computers & Biology Teaching

New Technologies in Biology Teaching at Australian Universities

Computers have become an important element in a student's experience at university. In 1994 a questionnaire was sent to the Biology departments of Australian Universities, with 50% response rate (54 departments). Ninety per cent of biological departments at Australian universities surveyed have computer facilities available to biology students for biology-related tasks. The types of personal computers used in biological departments at Australian universities are largely desktop machines, either Macintosh or PC, and currently there is no clear preference for either platform. Students at over half of the departments have access to computers running under each platform. The availability of differing platforms is often not determined by educational principles, but rather reflects costs, ease of networking, prior usage of a particular platform by academics, as well as the availability of suitable Computer-Aided Learning (CAL) packages. It is expected that educational issues will take a higher priority in future.

Computers in first year teaching

Of the departments that responded that teach biology at the first year level, two thirds use computers in their first year program. The nature of teaching and the likely needs of CAL differ from first year to later years. First year teaching typically involves large classes, teaching focuses on the conveyance of facts, and there is a potential for greater similarity of teaching programs from one institution to another. CAL is a useful addition to traditional means of education, particularly suited to large classes so that the time of academics can be released for remedial or advanced teaching. CAL is also well suited to developing a factual understanding. From a financial

perspective, it is more likely for CAL to be cost-effective (on a *per capita* basis) in first year teaching due to the large numbers of students undertaking introductory biology courses. Teaching in subsequent years is often more focused, more institution dependent, and involves smaller classes. The use of computers in such years may shift to the communication of complex issues - such as modelling. The use of CAL in more senior years is less likely to be as cost-effective as in junior years, and current use in senior years is more patchy.

Computers contribute to many facets of biology teaching

Computers are used in many aspects of teaching by biological departments. They may be used to present biological information and concepts, to simulate complex situations, develop generic skills, to graph and manipulate data, and to assess students. Even within these broad functions, there may still be a wide diversity in the ways New Technologies are used. For example, CAL packages that are of the 'tutorial style' may be used to extend talented or more motivated students, or they may provide remedial help, or for revision. When computers are used for testing students they can provide automated and immediate feedback to a student about their progress, or for assessment purposes. The use of computers to assess student performance has been adopted by some departments to reduce costs of marking. The use of computers has the benefit of providing feedback at a speed impossible if marked by staff. This allows many biology departments to provide the large number of students with guidance as to whether they have grasped the material at hand and where they need extra effort. There are clear advantages of using computers

across a wide range of teaching activities, and planning for the future should be alert to the diversity in this area.

Most biology departments want increased use of New Technologies in teaching

Of those departments that use CAL for teaching undergraduate biology, 90% use it for less than 10% of the contact time, almost half of these using CAL for less than 2% of contact time. The remaining departments (under 10%) use computers for 10-30% of contact time. No department uses computers for a larger proportion of contact time than this.

Only 15% of respondents were satisfied with the level of use of computers for teaching in their department. All of those dissatisfied with the use of computers believed that too little CAL was being used in their teaching program. The main impediments to making greater use of New Technologies in teaching were a lack of money, time, and persons with enthusiasm and knowledge in the field. The lack of money is a reflection of the costs of computer hardware and software, and the funds for staffing the development of CAL programs or simulations. Lack of time was not listed specifically in the questionnaire, but 13 of the respondents mentioned it as a factor restricting use of computers in teaching. This suggests that for many the enthusiasm and desire to be involved in the use and development of CAL for teaching is there but, due to the many demands on an academic's time, this cannot be achieved to a satisfactory degree.

Conclusions

Computers are already in widespread use in biology departments for teaching. They are welcomed by staff and students as a supplement to traditional teaching devices. There is a general view that they are under-used. The enthusiasm with

which they are used and greeted can assure us that the near future will probably see all students using computers at some stage in their biological education. Computers are used in many different ways. The survey has revealed the variety of hardware, differences in access to computers, the immense diversity of ways in which computers may be used, and the fact that each institution may seek to communicate different subject matter. It has revealed a motivation largely based on the educational needs of the students and not on commercial criteria.

The reasons for fostering the use of computers in teaching may have had little to do with the desired educational outcome, but more with management of staff, space, and budgeting. These benefits are not to be seen as incompatible with educational objectives, but rather as providing supplementary incentive to develop the use of CAL.

In addition to promoting an understanding of biology, the use of computers in biology departments enhance a student's generic, transferable, skills such as familiarity with computer operating systems, word processing, the use of spreadsheets and databases, as well as introducing and reinforcing biological content and concepts through biological CAL packages and simulations, and informing the students about their progress through the class material.

Dianne Chambers

This survey was undertaken as part of the study 'New Technologies in Biology Teaching: Towards a National Program' by Dr Dianne Chambers, Professor David Patterson and Dr Mary Peat, School of Biological Sciences, University of Sydney. The study was funded by DEET through their *Evaluations and Investigations Program*.

Article:

*Mick Pope is the
Educational
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UniServe•Science & the Web

<http://www.usyd.edu.au/su/SCH>

This article will familiarise you with the function and general jargon of the *World Wide Web (WWW)*, and then explain why UniServe•Science has a Web page, and what you can do with it.

The World Wide Web

The official description describes the *World Wide Web* as a “wide-area hypermedia information retrieval initiative aiming to give universal access to a large universe of documents” [1]. This information is accessed using software known as browsers (*eg* Mosaic or Netscape). The simplest example of hypermedia is hypertext, which is text on which a mouse-click will link to other documents (this is known as a hyperlink). Thus, a click of the mouse takes you to another document, locally or on the other side of the world. The great advantage of the Web is that it gives the user access to other forms of hypermedia; graphics, animations and sounds. The power of linking text (hypertext) or images (hypermedia), is that this more closely reflects the workings of the human mind than linear text does. It also employs other tools used by the Internet such as gopher, and ftp (file transfer protocol).

Uses of the WWW

What the WWW provides is a large body of information in an easy to use form. This information is available in three ways; (i) search tools, (ii) a ‘Jumpsite’ or starting points document, which is a list of links to sites of particular interest, (iii) random wandering (surfing or cruising the ‘net), which can be very time consuming. Search tools are powerful: they can search the

whole Web, but may take some time, and bring up many links that you are not interested in. A good jumpsite that pertains to the area you are interested in is a good alternative starting point. If you are interested in using software in your teaching, then UniServe•Science’s Web site will provide links to sites that may be of interest to you.

UniServe•Science’s Web page

One of the functions of the clearinghouse is to inform you what educational software is available. In addition to this newsletter, and our catalogues, the Web will provide you with an excellent means of getting access to information about what material is available. We will (in time) provide a searchable database that will allow you to find the software that best suits your needs. Reviews, evaluations and demo versions will be available at the click of a mouse. We will include references to commercial software catalogues and links to other sites where software is available. This saves you the effort of looking for it yourself. Since we are always looking at ways to improve our service, we welcome additions if you find materials or Web sites of interest. From time to time, re-visit our page to check out the latest interesting links or software reviews. UniServe•Science’s Web page is designed to assist you, and we hope that you will find it a useful tool.

Mick Pope

[1] *Entering the World-Wide Web: A Guide to Cyberspace*, Kevin Hughes.
<http://www.hcc.hawaii.edu/guide/www.guide.html>

Review:

Lake ecology while keeping your feet dry

Ove Hoegh-Guldberg is a Senior Lecturer in the School of Biological Sciences at the University of Sydney

For the teacher, bringing the biological, chemical and physical characteristics of a lake to life for students is often a tall order. Often the amount of time available extends at most to a few afternoons before the next subject has to be introduced. This problem can be partially solved by deploying interactive multimedia, which have the advantage that students can be guided through a series of experiences and problem solving exercises in a relative short period of time. The disadvantage, however, is that what is meant to be interactive multimedia is often no more than a 'book of moving pictures' with the result that the product does nothing to further student problem solving ability.

This is not the criticism that one can level at *Investigating Lake Iluka*. The Interactive Multimedia Unit at the University of Wollongong have come up with an excellent example of what can be achieved through an interactive CD-ROM product. This material is directed at high school students but could be used in first year of a general course in biology at a University. The user requires minimal computing skills to be able to operate it. While no software simulation will ever replace the value of going into the field with students, the combination of an afternoon at a real lake and *Investigating Lake Iluka* is extremely powerful. By combining the two, students would be able to see the real complexity of a lake ecosystem first hand, and then be guided through a series of otherwise difficult exercises using the interactive CD-ROM back in the classroom. When one considers the problem of providing an educational experience to students of large classes, this interactive tool becomes even more valuable.

Investigating Lake Iluka begins by carefully describing how to use the interactive CD-ROM by way of an effective tutorial that encompasses both visual demonstrations, and textual and spoken descriptions. It then directs the student to a series of habitats within a fictitious but realistic lake ecosystem. Accompanying the student on his or her excursion is a field notebook which can be used to gather data or write observations. There is a field centre which is both fun and informative, complete with reference collection and information source about the plants and animals in the lake as well as a news/history file. The student can also 'borrow' video tapes from the field centre and play a series of mini-documentaries on various aspects of the lake. The field centre is playfully realistic, with books untidily stacked on the shelves and the student's field notebook lying on the floor (presumably where they would leave it!).

While at the lake, the student can use a magnifying glass to explore the finer details of each habitat, and among these finer details can find a series of organisms that live in the lake. Perhaps the best aspect of this software is the ability for the student to take a series of chemical and physical measurements from Lake Iluka. Opening the physical toolkit, for example, allows the students to take measurements of temperature, humidity, irradiance, turbidity, and wind speed. These can be taken at any point in a habitat, and can be entered into the field notebook for later analysis. A similar range of chemical measurements are available in the chemical toolkit (eg phosphate, nitrate, etc.). The student is challenged to work out where and how to take samples, allowing them a

gentle introduction to the problems of measuring and describing a lake habitat.

Woven into the product are a number of problems for the students to pursue. Students are encouraged to answer the question of why lake water quality is declining in some areas, for example. To this end, they are given hints on what they might do to find out and where to go for information. By collecting physical, chemical and biological data on the lake, reviewing the reference collection and by pawing over the selection of news and video clippings, the students can develop a sophisticated scientific answer to the question of the decline of water quality in the lake. Once again, everything is recorded in the trusty notebook, which can be saved and printed out at a later stage in order to generate a student report. The material is extensive enough such that different student groups are likely to get quite different data sets, hence potentially come to different conclusions. This has potential to provide a lot of room for useful class discussion later on. The only criticism that might be levelled at the layout of the CD-ROM is that the 'problems section' comes last rather than first in the format, and there is a tendency for undirected exploration of the lake (which is fun and possibly useful as well) before one discovers the problem section. However, with a little guidance from the teacher, this aspect is a tiny criticism of what is an otherwise a top-class educational resource.

Ove Hoegh-Guldberg

Investigating Lake Iluka is published by Interactive MultiMedia Pty Ltd, and was developed by the Interactive MultiMedia Unit, Faculty of Education, University of Wollongong, NSW.

Requirements: Macintosh, Colour monitor, System 6.0.8 or above, QuickTime, 2.5MB RAM available.

Cost: \$175

A demonstration can be found at
<http://www.uow.edu.au/public/faculties/educ/IMLL.html>

Resource List

UniServe•Science aims to provide an easy means for academics to access information. Part of this aim is to provide referral to other services that offer information to academics. Listed below are contact details of a sample of information services you may wish to know about.

CTI Biology

CTIBiol@liv.ac.uk
gopher://gopher.csc.liv.ac.uk/11/ctibiol

CTI Chemistry

CTIChem@liv.ac.uk
<http://www.liv.ac.uk/ctichem.html>

CTI Geography (with Geology)

CTI@le.ac.uk
<http://www.le.ac.uk/cti/>

CTI Physics

CTIPhys@surrey.ph.ac.uk
<http://www.surrey.ph.ac.uk/cti/home.html>

CTI Psychology

CTIPsych@york.ac.uk
<http://ctipsych.york.ac.uk/ctipsych.html>

Rockware - The 1995 Earth Science Software Catalog

Graham Rennie, GeoSoft, 19 Britain Street, Como 6152, Western Australia

Scitech Software for Science.

\$2.95 from:
Techflow Pty Ltd, 5/17 Mooramba Rd
Dee Why, NSW 2099
Tel: (02) 971 4311, Fax: (02) 982 3623
<http://www.scitechint.com/scitech/>

Physics Academic Software 1994-1995

Prof. John Risely, Editor
Department of Physics
North Carolina State University
Raleigh, NC 27695-8202
Risley@ncsu.edu

Jacaranda Wiley Ltd

Margo Griffith mgriffith@peg.apc.org
<http://www.wiley.com/> Tel: (02) 805 1100
UniServe•Science currently has a number of titles from Jacaranda Wiley that are soon to be reviewed.

IME Software

i.moore@qut.edu.au
UniServe•Science currently has two titles from IME Software that are soon to be reviewed.

Dataflow Computer Services

PO Box 202, Waterloo, NSW 2017
Tel: (02) 310 2020, Fax: (02) 319 2676

Review:

WebElements: A Chemistry tool on the Web

Greg Warr is a Senior Lecturer in Physical Chemistry in the School of Chemistry at the University of Sydney

WebElements is a periodic table database available on the World Wide Web through several sites, including one at the Australian Defence Force Academy. The home page displays a periodic table in standard format forming a hypertext link to a separate data page. There are also references and links to other periodic table databases, which may differ somewhat from WebElements in presentation.

The home page also contains links to two utilities: an isotope pattern calculator and a mass composition calculator. Both are located at the University of Sheffield, and operate by the user typing a formula, e.g. C₆H₄O, and pressing Enter. The isotope patterns or elemental abundances are returned on a new page.

The main game is however the elemental data, which is presented as a single scrollable page for each element. This is fairly comprehensive and correct as far as I could see, but the data sources were not cited. Listed first are atomic number, weight, symbol, and some general information in such as standard state, colour, and details of the element's discovery. Scrolling down the page reveals atomics and ionic radii for various states, electronegativity, and effective nuclear charge, bond enthalpies, melting, boiling and critical temperatures, enthalpies of phase transitions and of ionisation, finally showing isotopic abundances.

While the data for each element is presented clearly, the organisation is inconvenient. As was suggested to me, a set of sub-headings which could be expanded via a hypertext link might make

it easier to navigate to the data you might want than the single page per element.

This makes WebElements a useful database, but with limited application in science education. If you want data on an element you should be able to find it. However more often one would like to be able to compare properties across a row or down a group of the periodic table, so a database permitting more sophisticated searching and comparison would be better in this context. This is in some ways a limitation of the web rather than WebElements. A more complex database would mean more memory and slower access. I am not even certain how far one can take html in this direction.

However, if you want elemental data, it is available on WebElements. Moreover, it's free, so you can look for yourself and determine how you might use it. I'm not sure that I'll use it very much, but it's nice to know it's out there.

Greg Warr

WebElements can be found at the URL
<http://apamac.ch.adfa.oz.au/ozChemnet/web-elements/web-elements.html>
For further information on the World Wide Web see the article on the Web earlier in this newsletter.

Sites of Interest

The NIH Molecular Modeling Home Page
http://www.nih.gov/molecular_modeling/mmhome.html

MacroModel Home Page
<http://www.cc.columbia.edu/~chempub/mmod/mod.html>

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Review:

OPTRANS - optics of imaging

Optrans is a numerical simulation of an optical Fourier bench, designed for use in an advanced physics or engineering course in modern optics. In use, one specifies an object, which is then Fourier-transformed to the diffraction plane. Filters may be applied in this plane and the result is Fourier-transformed to produce the image. Using the available features, 3D plots, profile plots and grey-scale displays are available to examine real functions of the data. These include: modulus, phase, imaginary part, *etc*, in the object, diffraction and image planes. The object may be built up from various arrays of simple geometric objects or can be imported as a subset of a .BMP file. Several standard filters, such as low-pass and high pass, are also available.

The program is for use only on a PC and installs easily from the single floppy provided. The user interface is pre-Windows and consists of a coloured set of menus which is generally negotiated hierarchically. However, at the top level, menus must be used in a forward sequence corresponding to the three planes. There is a manual which is 21 pages long.

The program performs efficiently and could be used in a computer laboratory with students working through a written tutorial. However, the lack of a Windows interface might tend to create a bad impression. It is somewhat unsuited to live lecture demonstrations due to the complexity of the menuing scheme and the screen mode changes. It could however be used to prepare images ahead of time.

There are several limitations which should be noted:

- There is no facility to unwrap the phase display, which makes it difficult illustrate how shifting the object alters the phase of the diffraction pattern.
- PostScript printers are not supported.

- The size of geometric shapes can be specified but not their position angle.
- There is little control over the assignment of greyscale to image amplitudes.
- There is no way to have say two diffraction patterns on screen for direct comparison

This reviewer could suggest some modifications the author might like to consider:

- The program uses the terminology input stage, diffraction plane, image plane. Either of the alternative terminologies object/diffraction/image or input/diffraction/output might be somewhat clearer.
- An extensive tutorial illustrating all the uses of the program would be very useful. The tutorial content of the manual is limited to one page.
- Allow the brush size to be specified when painting a general filter and improve the keyboard interface to make painting a mode rather than a command.
- Allow the same methods which are used to construct objects, to be used to construct filters.

There were also one or two occasions when the program crashed.

Nevertheless, despite these limitations, Optrans in its current form is a powerful program for illustrating Fourier concepts with 2D images, and should prove a very useful tool in a teaching laboratory.

Robert Minard

Optrans runs on a PC under DOS 5+, it requires at least 540K of memory, and will run more efficiently if 256K of expanded memory is available. Version 6 requires 4MB of RAM (8MB for 512 x 512 pixels) and a VGA card. Version 5 uses any graphics card.

To obtain Optrans contact its developer:
Dr Michael Reich
Dept of Applied Physics
RMIT
GPO Box 2476V
Melbourne Vic 3001
Tel (03) 9660 2603
email mike_reich@rmit.edu.au

Report:

OzCUPE2

Second Australian Conference on Computers in University Physics Education

*Ian Johnston is
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Lecturer in the
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the Director of
UniServe•Science*

This conference was held at the University of Melbourne on April 19–21, 1995. It was attended by approximately 100 physics academics from 30 universities in Australia and New Zealand. There were also invited speakers from the USA and Europe, and a small number of participants from universities in South East Asia.

The keynote speakers were:

- *Dr Fabio Bevilacqua* (University of Pavia) who described an elaborate CAL/Encyclopedia package for teaching history and philosophy of science.
- *Dr Rob Capon* (Department of Chemistry, University of Melbourne) who gave an extensive description of teaching packages used in first year Chemistry (see his article in this newsletter).
- *Dr John Davies* (Queensland University of Technology) who described the Software Teaching of Modular Physics (SToMP) project, part of the Teaching and Learning Technology Program (TLTP) in the UK.
- *Dr Ian Johnston* (University of Sydney) who described the Consortium for Upper-level Physics Software (CUPS), a USA-based project which has produced over sixty multi-part simulations for use in teaching.
- *Dr Bengt Kjällström* (University of Lund, Sweden) who spoke on the description of Swedish Council for Renewal of Undergraduate Education (CRUE), and their plans for establishing networks for the distribution of teaching software.
- *Dr Diana Laurillard* (Institute of Educational Technology, Open University, UK) who spoke on problems involved with the design of

interactive ('student-active') packages for teaching.

- *Professor Lillian McDermott* (University of Washington, Seattle, USA) who spoke on physics education research dealing with students' misconceptions in introductory physics problems.
- *Professor Joe Redish* (University of Maryland, USA) who spoke on new ways of using computers in the teaching of introductory physics courses, based on findings of recent educational research.
- *Professor Ed Taylor* (Boston University, USA) who spoke on a distance education course dealing with special and general relativity conducted entirely by email conferencing.

The meeting was enjoyed by all present, and cemented the feeling of community, established at OzCUPE1 (Sydney, 1993). It demonstrated the level of activity there is in this country, and underlines the need, which we at UniServe•Science are pushing, to make sure others know about the level of activity. A copy of the proceedings of the conference may be obtained (\$50) from the organizers: Dr David Jamieson and Mr Jon Pierce, Department of Physics, University of Melbourne; to whom a vote of thanks should be given for the success of the conference. Further information may be gained from their Web page: <http://OzCUPE2@unimelb.edu.au/info>

The next conference in the series will be held at the Queensland University of Technology in 1997. If you are interested in what is happening in the use of computers in university physics teaching, be there!

Ian Johnston

*These projects
are currently
funded by CAUT
grants in the
sciences*

CAUT Projects for 1995

BIOLOGY

Computer-supported collaborative work in microbiology and immunology

University of New South Wales: Prof A Lee, *et al.*, a.lee@unsw.edu.au

A multimedia package for teaching adaptive physiology

La Trobe University: Dr L M Gibson, M Boelen, A Verrinder, gibson@basil.ucnv.edu.au

Integrated laboratory programs for small group teaching of technical skills

La Trobe University: Mr K Wong Hee, C Hale, B Malone

An integrated instructional program on mathematical modelling for biology students

Flinders University of South Australia: Dr C M Franco, *et al.*, btcmf@cc.flinders.edu.au

Teaching practical pharmacology using interactive multimedia

University of Melbourne: Prof J Angus, D W Williams, james_angus@muwayf.unimelb.edu.au

Interactive multimedia computer tutorials in basic biology

University of New England, Dr P M Whittington, pwhiting@metz.une.edu.au

Application of explanation based learning to the teaching of biochemical calculations

University of Sydney: Dr G Denyer, J Johnston, gareth@biochem.su.oz

CHEMISTRY

Development and production of videos for microscale laboratory courses

Swinburne University of Technology: Ms J O'Connor, B Shearer (University of Ballarat), T Smith, jo-connor@buster.swin.edu.au

Interactive multimedia materials which develop student understanding of chemical equations

Edith Cowan University: Prof P J Garnett, M Hacking, R Oliver, p.garnett@cowan.edu.au

Learning modules for computational chemistry over AARNET

Northern Territory University: A/Prof B J Salter-Duke, *et al.*, b_duke@lacebark.ntu.edu.au

Design of a pool of constructivist tasks for learning chemistry

University of Western Australia: Dr R B Bucat, *et al.*, bucat@chem.uwa.edu.au

Interactive teaching & testing tutorials for first year chemistry

University of Melbourne: A/Prof P McTigue, *et al.*, peter_mctigue.chemistry@muwayf.unimelb.edu.au

GEOLOGY

Computer aided visualisation and interactive interpretation of geological history

University of Wollongong: Dr L E A Jones

Computer aided learning in earth sciences one path in a quality teaching environment

La Trobe University: Prof A J W Gleadow, *et al.*, agleadow@mojave.latrobe.edu.au

ICLASM interactive computer learning and soil management

University of Sydney: A/Prof A J Koppi, A McBratney, tony.koppi@cropsci.su.edu.au

PHYSICS

Diagnostic tools for improving concept development

University of Sydney: Dr B McInnes, P Walker mcinnes@physics.su.oz.au

Thinking skills for science students

University of Adelaide: Dr A Grisogono, I Kotlarski, amg@physics.adelaide.edu.au

Experimental methods in the physical sciences a text, video and computer based approach

University of Technology, Sydney: Dr L Kirkup, D Cobbin, B Larkin, kirkup@phys.uts.edu.au

Enhancing the broader skill requirements of science graduate

University of Technology, Sydney: Dr R J Sleet, P Hager, P Logan, r.sleet@UTS.edu.au

Calendar of Coming Events

If you know of other relevant conferences, let us know so that we can publish the details

WCCE '95 "Liberating the Learner" - 6th World Conference: Computers in Education.

Birmingham, UK, July 23-28, 1995,
Tel: Sandra Wills (042) 214 544

ALT-C '95 "Changing Education, Changing Technology"

Open University, Milton Keynes, UK, September 11-13, 1995
Rhonda Riachi, email: alt@vax.ox.ac.uk

ANZAAS '95

University of Newcastle, Newcastle, September 24-27, 1995
Tel:(049) 21 5630, Fax:(049) 21 6923

Karlsruhe: Learntec '95

Austria, November 7-10, 1995,
email: asi@asi.uni-klu.ac.at

Joint CTI/TLTP conference "Embedding Technology into Teaching"

Heathrow, UK, November 27-29, 1995

ASCILITE (Australian Society for Computers in Learning in Tertiary Teaching) Conference: "Learning with Technology"

University of Melbourne, Melbourne, December 4-6, 1995 (abstracts due June 30),
email: ASCILITE95@unimelb.edu.au
<http://ASCILITE95.unimelb.edu.au/info.html>

Coming in 1996

14th International Conference of Chemical Education, Brisbane, July, 1996

College Park Conference on Undergraduate Physics Education, Maryland USA, July;

14th Biennial Conference of Chemical Education , Clemson University USA, August

UniServe Sites

Co-ordinating Centre

Prof. Chris Bryant
Division of Botany and Zoology
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chris.bryant@anu.edu.au
<http://uniserve.edu.au/uniserve>

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Prof. R W Upfold
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University of Wollongong
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upfold@uow.edu.au
<http://engch.uow.edu.au/clearinghouse>

Humanities and Social Sciences

Dr Ern Reeders
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Administration
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Royal Institute of Technology
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Law

Dr R Moles
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Australian National University
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bob.moles@anu.edu.au
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Medicine, Health Sciences and Nursing

Level 3, Medical Sciences Building
Faculty of Medical and Health Sciences
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