MICROBIOLOGY TODAY

QUARTERLY MAGAZINE OF THE SOCIETY FOR GENERAL MICROBIOLOGY VOLUME 28 MAY 2001

Microbiology education special

Foot-and-mouth disease

Women in science

Public Library of Science – SGM policy

Contents

SGM Headquarters
Marlborough House,
Basingstoke Road, Spencers
Wood, Reading RG7 1AG
Tel. 0118 988 1800
Fax 0118 988 5656
email mtoday@sgm.ac.uk

SGM Website
http://www.sgm.ac.uk

Editor
Dr Meriel Jones

Editorial Board
Professor Dave Kelly
Dr Lynne Macaskie

Managing Editor
Janet Hurst

Production Editor
Ian Atherton

Assistant Editor and Book Review Manager
Janice Meekings

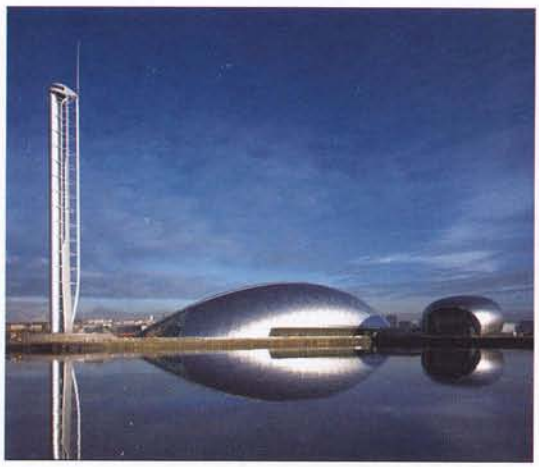
Contributions
These are always welcome and should be addressed to the Editor (c/o SGM Headquarters).

Copy Dates
Last dates for receipt of copy at Marlborough House are:
General Copy
August 2001 issue 29 May
November 2001 issue 3 Sept.
Advertisements (CRC)
August 2001 issue 25 June
November 2001 issue 1 October

Advertisements
All enquiries should be sent to:
Julie Lauder, NWH Sales Ltd,
The Arcade Chambers,
The Arcade, Aldershot,
Hampshire, GU11 1EE
Tel. 01252 357000
Fax 01252 357001
email jools@nwh.co.uk

Subscriptions 2001
NON-MEMBERS
Microbiology Today £50.00 (US$85.00)
MEMBERS
All members receive *Microbiology Today*. In addition they may take any of the Society's journals.
Ordinary Member
Membership Subscription (inc. *Microbiology Today*) £40.00 (US$70.00)
Microbiology £70.00 (US$135.00)
JGV £70.00 (US$135.00)
IJSEM £70.00 (US$135.00)
Student or Retired Member
Membership Subscription (inc. *Microbiology Today*) £20.00 (US$33.00)
Microbiology £35.00 (US$65.00)
JGV £35.00 (US$65.00)
IJSEM £70.00 (US$135.00)
Undergraduate Member
Membership Subscription (inc. *Microbiology Today*) £10.00

Design: Graphics International



Above: Glasgow Science Centre. *Courtesy Glasgow Science Centre / Keith Hunter*

Vol. 28, Part 2, May 2001

In this bumper issue we look at the many facets of microbiology education. Education Officer Liz Sockett introduces the theme by emphasizing that education is for life (p. 51), following this with some facts and figures about microbiology first degree course content and recruitment (pp. 54–58). Peter Wildy Prize lecturer Alan Cann considers skills that students have to learn outside the science (pp. 52–53) and Ron Bishop and Adrian Eley ponder on the knotty problem of teaching them maths (pp. 62–63).

At postgraduate level, the student/supervisor relationship is crucial, as Adrian Eley describes (pp. 58–59).

Studying overseas has its pros and cons. Here we cover the experiences of a UK microbiology undergraduate at a French university and what's involved in postdoccing in the USA (pp. 64–65). Meanwhile on p. 72 Martin Collins passes on his knowledge by running a training course in Mexico.

The resources and help available to microbiology educators are surveyed by Heather Sears (pp. 68–69), Yolande Knight (p. 70), Joanna Verran (p. 71) and Peter Robinson (p. 66). A wide range of teaching aids is also described by the innovative recipients of SGM Education Fund awards (pp. 77–80).

Developments in post-16 education in UK schools are discussed by Dariel Burdass, whilst Ian Sutherland describes the biotechnology summer school held annually for Scottish teachers (pp. 74–75).

Leigh Fish explores the facilities available to the public to learn about microbiology at the new Millennium Science Centres (pp. 60–61).

Other important topics covered include the UK foot-and-mouth disease outbreak (pp. 82–83) and the SGM stance on the Public Library of Science (p. 50).

These articles appear in addition to all the regular features and reports of Society activities.

Erratum

In the February 2001 issue (vol. 28, part 1) the first sentence in the article *Salmonella in Domestic Animals* on p. 41 should read 'salmonellosis', not 'mycoplasmosis'.

Articles

Regular Features

Other Items

The Public Library of Science campaign: a statement of policy by SGM Council

Recently, a letter has been circulating (www.publiclibraryofscience.org) urging life scientists to boycott journals, as authors, editors or referees, which do not:

- allow free on-line access to full-text articles from 6 months after publication
- deposit all content in public repositories such as PubMed Central.

The proposal has caused considerable debate and responses are appearing in various media. SGM Council has considered the matter and wishes to draw certain matters to the attention of members and other interested parties.

The objective of the Society for General Microbiology is to promote the science of microbiology. We do this by:

- publishing three journals, with quality ensured by rigorous peer review and editorial standards, and high production standards, including an excellent level of service to authors, readers, editors and referees
- supporting the career development of members, especially in the early stages
- holding a successful and enjoyable programme of scientific meetings
- organizing a number of educational and outreach activities to foster the wider understanding of microbiology. These include initiatives aimed at countering uninformed attacks on science; such attacks constitute at least as great a threat to the future of research as does a limitation on access to the published literature.

The income from subscriptions to SGM journals is used to cover the considerable costs of the peer review and production processes, including on-line publication. The modest surplus remaining is used entirely to support the wider charitable activities listed above.

Free on-line access to back issues

As scientists and scientific publishers, we recognize the merit of making full-text articles as freely available as possible. Access to the tables of contents and abstracts of the SGM journals at HighWire Press (www.sgmjournals.org) is free to all for current and all past issues. Full-text articles are currently made freely available to non-subscribers 12 months after publication.

This access control period will be kept under review, but it has to be said that many learned society, not-for-profit publishers are seriously concerned that making information freely available after only 6 months could seriously compromise income from journals, and hence place their economic viability and survival in doubt.

It is notable that the small number of journals that have moved to free availability after 6 months are largely those which support production costs by imposing page charges, which SGM does not. Several are published by large US societies which subsidize their activities by levying registration charges for meetings, which SGM does not.

So far, the large commercial publishers have made few moves to make any back issues freely available. It has indeed been suggested (*Nature* 410, 502) that they may relish the attack by Public Library of Science on the low cost journals produced by learned societies, as a means of seeing off the competition.

Overall, Council feels that any moves to increase free access to the Society's journals need to be approached cautiously and in the context of the activities and business model of the Society as a whole.

Deposition of content on PubMed Central and other public servers

The Society's electronic journals at HighWire Press have advanced features, either available now or under implementation, which make them amongst the most sophisticated in the world. These features include simultaneous searching across the 250 titles on HighWire, toll-free linking to cited articles, and soon linking to journals in other databases through the CrossRef scheme. Increasingly, our articles on HighWire can be 'pointed to' from other databases, to give seamless access.

Yet the main proponents of Public Library of Science have set great store in trying to coerce learned society publishers to deposit their data on PubMed Central and have been roundly criticized from many quarters on the grounds of impracticality, costs, lack of added value and more. Some of the main criticisms include:

- Technical difficulties and costs. Processing text and graphics files for mounting on different systems is complex, expensive and difficult. Why do it when the material is already available? SGM cannot afford to duplicate the costs it incurs at HighWire and in house.
- Technical difficulties at PubMed Central have meant that even though the site has been live for over a year, it still contains very few journals and some journals still lack basics such as a search facility. The Public Library of Science proposal for one or more central repositories may at present be a goal that is very difficult to achieve.
- Keeping material on a publisher's site enables the publisher to take responsibility for the reliability and maintenance of the data, including corrigenda, and to administer the copyright to protect the interests of authors. SGM is currently participating in two long-term archiving experiments, 'LOCKSS' and 'Dark Cave', to secure data in perpetuity.
- *Science* magazine (published by the American Association for the Advancement of Science) has expressed severe reservations about depositing a large proportion of the quality biomedical literature on PubMed Central, which is ultimately under the control of the US Government, and would effectively create a monopoly.

SGM Council recommends that members give very careful consideration to these drawbacks before considering whether to support the Public Library of Science campaign.

Microbiology – a lifetime's education

Liz Sockett

This issue of *Microbiology Today* covers microbiology education in the broadest sense of the words. Its contents range from the public educational opportunities at Millennium Science Centres, to the educational experiences of postdoctoral study in the USA and the pleasures and pitfalls of supervising postgraduates through their higher degrees. We examine the microbiology education that is to be had on bachelor's degree courses and in schools in the UK. Even the book review section is widened to take in the fun side of children's microbiology education to be found in the *Horrible Science* paperback series.

Education has often been seen in the past as a Cinderella activity for practising scientists. Indeed in 1998, when I took up the newly created role of Education Officer on SGM Council, the predominant sentiment of my academic peers was one of astonishment that I would take on a 'spare-time' task that does not count for the RAE! My experience to date as Education Officer has shown me that the highest echelons of government and commerce take education very seriously and that 'the ground' is moving very quickly. I'm convinced that we scientists all need to engage with education matters to ensure both a continued flow of qualified researchers into our field and continued public support and confidence in our work.

So these days I would suggest that education is the new mantra word for the 21st century. One of the incoming slogans of the current UK government was 'education' and the current Green Paper (*Schools: Building On Success*) from the DfEE speaks of the great need for '*education with character*'. As anyone who has gone through a PhD in microbiology can attest, getting educated in our discipline is most certainly character-building. With the advent of genomics, bioinformatics and web-based courses, there have never been more reasons for the microbiologist to interface with education.

As active microbiology researchers we may see education as something that takes place in a classroom, but our everyday lab experiences are all part of our own continuing education and of those we supervise or work alongside. At the recent Spring Meeting in Heriot-Watt University almost a quarter of our total membership thronged the halls and poster sessions in an act of mass education, all telling themselves that they were there to '*keep up with research developments*'! This meeting also highlighted several important educational issues for the microbiologist.

First, the particular importance of education in microbiology in the context of the social and public impacts of our subject. This was shown when Dr Nick Knowles from IAH at Pirbright briefed a packed auditorium on the foot-and-mouth disease epidemic. We SGM members, all 'microbiology experts' in our own right, keenly soaked up the real scientific details underlying the news headlines. Outside the auditorium, the public at large are fearful of micro-organisms, hearing much of their negative impacts and little of the essential life-support mechanisms that they provide. As the majority of our research is still publicly funded, we owe it to the tax payers of the UK to put on our educators hats and to explain our own balanced views of the risks and benefits of micro-organisms and of the need for ongoing research.

The second educational aspect of the Heriot-Watt meeting was also based upon public accountability. This time it was the accountability of university educators to deliver 'quality' education to our students which is good value for money for the government. The SGM Education Group ran a very timely benchmarking symposium in which representatives from the QAA, the Benchmarking Panel and heads of university biological sciences departments discussed the means by which our microbiology degree level teaching will be assessed against a generic set of biosciences benchmark statements in future. Like it or not this kind of scrutiny is here to stay in higher education. The draft biosciences benchmark was released for consultation only days before the SGM meeting. The good news is that we are all invited to enter the consultation process so that the final benchmark produced is one we can accept. Find it at www.biohubs.org.uk

Third, the need for lifelong learning was highlighted, by a Young Members Workshop, presented by members of the Sanger Centre. It outlined the utility of a suite of bioinformatic programmes for genome interrogation, including Artemis and ACT. Many of the 'young members' sneaking in were decidedly long in the tooth and it was quite rightly pointed out that many microbiology academics would welcome training in these areas so they can apply these programmes to their research and teaching. I will be looking to see how SGM can best help members with this need in future.

Finally, the Heriot-Watt meeting was the venue for the inaugural Peter Wildy Prize Lecture for Microbiology Education. This is the SGM's way of acknowledging the value of microbiology educators in disseminating the outcomes of their researches to schools, students, other professionals or to the public at large. The first winner, Dr Alan Cann, excels in web-based microbiology higher education and he contributes to this issue. In future years I am sure that we will be honoring microbiology educators in many different fields. The very nature of microbiology and the impacts that it has on human and animal health, means that there will always be pupils and members of the public wanting to know more about the microscopic and molecular world which we explore.

ROMILLY LOCKYER/THE IMAGE BANK
© MCMXCIV

● *Dr Liz Sockett is Education Officer of the SGM and can be contacted at Genetics Division, School of Clinical Laboratory Sciences, Queen's Medical Centre, University of Nottingham, Nottingham NG7 2UH.*
Tel. 0115 919 4496; Fax 0115 970 9906
email liz.sockett@nottingham.ac.uk

The key to success

Alan Cann

My Lords, Ladies and Gentlemen,

Welcome to the Educational Heavyweight Championship of Great Britain!

In the red corner:

David 'Bomber' Blunkett,
Secretary of State for Education & Employment and his henchmen, The Campaign for Learning (www.campaign-for-learning.org.uk)

CARTOON BY SALLY NOBLE

In the blue corner:

Chris 'I could have been a contender' Woodhead,
former OFSTED Chief Inspector of Schools

'Everybody gets so much information all day long that they lose their common sense.' *Gertrude Stein*

A vigorous debate has been raging in the UK recently between the exponents of key skills ('learnacy' – the ability of students to manage their own learning) and the exponents of 'knowledge' – the old 3 'R's. After simmering for some time, debate boiled over after an article in the *Daily Telegraph* on 1 March 2001 which launched Chris Woodhead's media career with an attack on *'a misguided emphasis on utilitarian skills'*.

What might these 'skills' be? There is no universally accepted definition, but a typical set of 'key' or 'transferable' skills designed to promote career achievement would be something like:

- Communication
- Application of number
- Information technology
- Working with others
- Improving learning performance ('learnacy')

Does that sound awfully like common sense? How do you teach that?

How did we get into this mess?

The reasons are buried deep in educational theory. The work of behaviourists such as Pavlov and Skinner gave rise to a school of thought that learning is a modification of behaviour patterns which can be induced by conditioning. 'Operant conditioning' occurs when reinforcing consequences immediately following a particular response increases its future likelihood and aversive consequences immediately following the response decreases its future likelihood. No, we are not talking electric shocks here! Assessment outcomes are a powerful motivating force for most students. The difficulty with these ideas is that the reinforcement is often far divorced from the behaviour which elicited it – how long does it take you to mark your exam papers?

These difficulties gave rise to the alternative cognitive theories of learning – the preferred ways in which individuals process information. Kolb's 'experiential learning' model and Schon's 'reflective-practice' approach stress the importance of individual involvement in learning and subsequent critical reflection to build knowledge and understanding. From these, and simply from looking at the students we teach, we get the concept of 'deep' and 'superficial' learners. These alternative approaches are not inherently good or bad, they are merely alternative strategies students adopt.

So what works best?

Warning! Controversial statement follows:

'Microbiology as a discipline is almost devoid of theory.'

Once students have grasped the concept of asepsis and the universality of micro-organisms, all the rest is simply cramming facts. OK, so I'm exaggerating. Slightly. But compared with maths, physics and even chemistry, we are a knowledge-based subject. Yet few of us would maintain that we do not need to equip our graduates and postgraduates with the necessary skills to succeed in the job market – how many of them will need to know the difference between a *Proteus* and a pseudomonad after they graduate? So many bugs, so little time... The only

solution I have been able to come up with is to try to integrate key skills into subject-specific materials.

Communication. Written, verbal and electronic communication skills are all vital to professional success. Writing an essay on bacterial endospores is fine if you are heading for a career writing papers for *Spores* or whatever the latest obscure research journal is, less useful if you are destined to become a teacher or a sales rep. Conducting interviews with scientists is popular in the United States, as my groaning email inbox testifies (no, please, don't...). One of the exercises I use is to try to tie academic content to current media concerns gathered from the *Microbiology Newsroom* (http://www-micro.msb.le.ac.uk/tutorials/news/micronews.html).

Application of number. OK, so our students are maths-phobic – that's why they're microbiologists rather than biochemists! To overcome this, we must teach them microbiology, not maths. Forget the theory and how all the equations are derived (yes, I know it's difficult, but you've got to let go – you can always supply this information to the high achievers if you feel you must). Start with '*How many bugs make three?*' if necessary and move on to the probability theory behind calculating multiplicity of infection.

Information technology. Integration is the key. Communicate with them by email, bulletin boards and discussion groups as well as face to face. Insist on word processed essays containing graphics and that practical data is returned as a spreadsheet. Don't teach them IT – teach them microbiology, using IT.

Working with others. Truly collaborative practical and data collection/analysis exercises where students do not just work in cozy pairs but must first organize appropriate group structures and responsibilities, and then rely on group data for a successful outcome.

Improving learning performance ('learnacy'). I suggest that teaching for 6 or 7 months followed by a 3 hour exam is not the best way to promote optimum learning skills for the majority of students. Neither is a degree where continuous assessment is the sole measure of achievement. Goals, targets and deadlines must be set, possibly by negotiation, monitored, met and rewarded appropriately.

So what should we tell Messrs Blunkett and Woodhead or our Head of Department when they ask us what we are doing about key skills?

- That we have always taught key skills, we just didn't know we were doing it.
- That our students registered for a degree in microbiology/biology, not 'key skills', but we recognize that they want a job at the end of it.
- That usable skills come from experience, and that knowledge and experience cannot be separated.

'*It is a very sad thing that nowadays there is so little useless information.*' *Oscar Wilde*

● *Alan Cann won the first Peter Wildy Prize for microbiology education. He is Senior Lecturer, Department of Microbiology & Immunology, University of Leicester, PO Box 138, Medical Sciences Building, University Road, Leicester LE1 9HN. email alan.cann@leicester.ac.uk*

Disclaimer

This article reflects the author's personal viewpoint. Any resemblance to real persons, living or dead is purely coincidental. Void where prohibited. Some assembly required. Batteries not included. Contents may settle during shipment. Use only as directed. Best if eaten before date on carton. Subject to change without notice. Breaking seal constitutes acceptance of agreement. Building robots is dangerous and should not be attempted without great care. Substantial penalty for early withdrawal. Do not write below this line. No purchase necessary. Driver does not carry cash. No shoes, no shirt, no service. Other restrictions may apply.

Microbiology education and the SGM

The SGM Education Group

What does it provide and how does this fit in with the work of the SGM HQ staff and Education Officer?

The Group, which is run by a committee led by convener Peter Wyn-Jones, organizes a series of symposia and evening workshops which address issues relevant to undergraduate, postgraduate and professional training in microbiology. Liz Sockett, the Education Officer, is the Council representative on the committee and an ordinary member of the Group to ensure continuity between HQ activities and Group activities.

Membership of the Education Group is drawn from academics in higher education and from industrial microbiologists who have public education/schools liaison duties. New members are required annually for the Group Committee so please contact the convener if you are interested in being nominated (peter.wyn-jones@sunderland.ac.uk).

Recent Education Group symposia have highlighted issues of relevance to microbiology higher education, e.g. *Bioscience benchmarking*, *Mathematics in microbiology*, *Innovative teaching methods*, *Teaching microbiology to non-specialists* and *Computer-assisted learning*.

The future programme includes:

- **Autumn 2001**, University of East Anglia Symposium on *Research supervision: how to get it right*
- **Spring 2002**, University of Warwick Symposium on *Careers in microbiology*, to include an evening workshop
- **Autumn 2002**, University of Loughborough Symposium on *Patents and intellectual property rights*

BSc microbiology degrees in the UK

Liz Sockett

Liz Sockett takes a look at first degrees in UK universities, analysing the recruitment figures and checking out their course content.

Entering stationary phase? Student recruitment

An interrogation of the UCAS statistics for 2001(www.ucas.ac.uk) reveals 199 UK first degree programmes that include the word 'microbiology' in their title, of which 51 are single-subject microbiology degrees. In the remainder microbiology is offered in combination with subjects including French, German, psychology, computing, food science, immunology and opthalmic dispensing. The range of UK institutions offering these degrees is shown in Fig. 1. Some others, not listed, offer microbiology within biotechnology programmes.

Despite the plethora of institutions offering degrees, the total number of students entering bachelors degrees with a C5 microbiology code in the UK is only around 500. As the histogram in Fig. 2 illustrates, this number is similar to that for genetics, but considerably less than for biochemistry, chemistry and biology degrees. As Fig. 2 shows, recruitment to microbiology degrees is approximately one-quarter of that to media studies degrees. If only microbiological media were as attractive as the news media!

As can be seen in Fig. 3, recruitment onto microbiology degrees has remained steady or even slightly increased over the last 5 years with the exception of 2000 where a downturn was experienced. Whether the 2000 figure turns out to be an anomaly, only time will tell. The picture is similar for biochemistry and genetics degrees. For degrees in biology and chemistry a moderate downturn in recruitment is seen, but this is from a pool of student places that is eight to ten times bigger. This recruitment picture is set against an approximately 7% increase in total student numbers entering university over the same 5 year period. The comparative figures for media studies help to explain where those students are going.

What these recruitment figures clearly show is the value of explaining the interesting careers that a degree in microbiology offers to even a small group of local school pupils. Speaking to just five pupils one could be addressing 1% of all entrants to microbiology degrees in a year! The SGM External Relations staff put a great deal of effort into attending careers fairs for pupils who are deciding which GCSEs to take or which degree to study. Our careers leaflets and posters, *Microbiologists make a difference!* (as shown above), explain which school subjects give pupils access to microbiology degrees and dispel some of the specialization myths that abound. All SGM members running any sort of schools open days are welcome to have a supply of the leaflets by contacting careers@sgm.ac.uk

Once again we are all busy with our research but taking time to do a bit of recruiting for our subject is a positive alternative to bemoaning the paucity

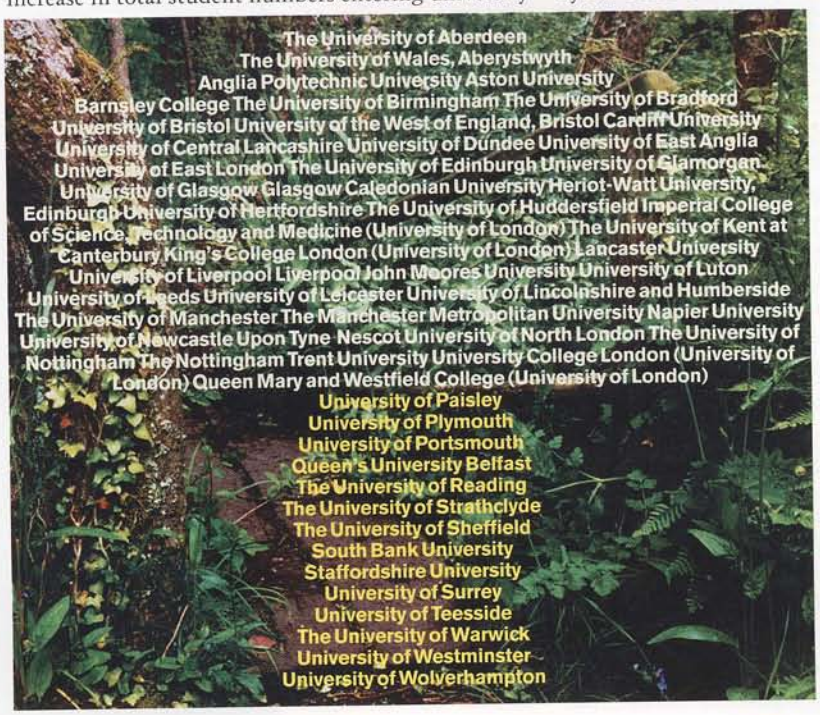


Fig. 1. Mushroom diagram of UK universities offering degrees containing microbiology.

Fig. 2. Number of 'degree accepts'*

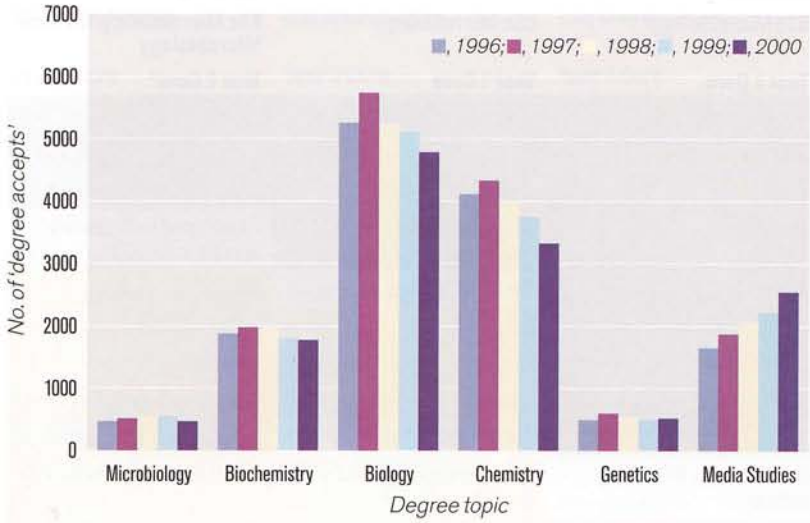
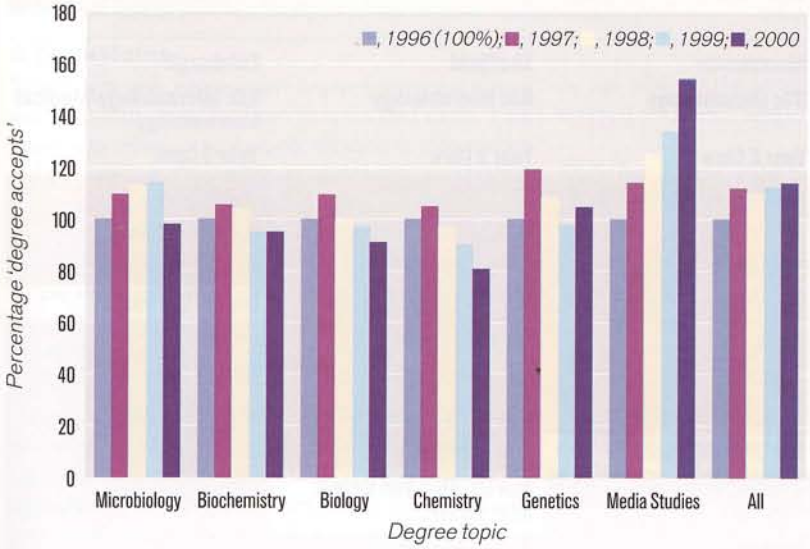


Fig. 3. 'Degree accepts' as a percentage of 1996 numbers*



*Source: Higher Education Statistics Agency. The figure of 'degree accepts' shown in Figs 2 & 3 above represents those applicants who firmly accepted an offer to do a microbiology degree and then made the grades required by their offer.

of postgraduate and postdoctoral applicants that we receive when advertising our research posts! I am well aware that issues of temporary contracts and salaries that are adequate rather than meteoric do make microbiology careers harder work than maybe those in media studies. However, the exciting and sometimes threatening challenges that bacteria and viruses are constantly presenting to our society need an army of well-educated graduate microbiologists to tackle them. Otherwise we may no longer be around to read the papers that the media studies graduates produce!

BSc microbiology today

Microbiology can encompass a diverse set of subjects and the content of microbiology degrees depends upon the research interests of the academic staff and upon the requirements for co-teaching of classes with other bioscience students, especially in the early years. As we are specializing in microbiology education in this issue of *Microbiology Today*, I have tried to compile a very small snapshot of degree content kindly supplied to me by some members of SGM Council. The degree courses were chosen purely arbitrarily based on the supply of usable material to me. I do not provide these data as any sort of statistically reliable view of current BSc microbiology courses, but it strikes me that as an educational community, we know little of the diversity of degree courses in our neighbours' institutions. Further surveys of degree course content in all institutions can be found in the *CRAC Degree Course Guide: Microbiology, Immunology and Biotechnology* and I will not be volunteering to expand upon the tables presented here!

Although the snapshot is very small and does not include a diversity of old and new universities, it is good to see that the research project and literature review, or dissertation, are alive and well. It is also interesting to note the varying levels of provision made for mycology in different degree schemes, supporting the comments made by Professor Tony Trinci about the dearth of university mycologists in the August 2000 issue of *Microbiology Today*. In addition we can see that some universities have already decided to incorporate bioethics or microbiology and society modules into their degree courses. With pressures for transparent public accountability in scientists rising, this may be a trend that is set to continue. Interestingly, training in ethical issues is listed in the draft *Bioscience Benchmark*.

Another feature of the degree schemes is the reassuringly high microbiology content. With the amalgamation of many former microbiology departments into super-schools of molecular biology or life and health sciences, it is pleasing to see that a BSc in microbiology has not become simply a degree in molecular biology with slight lip-service paid to the organisms in which genes are manipulated. Molecular biology techniques are very useful, but in the post-genomic era, now that we are trying to assign function to gene products, we need young scientists who can understand the diverse physiologies, behaviours and community interactions of micro-organisms. While on the subject of microbial communities, it is interesting to note that not many of our snapshot courses explicitly teach biofilm biology – a shortcoming identified in American degree courses that was addressed by visiting ASM members Bill Costerton and John Lennox at an evening educational workshop at the Exeter SGM Meeting in 2000. Maybe our biofilm biology is embedded into relevant courses on medical and environmental microbiology.

Liverpool BSc Microbiology	Nottingham BSc Microbiology	Manchester BSc Microbiology	Sheffield BSc Microbiology	Edinburgh BSc Microbiology/Medical Microbiology
Year 1 Core	**Year 1 Core**	**Year 1 Core**	**Year 1 Core**	**Year 2 Core***
Cells	Genetics & Cell Biology	The Cell	Molecular Biology of the Gene 2x	Cell Metabolism & Regulation 2x
Molecules	Industrial Applications	Biotechnology	Microbes in Medicine & Industry 2x	Microbes, Cells & Immunity 2x
Diversity & Evolution	Foundation Science	Genetics	Genetics 2x	Genes & Gene Action 2x
Biochemistry	Biochemistry	Biochemistry	Biochemistry 2x	Equivalent of six 1x courses from these OPTIONS:
Four OPTIONS from:	Food Manufacture, Nutrition & Health	Bacteriology & Virology	Two OPTIONS from modules in:	Biometrics 2x
Chemistry	Virology	Molecular Biology	Biology	Evolution in Action 2x
Environment & Humanity	Microbes & Disease	General Chemistry	Physics	Animal Biology 2x
Immunology	Food Safety	Biomaths	Chemistry	Plants, Fungi & Symbiosis 2x
Genetics of Higher Organisms	Microbial/General Genetics	Tutorial Units	Two OPTIONS from:	Chemistry for Life Sciences 2x
Ecosystem Ecology	Metabolism/Biochemistry	One from many OPTIONS, including:	Unrestricted choice of modules to fit timetable	Global Environmental Processes 2x
Cell to Multicells	Data Analysis/Presentation	Diversity & Evolution		
	Whole Organism Biology	Animal Designs		

Liverpool BSc Microbiology	Nottingham BSc Microbiology	Manchester BSc Microbiology	Sheffield BSc Microbiology	Edinburgh BSc Microbiology/Medical Microbiology
Year 2 Core	**Year 2 Core**	**Year 2 Core**	**Year 2 Core**	**Year 3 Core**
Biotechnology	Medical Microbiology	Bacterial Infection & Host Immunity	Environmental Micro	Microbiology 3x
Microbial Physiology	Microbial Physiology		Microbial/Human Disease	Medical Microbiology 3x
Parasitism/Symbiosis	Plant Pathology	Parasitology (molecular)	Practical Molecular Biology	Microbial Biotechnology 3x
Microbial Genetics	Food Borne Pathogens	Gene Mobility/Maintenance	Molecular Biology Techniques	One OPTION from:
Virology	Dissertation	Tutorial Units	Microbiology Practical	Immunology 3x
Microbes & Environment	Applied Mycology	Fungal Diversity & Physiology	Microbe Structure Function/Growth	Molecular Biology & Genetics 3x
Human & Plant Pathogens	Microbial Fermentation	Structure/Function of Microbes	Gene Expression & Regulation	Molecular Cell Biology 3x
One OPTION from:	Five OPTIONS from:	Four OPTIONS from:	Microbial Energetics	
Genetic Analysis	Plant Biotechnology	Gene Expression	Four OPTIONS from these or other modules:	
Evolution	Bioethics	Immunology	Practical Biochemistry	
Population Ecology & Pest Control	Chemistry of Macromolecules	Commercial Exploitation of Plants	Struct. & Funct. of Macromolecules	
Molecular Biology	Bacterial Genes/Development	Genetic Engineering	Biological Membranes	
	Food Preservation	Plant Pathology	Biological Messengers	
	Computing	Biomaths	Eukaryotic Genetics	
	Practical Plant GM		Metabolism Control/Manipulation	
	Molecular Evolution		Microbial Genetics	

Liverpool BSc Microbiology	Nottingham BSc Microbiology	Manchester BSc Microbiology	Sheffield BSc Microbiology	Edinburgh BSc Microbiology/Medical Microbiology
Year 3 Core	**Year 3 Core**	**Year 3 Core**	**Year 3 Core**	**Year 4 Core**
General Microbiology	Project Literature Review 2x	Dissertation	Library Project	Review Essay (Dissertation)
Research Project 2x	Research Project 4x	Research Project 3x	Research Project 2x	Research Project 3x
Five OPTIONS from:	Six 1x Courses from:	Molecular Virology	Microbiological Data Handling	Honours Year of Weekly Topic Blocks
Microbial Diversity	Biotechnology 2x	Virology Practical	Microbiology & Society	Prevention & Control of Infection
Molecular Microbiology	Microflora of Foods 2x	Four OPTIONS from:	Six OPTIONS from:	Microbiology Honours Practicals
Microbial Versatility	Plant–Microbe Interactions	Three Immunology Courses ± Microbiology or Parasitology	Microbial Sensing	Microbial Pathogenicity
Microbial Disease	Fermentation	Aquatic Microbiology	Animal Viruses	Special Topics in Microbiology
Biotechnology	Molecular Plant Pathology	Molecular Microbiology	Molecular Immunology	Honours Tutorials
Microbes & Environment Control	Industrial Appl. of Microbial Analysis	Advanced Infectious Disease	Photosynthetic Membranes	Cells Molecules & Nucleic Acids
	Bacterial Gene Expression	Cell Biotechnology	Fungal Genetics	
	Plant Disease Control	Medical Virology	Bacterial Differentiation/Genetics	
	Applied Mycology	Microbial Biotechnology	Bacterial Pathogenesis	
		Designer Molecules	Biotechnology Topics	

Table Notes

Tables show only approximate degree contents as a great deal of information has been summarized to fit. I am grateful to colleagues for supplying module information and apologetic to those whose module book complexities defeated my tabulating powers!

'2x' indicates a module that is two times the length of others in that column. Options choice numbers relate to single size modules. Different degree courses operate difference course lengths within them and sometimes different course sizes across different years. Not recorded on the tables is the option for students to take single external modules in languages, etc.

*Edinburgh runs to the Scottish 4 year system, so only the last 3 years of this degree are tabulated. The first year includes courses such as: origin and diversity of life, quantitative biology, physics in the life sciences, chemistry for life sciences, environmental and community biology, molecules and cells. As the table shows, many of these topics are covered in the English system in year 1.

In conclusion, I hope that the quality and diversity of microbiology degrees that we have in the UK will be maintained with the advent of degree-benchmarking and possibly entirely web-based degree courses. Maybe we should take another snapshot in a few years time to check?

● *Dr Liz Sockett is Education Officer of the SGM and can be contacted at Genetics Division, School of Clinical Laboratory Sciences, Queen's Medical Centre, University of Nottingham, Nottingham NG7 2UH.*
Tel. 0115 919 4496; Fax 0115 970 9906
email liz.sockett@nottingham.ac.uk

Further reading

CRAC Degree Course Guides: Microbiology, Immunology and Biotechnology 2001/2002. Hobsons. Available from Biblios, Star Road, Partridge Green, West Sussex RH13 8LD (Tel. 01403 710851).

Research supervisor training: an irrelevant concept or the key to success?

Adrian Eley

The relationship between postgraduate student and his or her supervisor can be a tricky one. Adrian Eley describes some of the problems and explores the need for supervisor training.

The last few years have seen an increase in the number of postgraduate students from the UK and from overseas. As a result, more academic staff have supervisory responsibilities, often to a greater extent than before. This increase has been accompanied by external pressures from funding bodies for successful and rapid completion of research degrees and for early publication of research work in good quality journals. These changes are occurring at a time of increasing pressures on academic staff with regard to their teaching and administrative duties. The combination of all these factors could be bad news for the quality of graduate supervision. If academic staff are to carry out their new or increased supervisory responsibilities effectively, there is likely to be a need for increased staff development, as individuals may need support if they are to successfully supervise and support postgraduate students through a research degree programme. The question is, do we really need more supervisor training, or is this just an increase in bureaucracy that we really haven't got time for?

The supervisor-student relationship is all important!

CARTOON COURTESY IAN GEARY, UNIVERSITY OF SHEFFIELD

What do supervisors do?

The term 'supervision' means many things to many people, depending largely on their own experiences as either student or supervisor or both. Essentially, supervision should be the process of training the student to become a successful researcher and for this to be suitably recognized by the award of a doctorate (or other research degree). The student should not just be regarded as 'a pair of hands', a means of generating research data for the supervisor to use.

The problem is that to be a good supervisor – a good research trainer – one has to be successful in many roles. As Phillipps & Pugh have described, students expect their supervisors to:

- read their work well in advance
- be available when needed
- be friendly, open and supportive
- be constructively critical
- have a good knowledge of the research area
- structure meetings so that it is relatively easy to exchange ideas
- have sufficient interest in their research to put more information in the student's path
- be sufficiently involved in their success to help them get a good job at the end of it all

It is clear therefore, that the demands on a supervisor can be high and that the supervisor–student relationship is fundamental to the supervision process. Many problems that arise with supervision can be traced back to the two parties' attitudes towards this key relationship.

Problem areas

Common problems for students

A lack of:

- resources and facilities
- student rights and entitlements
- clarity over supervisory roles
- attention to process (e.g. methodology, evaluation of data, etc.)
- attention to the 'whole person'
- attention to monitoring and support mechanisms

Common problems for supervisors

Students not:

- being independent enough
- producing written work of a high standard
- being honest about their progress
- following the supervisor's advice
- realizing how much work is involved
- making a real commitment to their research

Even the best supervisor will no doubt admit to making mistakes in supervising as each student is different and potentially needs managing in a different sort of way. However, there can be tragic consequences if things do go terribly wrong as shown by the suicide of an American graduate student in 1998. This case highlighted the need to consider a different system of monitoring the quality of a graduate student's supervision. It was also evident that this was not just a one-off case and that others were known.

So if we all know that problems do occur, what can we do about them?

Solutions

Unfortunately, there are no simple solutions. The nature of academic research inevitably leads to a self-perpetuating system: one generation of specialist researchers trains the next and so on. When students themselves eventually become supervisors they usually have a very limited number of role models to turn to for guidance. If their supervisors were not particularly effective, students may often not have other points of reference to help them develop better practice for themselves. Therefore, if nothing is done to change the status quo, it is difficult to see how things can improve. This is where the idea of supervisor training has emerged from, in an attempt to change bad practice into good practice and break the cycle of new supervisors replicating the processes that they themselves experienced.

Training has been introduced in many institutions to help academics develop their supervisory roles more effectively and avoid or resolve problems in the supervisory relationship. It often takes the form of discussion groups and may include topics such as exchanging good practice, refining the role of the supervisor and finding practical ways to improve standards. However, not all academics consider supervisor training to be useful, or even necessary, and this view seems to be coloured by two main problems. The first is terminological: using the word 'training' in this context may suggest that supervisors are not carrying out their supervisory duties correctly. This can create a negative perception of training programmes, particularly among more experienced staff who have supervised research students and are reluctant to admit that they might need 'training' to do something which they are already supposed to know how to do. Programmes that focus on awareness of current issues and enhancing the development of supervisory skills may stand a better chance of overcoming this natural defensive reaction. Second, there has been the issue of provision. Supervisor 'training' can often be provided on an *ad hoc* basis and the programmes themselves may not be properly thought through. There is a wide variation between institutions, from those which provide poor or in some cases non-existent programmes to those which play an important part in developing graduate education. For example, at the University of Manchester, there is a contractual requirement for attendance at a supervisor training programme at least once every three years. Failure to attend means that the institution will no longer support the supervisor and he/she is ineligible for Research Council studentships.

As mentioned above, although training provision is mixed across universities, help and guidance are provided at national level. In 1994, the UK Council for Graduate Education was established to promote the interests of graduate education in all disciplines in higher education institutions. It achieves this through a series of activities, workshops, conferences and seminars which often include the topic of research supervision.

Future prospects

External scrutiny of research supervision is likely to increase. We are already expected to be in a position to meet the expectations of the new QAA Code of Practice on Postgraduate Research Programmes. Now HEFCE has put forward plans to assess the quality of research provision and supervision, proposing that failure to meet minimum standards would lead to research studentships no longer being awarded. This further regulatory mechanism in addition to the RAE would greatly increase academic workloads even further.

If we are not unduly concerned about attracting funding or research students, then research supervisor training may well be an irrelevant concept. However, if we want to continue to attract research funding and the best research students, then we have no choice but to enhance our research supervisory skills – and be able to demonstrate that we have done so. Some type of research supervisor training or development programme could help us to achieve this goal. As a first step, if you would like to find out more about this issue, why not come along to the SGM Education Group sessions at UEA in September 2001. There will be two events, including a symposium on *Research Supervision: How to Get it Right* and a workshop on *Problems in the Supervisor–Student Relationship*. Supervisors and students are welcome to attend and I look forward to seeing you there.

● *Adrian Eley is Senior Lecturer in Medical Microbiology, Division of Genomic Medicine, University of Sheffield Medical School, Sheffield S10 2RX.*
Tel. 0114 271 2335; Fax 0114 273 9926
email a.r.eley@sheffield.ac.uk

Further reading

Higher Education Funding Council for England (2000). *Review of Research: Postgraduate Student Issues.*

Djerassi, C. (1999). Who will mentor the mentors? *Nature* 397, 291.

Phillipps, E.M. & Pugh, D.S. (2000). *How to get a PhD*, 3rd edn. Open University Press.

The Quality Assurance Agency for Higher Education. (1999). *Code of Practice for the Assurance of Academic Quality and Standards in Higher Education: Postgraduate Research Programmes.*

Millennium science centres and life sciences education

Leigh Fish

Where can the public go to be educated about biological science? Leigh Fish describes the current Science Centre Scene.

The next generation of science centres is opening across the UK offering exciting learning opportunities in microbiology, biotechnology and genetics. These new centres aim to enthuse and motivate visitors about science and technology through exhibitions, science shows, information technology (IT) facilities, Imax cinemas and more traditional practicals and workshops. The unique combination of learning formats and trained science communicators in these inspiring environments is already proving popular with a wide range of audiences.

The National Lottery's Millennium Commission, the Wellcome Trust and public and private sector funding partnerships bequeathed the network of new science centres. These have built on best practice from established centres like the Exploratory (now replaced by At-Bristol), Techniquest in Cardiff and the Science Museum's Launch Pad (London). They are acting as hub organizations and forging links with universities, industry, learned societies and research funders and are working towards some of the targets expressed in the Science and Society House of Lords Select Committee report. Science centres target members of the public and community groups, pre-school children, schools and colleges, further and higher education establishments offering post-16 vocational and non-vocational courses, and life-long learners. They offer carefully designed programmes using exhibitions, laboratories, classrooms and discovery environments and it is in these venues that both formal and informal learning are flourishing.

There are currently 51 science centres listed by the British Interactive Group, so it should not be hard to find a science centre near you – many are also offering outreach activities and in-service education training (INSET) for teachers. Each centre is different, with distinct foci on the areas of science covered, although these often include the life sciences. The Wellcome Trust has played a major role in funding seven of the new centres and it is these facilities that feature most biotechnology, microbiology and genetics. Of the centres not already open, most will be complete in early summer (Birmingham Thinktank follows in late September), with pilot programmes already offered by many to educational groups and the public.

Of the many and varied programmes on offer, micro-organisms are specifically explored by At-Bristol and Life Interactive World, with Glasgow Science Centre planning to offer real time gold-coating and scanning electron microscopy of samples when they open fully in the summer. Techniquest in Cardiff, one of the long established science centres, excels at providing microbiology workshops in partnership with the local Public Health Laboratory Service where visitors aim to find the source of food poisoning at a wedding. Biotechnology is also represented with a plant power game show (audience participation obligatory!) and Science and Plants for Schools (SAPS) protocols.

Genetics workshops on offer not only explore chromosomes, nature/nurture and evolution, but also feature practical activities, often using protocols from the National Centre for Biotechnology Education (NCBE) at Reading. These include solving a crime using a 'suspect's' DNA and restriction enzymes, simulated 'pre-natal screening of embryos' using the same techniques, or extracting DNA from plant tissues. Life Interactive World is closely linked with the research genetics centre of the

Table 1. Selected science centres (referred to in this article)

At-Bristol Harbourside, Bristol BS1 5DB	Tel. 0117 915 5000; Fax 0117 915 7200 email information@at-bristol.org.uk www.at-bristol.org.uk
Glasgow Science Centre 50 Pacific Quay, Glasgow G51 1EA	Tel. 0141 420 5010; Fax 0141 420 5011 email admin@gsc.org.uk www.gsc.org.uk
Life Interactive World Times Square, Newcastle upon Tyne NE1 4EP	Tel. 0191 243 8223; Fax 0191 243 8201 email general@centreforlife.co.uk www.lifeinteractiveworld.co.uk
Thinktank (Birmingham's Museum of Science and Discovery) 144 Newhall Street, Birmingham B3 1RZ (correspondence only)	Tel. 0121 303 2983; Fax 0121 303 1315 email enquiries@discovery.org.uk www.discoverycentre.org.uk
Manchester Museum of Science and Industry University of Manchester, Oxford Road, Manchester M13 9PL	Tel. 0161 275 2634; Fax 0161 275 2676 email anna.j.davey@man.ac.uk www.museum.man.ac.uk
Science Museum Exhibition Road, London SW7 2DD	Tel. 0870 870 4771; Fax 0207 942 4302 email sciencemuseum@nmsi.ac.uk www.sciencemuseum.org.uk
Sensation Greenmarket, Dundee DD1 4QB	Tel. 01382 228 800; Fax 01382 868 602 email alice.hague@sensation.org.uk www.sensation.org.uk
Techniquest Stuart Street, Cardiff CF1 6BW	Tel. 029 20 475 475; Fax 029 20 482 517 email gen@techniquest.org www.techniquest.org

LEFT:
Visitors photocopy their DNA using PCR at the Manchester Museum, University of Manchester.
COURTESY SUSAN BULLEID AND THE MANCHESTER MUSEUM, UNIVERSITY OF MANCHESTER

nearby University of Newcastle and its programmes strongly feature genetics, including DNA subspecies identification and 'genetic engineering for beginners' with transformation of cells. The polymerase chain reaction (PCR) is used at Techniquest, At-Bristol, Glasgow Science Centre, Life Interactive World and the Manchester Museum of Science and Industry to amplify mitochondrial DNA from cheek cells and show the power of this technique in detection and diagnosis.

In addition to the basic skills learned by participants in these programmes (developing observation, considering evidence and drawing conclusions) the activities are extended to use real scientific techniques and are often linked to the ethics involved in applying that science. In considering the use of PCR to detect genetically modified crops, hepatitis C contaminated blood or foot-and-mouth disease, visitors achieve a greater understanding of the type of work scientists do and are more able to examine and understand some of the ethical implications. Debates at Glasgow Science Centre, At-Bristol and Birmingham Thinktank encourage visitors to draw their own conclusions and to be more confident in interpreting newspaper articles and TV programmes.

At many of the new centres, the exhibitions feature current hot topics in science and canvass the opinions and views of visitors. The education programmes are closely tied in with the exhibitions, each reinforcing messages and content in the other. Although most of the centres have laboratories and classrooms, several of the larger institutions have brought together diverse tools to assist with their communication aims and have linked these to the education programmes. Increasingly, planetaria are being used as 360 degree projection spaces and feature journeys through the body as well as star fields. Glasgow Science Centre features a multimedia theatre and virtual science theatre powered by a powerful Silicon Graphics computer which allows data from microscopy and medical imaging technologies like magnetic resonance imaging, ultrasound and the 'visible human' project to be explored in real time interactively. The running of educational programmes specifically designed for these new media (Glasgow houses the only other theatre outside Japan) allows in-depth exploration and coverage specifically tailored to the needs of each educational group.

Many of the new centres are equipped with IT facilities which allow visitor-focussed research and learning, in addition to offering training in computing skills and acting as a showcase for software. IT will increasingly be used for video conferencing and debating, to allow visitor opinions and views to be shared nationwide and for combined multimedia presentations across the centres – visits by real scientists will be shared by science centres, giving more effective use of scientists' time and a bigger audience.

Science centres have the potential to bring science closer to its public and these are truly interesting times.

● *Dr Leigh Fish worked as content manager on the Get Connected! Gallery for At-Bristol before moving on to Glasgow Science Centre where he is currently a staff scientist involved in the ongoing operations of laboratories and IT suites. He can be contacted at Glasgow Science Centre, 50 Pacific Quay, Glasgow. G51 1EA.*
Tel. 0141 420 5010; Fax 0141 420 5011
email leigh.fish@gsc.org.uk

Acknowledgements

Thank you to all the staff at the science centres listed above who provided information for this article.

Further reading

British Interactive Group list of UK science centres: http://www.big.uk.com/centres/index.htm

House of Lords Select Committee 3rd Report full text: http://www.parliament.the-stationery-office.co.uk/pa/ld199900/ldselect/ldsctech/38/3801.htm
Also available from HMSO: *House of Lords Select Committee 3rd Report HL38* (14 March 2000); ISBN 0 10 403800 4.

Microbiologists and maths

Ron Bishop & Adrian Eley

Most microbiology students are scared of maths. Ron Bishop and Adrian Eley share some resources and strategies developed to combat those fears and give confidence to the innumerate.

Biologists, of course, are traditionally hopeless at maths, but nowadays the term 'hopeless' seems to have acquired new depth of meaning. Why are so many of today's microbiology students, at least in the UK, so completely incapable of handling numbers properly? Almost every microbiology tutor, usually no great shakes mathematically themselves, despairs at student attempts to manipulate data and understand quantitative concepts. A recent symposium of the Society's Education Group (*Developing Mathematical Skills in Microbiologists* at Exeter last September) explored the problem.

Scared of maths

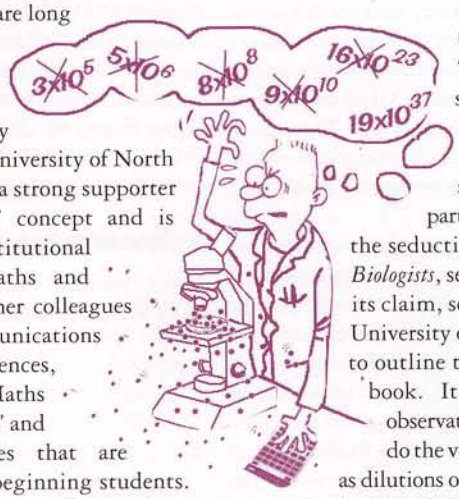
Why are we so scared of maths? Roseanne Benn, of the Institute of Lifelong Learning at the University of Exeter, has studied the attitudes and experiences of English adults. She has shown that people in general can and do cope quite well with numbers (betting, numerical and logical quizzes, money), but only by abandoning 'school maths' and developing their own roundabout methods. It's not maths *per se* but formal 'school maths' that is really the problem for most people, including many graduates. She has outlined a long series of very convincing reasons why there is a cycle of aversion between teachers and learners and why formal maths teaching in primary and secondary school is perceived by most of its victims as being authoritarian and not intrinsic to real life situations.

Maths help

Clearly, microbiology students are coming into tertiary education sharing many of these attitudes. Tutors find that they need to spend large amounts of time repetitively going over very basic points with individual students, and discussion throughout the symposium reinforced the benefit of as nearly as possible one-to-one remedial tutorials. But the days are long since gone when we could find the time or resources to do this routinely. Money helps, though, as was impressively shown by Helen Robert of the University of North London. UNL is institutionally a strong supporter of the 'capability curriculum' concept and is prepared to devote some institutional funding to non-specialist maths and numeracy support. Helen and her colleagues in the School of Communications Technology & Mathematical Sciences, advised by a university-wide Maths Group, developed 'Data analysis' and 'Maths through IT' modules that are taken by a very wide range of beginning students. Crucially, a central maths workshop, staffed for 10 hours per week by two very experienced, patient and approachable further education teachers, and with purpose-built facilities, is available to support the students. The workshops are extensively advertised during module classes and provide a wide range of both web- and text-based materials in addition to the personal and group contact. Diagnostic tests mapped onto a learning grid help students to identify their particular problems and banks of data taken from Honours projects and other sources provide learning examples that are directly relevant to each student's specialism. Extensive web-based delivery allows student progress to be monitored more easily and also allows them to support each other through on-line discussion groups.

Numeracy package

Several microbiologists around the country have started their own initiatives. Kay Hack of the School of Biomedical Sciences, University of Ulster, was able to get funding to develop a complete numeracy package for entry-level students. It is CAL-based to facilitate independent learning and to build in assessment. A diagnostic section identifies strengths and weaknesses and can plot changes in skill level throughout the student's career. A wide range of colleagues was surveyed to define the mathematical skills that are really needed by life sciences students and these are developed in the on-line tutorial sections, again linking the exercises to course and module content by using subject-specific examples. The content of the package can easily be changed for different student groups and modified in the light of experience. The database allows comparisons between student groups or institutions as well as customization of information for the students and their advisers. Interestingly, it suggests that new postgraduate students may be even less numerate than first year undergraduates – perhaps their tutors have learned to avoid the numerical stuff in later parts of the courses!



Workbook

Traditionally, we would have told students with a maths problem to get a good book and work through it. Indeed, there are several on the market aimed particularly at biologists. One, with the seductive title of *Easy Mathematics for Biologists*, seemed in particular to live up to its claim, so its author, Peter Foster of the University of Central Lancashire, was asked to outline the origins and rationale of the book. It started from the common observation that students were unable to do the very simplest of calculations, such as dilutions or concentrations. Concerned staff in the Biological Sciences Department at Central Lancashire tried to develop a skills module including

numeracy to improve students' ability to do simple calculations and to interpret graphs. Initially, the conventional module structure of lectures and worked examples proved largely ineffective as students differed so much in their abilities and speed of understanding that the pace suited nobody. The approach was altered to allow students to identify their particular deficiencies with a diagnostic test. This mostly showed the difficulties to be in applying their existing basic mathematical knowledge (which was usually, if not always, there) to actual practical problems. A workbook of eight sequential sections was developed, covering procedures like ratios, exponentials, expressions and graphs that are basic to all biologists. First the concept is introduced, followed by worked 'pure' examples and then worked applications. Students study at their own pace but with an hour a week of small(ish) group tutorial contact with staff. Various forms of assessment have been used, all showing most students to make significant improvements. The workbook was published commercially in 1998.

The internet

The internet is often seen by those who haven't really tried to use it as the answer to all pedagogical problems. Inevitably, it isn't; but it can certainly help and students feel increasingly comfortable with it. No-one who searches the web for microbiology education resources gets far without coming across material from Alan Cann of the Department of Microbiology and Immunology at the University of Leicester. Alan's PowerPoint presentation is on his website. It describes the development of a web-based first year numeracy module at Leicester. Since the 1960s, staff had tried to promote relevant numeracy skills in a first year 'Quantitative Biology' course, but the evidence suggested it remained of little value to the students despite its many modifications. In 1999, in accord with the university's Learning and Teaching Strategy, a new module 'Numeracy and computer skills for biologists' was developed. It aims to promote not only subject-specific and transferable knowledge and understanding, but also student planning skills and time management through the use of continuous assessment and electronic submission of assignments. The underlying ideas are to fuse the acquisition of numeracy and IT skills by computer-based delivery and assessment of both topics via the web , to use computer-based learning to overcome biologists' traditional negativity towards maths and to reduce staff time spent on repetitive marking of weekly assignments by 95 % so that the effort can be redirected to individual student support.

His presentation outlined the implementation of hands-on computer sessions and how lectures describing mathematical and statistical techniques were followed with a URL providing a set of relevant problems to be completed and submitted over the web for computer-marking. Problem clinics were open to all, but were compulsory for those who failed or did not submit the problem answers. The numeracy syllabus covers concentrations and dilutions, units, indices and exponentials, areas and volumes and manipulating numbers. Statistics and IT syllabuses are also very straightforward and relevant, and all the applications covered in the latter are used directly to carry out and submit the coursework. Much of the staff–student communication is by email. The results and student feedback, both positive and negative, from the first running of the module are shown on the website. The first cycle of module redesign in the light of this feedback includes abandonment of the peer support mechanism which seemed ineffective, enhanced feedback emphasizing methods of calculation rather than just the correct answer and some modification of the problem clinics. There are still some uncertainties, though; not least of how to motivate and reward the high achievers who found it all too easy!

So do not despair! There are still no simple or perfect answers to the thorny problem of developing mathematical skills in our students. But these and several other microbiologists (e.g. Alastair Wardlaw at Glasgow University and Vicky Tariq at Queen's University Belfast) have worked very hard to develop good practice and the rest of us can learn a great deal that is useful from their achievements. As Alan Cann's well known motto says, '*Education costs money – ignorance costs more*'!

● *Dr Ron Bishop is Senior Lecturer in Biological Sciences, School of Applied Medical Sciences and Sports Studies, University of Ulster, Newtownabbey BT37 0QB.*
Tel. 028 9036 6226; Fax 028 9036 6028
email rh.bishop@ulst.ac.uk.
● *Dr Adrian Eley is Senior Lecturer in Medical Microbiology, Division of Genomic Medicine, University of Sheffield Medical School, Sheffield S10 2RX.*
Tel. 0114 271 2335; Fax 0114 273 9926
email a.r.eley@sheffield.ac.uk

Further reading

Benn, R.C. (1997). *Adults Count Too*. London: National Institute for Adult & Continuing Education.

Foster, P.C. (1998). *Easy Mathematics for Biologists*. London: Harwood Academic Publishers.

Useful websites

http://www.unl.ac.uk/ctms/mathshelp/

http://www.ulst.ac.uk/resources/numeracy

http://www-micro.msb.le.ac.uk/AJC/talks.html

CARTOONS COURTESY IAN GEARY, UNIVERSITY OF SHEFFIELD

Home thoughts from abroad

Some personal views of microbiology education overseas

Sun, sea and science on California's Biotech' Beach

Keith Stephenson

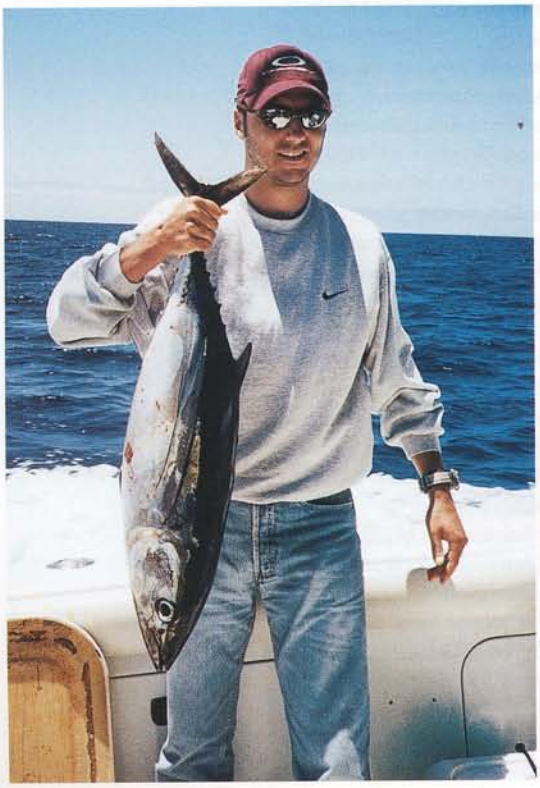
Keith Stephenson discovers the pros and cons of postdoccing in the USA.

My scientific research career started in my home town at the University of Newcastle upon Tyne where, after a PhD and postdoc with Dr Colin Harwood, investigating protein secretion from *Bacillus subtilis*, I was offered a research position at The Scripps Research Institute, commencing June 1999. Scripps is located in La Jolla on the Pacific coast just north of San Diego in southern California and is surrounded by numerous research institutes and biotechnology companies (hence San Diego's suitably tacky nickname of 'Biotech' Beach'). My new lab was to be that of Prof. James A. Hoch who is a world renowned scientist in the field of bacterial signal transduction. The international reputation of Scripps combined with that of my potential boss meant that the job offer was hard to turn down and a move to the USA would, I hoped, facilitate my scientific education and my long-term goal of a good academic position back in the UK.

As might be expected the labs within Scripps are very well funded and the institute provides a great platform to conduct stimulating research. Since there is no formal teaching, Scripps is organized for pure research and supported by on-site core facilities that take care of every scientific service that might possibly be required.

I went to the States with the intention of working hard but the major difference between being a postdoc at a UK university and at an institution in the USA is the high level of work that is demanded in the latter. This was reinforced on my first encounter with my new boss when it was politely (not!) pointed out to me that '*postdocs work six days a week in my lab*'. A typical work day for a postdoc in the lab starts at 8 am and finishes after 7 pm with a brief period somewhere in the middle to inhale lunch (no long lunches in the pub for me anymore!). Furthermore, with two lab meetings per week there is constant pressure to generate new data to present to the boss and the rest of the research group.

BELOW:
Keith tuna fishing off the coast of Mexico.



A postdoctoral position in the USA is regarded as a training position and consequently the salary can often be less than that of a technician with significantly less experience and qualifications. However, this aside, the salary is still better than the UK (in my experience at least) and as a consequence trips south of the border to Mexico and to the bright lights of Las Vegas are regular events.

In general, the day-to-day operation of the labs at Scripps seems to proceed in a similar manner to those in the UK, complete with the usual minor problems and petty annoyances of a busy lab environment. From a purely academic point of view I have learnt a tremendous amount from my time in the USA and I have been able to build on my knowledge of molecular microbiology and extend it into the previously unknown realms of biochemistry and structural biology. The attitude towards research in the USA centres around working hard and efficiently in an independent manner and accumulating publication quality data in the shortest possible time. I firmly believe that this attitude is one of the most important things that I will take away from Scripps. Furthermore, the education I have gained has broadened my scientific horizons and prepared me for future phases of my research career.

These are my personal thoughts and experiences and they are limited to the research environment of The Scripps Research Institute. To anybody considering a postdoc in the States I can honestly recommend it for the experience and the education, but go prepared to work hard. There seem to be a lot more opportunities for biological scientists in the States and particularly in San Diego. These opportunities, combined with the better salary, the weather and the great Scuba diving, make the decision to return to the UK a difficult one for me. I wait in hope of a shake up in the British educational system which would allow better salaries and contracts for academic research scientists in the UK. This would help reduce the brain drain and ultimately make my decision to return to home soil a lot easier. After all, San Diego is a long way away from the bars of the Newcastle Quayside and the sacred turf of St James' Park.

● *Dr Keith Stephenson, Research Associate, Division of Cellular Biology, Department of Molecular and Experimental Medicine, The Scripps Research Institute, 10550 North Torrey Pines Road, La Jolla, CA 92037, USA. Tel. +1 858 784 7909; Fax +1 858 784 7966. email keith@scripps.edu*

Keith's career path

BSc (Hons) Microbiology, 1992
University of Newcastle upon Tyne, UK
PhD Molecular Microbiology, 1996
University of Newcastle upon Tyne, UK
Postdoctoral Research Associate, 1996–1999
University of Newcastle upon Tyne, UK
Postdoctoral Research Associate, 1999–Present
The Scripps Research Institute, CA, USA

The Marseille contract

Tracey Duncombe

Gradline Editor Tracey Duncombe relates the experiences of a student from the School of Biosciences, University of Birmingham, who spent time abroad as part of her studies.

LEFT:
Old Port, Marseille, at night.
WERNER DIETERICH/THE IMAGE BANK. ©MM

Stephanie Hunter, a fourth year sandwich student, spent last year at Marseille University, France.

One of the primary concerns of anyone contemplating study abroad must be their ability to cope with the language, and the British with our stereotypical ineptitude for languages epitomize this. However, Stephanie Hunter is one of a growing number of UK students who have chosen to include a placement abroad as part of their biological science degree. 'I already had A/S level French and took extra French units as part of my degree course in Birmingham so I wasn't too worried about making myself understood. I did find the lectures hard going. Not only were they 4 hours long, with a short break after 2 hours, but also the tutors dictated notes. Luckily, I was able to borrow notes from a friend to make sure that I didn't miss anything. The days themselves were long too; we studied from 8 in the morning to 6 at night.'

'The course in Marseille was lecture-based and there was no laboratory project. There wasn't much course work either as most of the marks went on exams. I was a little disappointed with the content of the programme because it contained more general biology than my course in Birmingham.'

The structure of the French university system is very different from that of the UK. It is a tiered system whereby almost everyone entering university at 18 years old spends 2 years studying for a 'first level degree'. This is a general qualification in which students select a major field, e.g. sciences, and a minor field, e.g. classics. The curriculum is divided into required and elective units of instruction. 'Students who go onto their third year face the equivalent of our BSc but really it is a level lower. Those who are still interested in continuing their studies after their third year would go on to take a Masters-type course.'

'What I liked about studying in France was the attitude of the French to studying. It is a lot more relaxed compared to the UK. There was less pressure on me also as I only had to get 20 credits to pass the year. However, things didn't always run smoothly. There is generally a lot more bureaucracy under the French system and this made it difficult, for example when I wanted to change certain modules.'

'Marseille was a great place to study. There weren't many Brits there so I was forced to get on with everyday life in France, but I was glad to do this, my French and my confidence have improved because of it. I'd definitely recommend this experience to other students both to experience living in another country and the different culture. It has also opened up a number of opportunities to me as employers frequently ask for fluency in a second language. I might also consider returning to study for a PhD in France.'

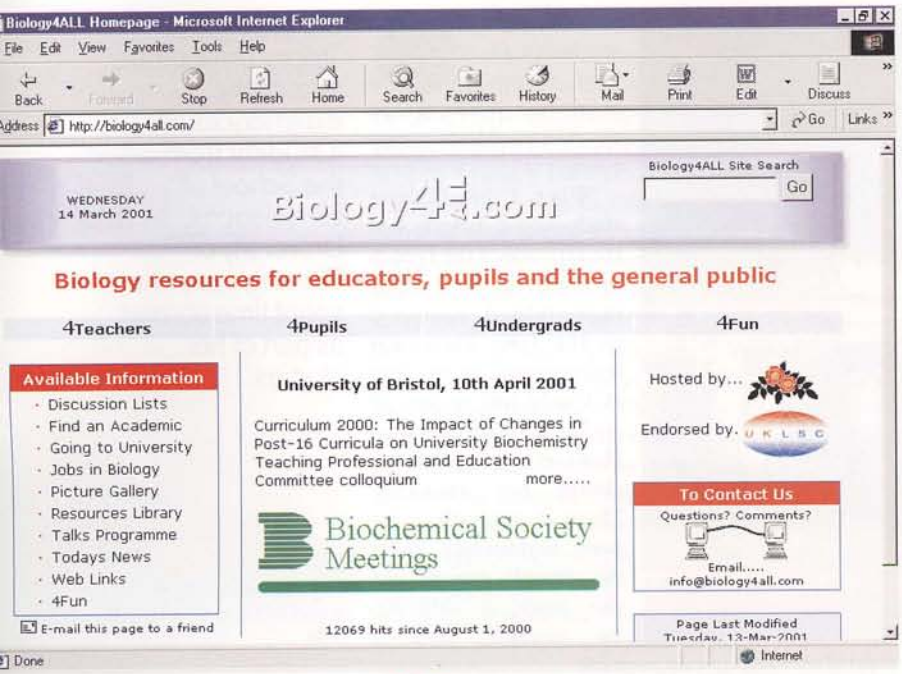
Time abroad

The University of Birmingham participates in the SOCRATES scheme which allows students to spend a year studying biology, language and culture in a European university – thereby extending their biological science degree to 4 years.

Many other UK universities offer biological science courses which include either a period of full-time study in an overseas institution or work experience abroad. For details see *The Official UCAS Guide* or the *CRAC Degree Course Guide: Microbiology, Immunology and Biotechnology* (Hobsons, 2001).

Biology4ALL.com aims to bridge the gap between universities and schools

Peter K. Robinson



Nowadays, the launch of a new website is generally little to 'write home about'. However when the University of Central Lancashire launched its Biology4ALL.com site in September 2000 this was another significant step towards bridging the gap between biology schoolteachers and the academics in universities and research establishments.

The Biology4ALL project actually began some years earlier when, in March 1998, staff at the University of Central Lancashire launched a free email discussion list (called BIOTUTOR-L) specifically for biology teachers in local schools around the Preston area. Teachers could email problems and requests to the discussion list and then either university staff or other teachers could email a response. A rather unusual feature of this list – and perhaps a key reason for its success – was that it was private, with subscription being restricted to teachers or others with a professional interest in biology. This meant that teachers could discuss real problems without fear of their pupils 'listening in'. Thus, whilst similar discussion lists, bulletin boards and chat rooms have struggled to achieve significant interest, the BIOTUTOR-L list quickly outgrew its local roots and achieved national coverage within its first six months of operation. Currently, there are about 350 schools subscribed to the service, mainly from the UK but also from Australia, New Zealand, Zimbabwe, the US, Austria, Denmark and the Philippines. Last year the Listserver in Preston distributed over 200,000 emails to members of the group. Indeed the list has proved so successful that a second list (SCITECH-L) has been set up to provide a similar service for science technicians in schools. Within eight months SCITECH-L has also grown to have over 300 subscribers and has generated a staggering 500,000 email deliveries.

The BIOTUTOR-L discussion list thus provides an excellent forum for biology teachers to share good practice and resolve problems. It is also increasingly being used by learned societies and universities to advertise events and projects that may be of interest to schoolteachers and their pupils. As well as the SGM, the Institute of Biology, Society for Experimental Biology, the Biochemical Society, Physiological Society, Science Museum, BBSRC, BBC (Education) and Royal Society of Chemistry have all used the service over the past year.

Email discussion lists are, however, not necessarily the best way of disseminating complex information such as practical schedules – as most people who have tried to send an email attachment to multiple recipients will generally confirm! Consequently, the University of Central Lancashire developed and launched the Biology4ALL.com website (http://www.biology4all.com). This houses a resources library where teachers can both retrieve and deposit practical schedules, lesson notes, spreadsheets, PowerPoint presentations and images. This website is now listed on all major web search engines and currently receives over 700 visitors per week (generating 3,000 page impressions per week). The resources library welcomes contributions from SGM members who have information which they feel may be useful for GCSE and post-16 teachers and (very importantly) which is free from copyright restrictions.

The website also provides information for those interested in studying biology at university and houses a links page to all 250 UK university bioscience departments (including medical, dental and veterinary schools). A jobs page also enables visitors to find employment in the field of biological sciences. The site also acts to help advertise the schools liaison events of UK universities and a list of university lecturers prepared to visit schools to give talks is expanding steadily.

The recent endorsement of Biology4ALL.com by the UK Life Sciences Committee was another pleasing step in the development of this project and should hopefully encourage wider interest in the project from the UK higher education community. Should anyone wish to subscribe to either of the two discussion lists, or if anyone feels that they have either content or expertise that could help in the development of this project, please contact me.

● *Dr Peter K. Robinson can be contacted at Department of Biological Sciences, University of Central Lancashire, Preston PR1 2HE. Tel. 01772 893911; Fax 01772 892929 email pkrobinson@uclan.ac.uk*

It's time to stop reinventing the learning and teaching wheel!

Heather Sears

Where do HE educators find advice and resources to support bioscience teaching? The Learning and Teaching Support Network aims to meet this need.

Academic staff simply do not have the time to wade through the alphabet soup of acronyms adopted by the numerous projects and national initiatives in learning and teaching. Consequently, the wheel has been reinvented many times, with the duplication of projects and inadequate dissemination of results. Fortunately, the LTSN (yes, another acronym!), has been established to co-ordinate and share information in a coherent and accessible form within higher education. LTSN stands for the Learning and Teaching Support Network, a national network of 24 subject centres distributed at universities around the United Kingdom and a generic centre, based at the network headquarters in York. The LTSN Centre for Bioscience, based at the University of Leeds, is the subject centre for the life, food and agricultural sciences.

The diverse range of subjects that falls under the bioscience umbrella certainly has its own unique challenges. Bioscientists identify most closely with their particular discipline (what's your response to '*So what is it you actually do?*' Probably not '*Well actually, I'm a 'bioscientist'*'). Biologists also tend to be more receptive to ideas when they are talking to their own species. That's why LTSN Bioscience has three Subject Specialists (all biologists, with different backgrounds and expertise), to act as discipline-specific contacts. Our experiences in research and teaching means that we are only too aware that many academic staff work in a research-driven climate, where teaching excellence often goes unrecognized.

Teaching ideas and material; practical, solid and tangible

One of our first activities was to survey the community, asking what our priorities should be. The overall response is summarized from one of the replies: '*Teaching ideas and material; practical, solid and tangible*'. Here are the most popular requests and what we're doing about them.

Digital image bank. Microbiologists are fortunate that the ASM already hosts an excellent bank of high quality images that are cleared for non-profit educational use (www.microbelibrary.org) but other disciplines are less lucky. The images that are available are distributed across innumerable individuals and organizations. We are currently collating existing material and defining areas of high priority. Many lecturers take a risk in using copyright material in lectures and handouts – we aim to make images freely available for educational use.

ltsn
Learning and Teaching Support Network

Bioscience

OPPOSITE PAGE:
LTSN Centre staff: Dr Heather Sears (right) and Mrs Trish Walker (left).

THIS PAGE TOP:
Students using microscopes.
PHOTO COURTESY UNIVERSITY OF LEEDS.

BOTTOM:
The group photograph shows (from left to right): Professor Ed Wood, Centre Director; Dr Yolande Knight, Subject Specialist; Mrs Trish Walker, Centre Manager; Dr Heather Sears, Subject Specialist; and Professor Ian Hughes, Centre Co-Director.

Compendium of good practice and innovation. Case studies are a useful and quick means of deciding which methods and techniques established elsewhere could be applied to your own teaching. Thus, we are collecting case studies of good practice and innovation in learning and teaching from across the sector. In addition, we aim to provide a central repository of tried and tested practical classes, including evaluated alternatives to traditional laboratory exercises, as this vital component of a life science degree is under considerable pressure due to reduced funding, increased student numbers and diversity of student abilities.

Assessment. Increasing student numbers have also put pressure on the assessment process. LTSN Bioscience has considerable expertise in alternative assessment methods such as peer assessment and is sharing it in a series of workshops and articles. We are also part of a major project, headed by the LTSN Generic Centre, looking at various aspects of assessment.

Special interest groups. We will shortly be forming our first special interest groups to address and develop specific topics from a biology perspective. Following on from the issues raised above, unsurprisingly, the most requested topic for discussion is assessment!

The Knowledgebase. Where are all the resources going to be stored? In our on-line information service, the 'Knowledgebase', accessed through our website. Now developed and ready to grow, users will have rapid access to evaluated information on a wide range of learning, teaching and assessment strategies and products.

We need your help!

Although we can provide information, resources and advice, it is up to you to decide to share your expertise and experience with others. You might be surprised to find that your normal practice is another's innovation and vice versa. The first step is to register with the Centre to find out more about the services that we can offer you and your colleagues. We look forward to working with you.

● *Dr Heather Sears is a Subject Specialist at the LTSN Centre for Bioscience and can be contacted at LTSN Centre for Bioscience, School of Biochemistry & Molecular Biology, University of Leeds, Leeds LS2 9JT.*
Tel. 0113 233 3001; Fax 0113 233 3167
email ltsnbioscience@bmb.leeds.ac.uk
website http://bio.ltsn.ac.uk/

From *Anabaena* to zoonoses: electronic microbial education resources at your fingertips

Yolande Knight

Yolande Knight of the LTSN describes some useful websites for microbiology teaching.

Whether we like it or not, the internet and web are revolutionizing information exchange, with enormous implications for the academic community in the arenas of research and education. The sheer scale of this information mountain can overwhelm even the most enthusiastic of surfers. In December 1997 it was estimated that at least 320 million pages of information existed on the web. If you are a teacher interested in incorporating electronic resources into your module material, the time required to search out decent material can be frustrating and may result in a dented monitor and some fancy explaining to your department's computing service.

At LTSN Bioscience we aim to ease this process, providing information and links to useful websites and inviting reviews from users. Some examples of microbiologically relevant websites for learning and teaching are described below (see Table 1). An expanded list of resources relevant to this article can be found in *Resource News* on our website.

Websites

As a first port of call for the microbiological surfer, we would recommend three major websites, all of which provide reviewed links. BIOME is a gateway which provides a searchable catalogue of internet sites and resources covering the health and life sciences and is a great way for cutting down your search time. The American Society for Microbiology's 'MicrobeLibrary', is a peer-reviewed, web-based collection of academic resources for microbiology educators. Its contents include images, curriculum activities and the society's new journal *Microbiology Education*. Email discussion lists are also available and extremely active! Merlot Biology (Multimedia Educational Resource for Learning & Online Teaching) is a free and open resource designed for teachers and students in higher education.

Thousands of subject-specific websites can also be found by the determined. The links mentioned previously provide gateways to a number of these sites. For example, within the pages of All Virology on the web you will find educational resources, including on-line course notes and tutorials, links to specific virus sites and the *Big Picture Book of Viruses* which contains an extensive collection of searchable virus pictures. The Digital Learning Centre for Microbial Ecology aims to use computers and network technologies to provide students and teachers interested in microbiology and microbial ecology with resources that may aid their learning and teaching. This includes the *Microbe Zoo* (with guests able to visit 'Poo Corner' and 'Redox Mine Shaft' to name but two) and *Microbe of the Month*.

Generic learning and teaching sites are often hard to access through subject-specific gateways, but it is worth persevering, as with imagination they are every bit as valuable to the inventive teacher. The Castle Project provides a free toolkit for the development of on-line interactive multiple choice questions, with tips on good practice in test and question design. The Resource Discovery Network (RDN), which links to BIOME, also provides free 'teach yourself' tutorials such as 'Internet Medic'. These tutorials are aimed at providing both students and teachers with the skills to not only search the web, but decide on the quality of the information found. 'Internet Bioresearcher' will be available from May 2001.

● *Dr Yolande Knight is a Subject Specialist at the LTSN Centre for Bioscience, School of Biochemistry and Molecular Biology, University of Leeds, Leeds, LS2 9JT.*
Tel. 0113 233 3001; Fax 0113 233 3167
email ltsnbioscience@bmb.leeds.ac.uk

Table 1. Useful websites (referred to in this article)

LTSN Centre for Bioscience	http://bio.ltsn.ac.uk
BIOME	http://www.biome.ac.uk
American Society for Microbiology Microbelibrary	http://www.microbelibrary.org/
Merlot Biology	http://biology.merlot.org:9100/Home.po
All Virology	http://www.virology.net/garryfavweb.html
Digital Learning Centre for Microbial Ecology	http://commtechlab.msu.edu/sites/dlc-me
Castle Project	http://www.leicester.ac.uk/cc/ltg/castle/
RDN	http://www.rdn.ac.uk

Video teaching aids

Joanna Verran

A further aid to teaching from the electronic resource stable is that of videos and video-streaming. A number of projects are underway to provide video material for use in learning and teaching of the biosciences. Shotlist Video Resources for Higher Education provide subject-specific teaching video materials available at minimal cost to all UK educational establishments. The LIFESIGN project aims to identify and develop a collection of video resources in the life sciences and deliver these across the internet to users. The project seeks active teaching academics in the life sciences keen to use streaming video within their courses and has set up a demonstration site to illustrate examples of what is possible and to seek input into what individuals require for their teaching.

Certain videos have also been produced specifically for the microbiology educators' market. For example, *An Introduction to Practical Microbiology* (priced £28.50, available from Joanna Verran) has been recommended as support for Curriculum 2000. Another video, *Microbiology Laboratory Procedure* covers topics such as aseptic techniques, safety and using a microscope. It is available from A. Vilkins, AVS, Medical Sciences Building, University of Leicester, University Road, Leicester LE1 9HN (price £30, incl. VAT + p&p). Following this microbiological theme, a set of videos entitled *Intimate Strangers* has been produced by the American Society for Microbiology based on a US television series. Designed to support microbiology education in schools and colleges, it uses information and footage supplemented with further academic learning resources. A group of staff at the Manchester Metropolitan University is currently evaluating both the TV series and the teaching package with a view to incorporation into their undergraduate curriculum. Dissemination of the findings through the SGM is likely.

Please contact Dr Joanna Verran (j.verran@mmu.ac.uk) for further information on the *Intimate Strangers* videos.

● *Dr Joanna Verran is a Reader in the Department of Biological Sciences, Manchester Metropolitan University, Chester Street, Manchester M1 5GD. She is a member of the SGM Education Group Committee.*
Tel. 0161 247 1206; Fax 0161 247 6325
email j.verran@mmu.ac.uk

SGM funding support for microbiology education

The Society runs a wide range of schemes which support education in its widest sense, as listed below. Details of all these grants and awards, together with application forms where appropriate, are available on the website: www.sgm.ac.uk

Schemes for Students

Undergraduate Microbiology Prizes – awarded annually to the undergraduate student in each qualifying university who performs best in microbiology in their penultimate year of a BSc course.

Postgraduate Student Meetings Grants – cover travel, accommodation and some subsistence expenses for attendance at one SGM meeting each year.

President's Fund – makes limited grants to enable young microbiologists to make short research visits, attend courses, or present their work at scientific meetings.

Student Society Sponsored Lectures – small grants to cover the expenses of up to two speakers on microbiological topics each year at student society meetings.

Vacation Studentships – small awards to enable undergraduates to work on microbiological research projects in the summer vacation before their final year.

Overseas Schemes

International Development Fund – small grants to members to help microbiologists in developing countries and Eastern Europe, often for training courses.

Watanabe Book Fund – provides funding to members permanently resident in a developing country for the purchase of microbiology books.

International Research Fellowships – grants to facilitate overseas visits to carry out a defined piece of work in any area of microbiology.

Other Schemes

Education Development Fund – grants to members for developments likely to lead to an improvement in the teaching of any aspect of microbiology or towards science promotion/public understanding of science activities.

Retired Member Conference Grants – cover accommodation at one SGM meeting each year to enable retired members to interact with practising scientists.

Seminar Speakers Fund – makes small grants to cover the expenses of up to two speakers on microbiological topics in annual departmental seminar programmes.

Year of Science

The Government has declared a *Year of Science* running from September 2001. The activities, aimed mainly at the 11–16 age group, are being collated by NESTA. SGM will be helping to promote this initiative by a range of special activities (as well as those listed on p. 93), including:

- Competition for primary schools – poster on *Microbes: Friend or Foe?*
- Assembly pack for primary schools – *Microbes Make the World Go Round*
- Poster pack for KS4 & post-16 – *Microbes and the Human Body*
- Practical investigation for Key Stage 3 – *Naturally Good for You?: the antimicrobial effects of health products*
- General participation in events and initiatives organized by the UKLSC Education Group

Microbiology education in Mexico

Martin Collins

ABOVE:
The Stock Exchange in Mexico City in the Zona Rosa (the 'west end', not the 'red light' district!).

RIGHT:
An expedition from the lab in the UAM Department of Biotechnology in 1997. We visited a colonial style town about 50 km outside Mexico City, well away from the pollution.

PHOTOS COURTESY MARTIN COLLINS

A web search for Universities in Mexico will reveal a listing of some 102 publically and privately funded universities and polytechnics spread throughout the country (http://geowww.uibk.ac.at/univ/). These vary markedly in size and the range of courses offered with virtually a complete absence of named degrees or departments of microbiology. However, microbiology is an integral component of many degree or Licentiateship courses spanning medicine, biology, molecular genetics, food technology and more, whilst microbiological research is active in many departments throughout the country. By far the largest and oldest university is the Universidad National Autónoma de México, located in Mexico City, with about 300,000 registered students. Another publicly funded university in the capital is the Universidad Autónoma Metropolitana (UAM) with which I have been associated for the last 10 years through a variety of British Council and EU-funded initiatives. UAM comprises three separate campuses in different parts of the city. UAM-Iztapalapa (about 13,000 students) is situated in an industrial area and amongst its specialities are biology, hydrobiology, biochemistry and food technology, and engineering. Its organization of microbiology teaching typifies that in many Mexican universities and polytechnics. A major course in microbiology is taught in the second year of study and is common to several degree programmes, thus classes are large and practicals a major feat of organization. More specialist courses such as food microbiology are taught in the third year to smaller sized groups. Further specialization and a major project are undertaken in the final year. Thus it is possible for students to graduate in several named degrees having gained quite a range of experience in microbiology. Such experiences may be extended through postgraduate MSc courses, again under inclusive titles, e.g. biotechnology.

Visiting staff from UK and elsewhere may be involved in various aspects of these courses. Certainly those of us from Queen's University Belfast (QUB) have taught courses ranging from food poisoning to microbial molecular genetics, language rarely being a problem due mainly to the linguistic skills of the students! On one memorable occasion a course for industry on microbiology and the development of organoleptic characteristics of yoghurt was jointly organized and run by colleagues from UAM, Huddersfield, Nottingham and QUB.

Postgraduate students and staff at UAM are encouraged to make use of International University links and interactions typified by QUB-UAM links in which a succession of students and staff from UAM spend some time working in the Department in Belfast and those from QUB spend time working on joint research and teaching in UAM.

● *Dr Martin A. Collins can be contacted at Department of Food Science, Agriculture and Food Science Centre, The Queen's University of Belfast, Newforge Lane, Belfast BT9 5PX. Tel. 028 90 255314; Fax 028 90 668376 email m.collins@qub.ac.uk*

Teaching teachers microbiology and much more: a biotechnology summer school

Ian Sutherland

'Take 50 battle-weary Scottish biology teachers ... and return them to their student days!' *Quote from a recent participant*

For the last three years, the Institute of Cell and Molecular Biology (ICMB) at Edinburgh University has hosted a summer school for biology teachers involved in the new Scottish syllabi. Last year the focus was on the Advanced Higher 'biotechnology' programme. Although labelled 'biotechnology' much of this syllabus, especially at the practical level, focuses on microbiology. Our courses have taken 50 teachers each year from a wide geographical spread of Scottish schools and FE colleges. They spend five days living in university halls of residence and attending a mix of lectures and practical sessions. The opening lectures, following registration on a Monday morning, have updated the teachers on molecular biology or have covered a wider range of biological topics. The aim of these has always been to present a modern view of biology at a level suitable for teachers for whom much has changed since they obtained their initial degrees.

The Monday afternoon is spent on microbiology practical work. Here it has to be remembered that with the current age profile of teachers, many will not have handled bacterial cultures before. The teachers are also subject to the very restrictive protocols required in schools. What would seem a simple undergraduate practical has to include very detailed safety instructions, before we can start to look at a number of fairly simple isolation procedures. As nitrogen fixation features strongly in the syllabus, we place considerable emphasis on free-living and symbiotic nitrogen fixers and the spacing of the practical sessions is deliberately aimed at giving time for the isolates to develop.

In the following days, there is a mix of lectures and practical sessions with one day devoted to 'industrial' visits. It was especially appropriate that last year, in the week when the results of the Human Genome Project were announced, the guest lecturers were from the MRC Human Genetics Unit and the Medical Genetics Section, based at the Edinburgh Western General Hospital. Their lectures covered the Human Genome Project, genetic disorders and gene sequences. A further lecture in this area discussed the use of monoclonal antibodies in human therapeutics.

BELOW:
Participants in one of the Institute of Cell and Molecular Biology (ICMB) at Edinburgh University summer schools for biology teachers.

Evening sessions held in the halls of residence included a showing of the video *The Gift*. This has been produced by the Wellcome Trust as part of its educational programme and deals with inherited human genetic disorders. A representative of the Wellcome Trust outlined some of their projects and initiatives in the area of education and this was followed by an extended discussion on the ethical problems posed by modern human genetics and the ways in which they might be handled within the school curriculum.

A half-day visit to the Scottish National Blood Transfusion Service allowed an insight into the applications of therapeutic proteins and diagnostic products. In previous years visits have included the 'Quest' yeast production facility and a meeting with 'Dolly' the sheep at the Moredun Research Institute. Last year we were able to include another highlight with a guided tour of the 'Frontiers of Science Exhibition' at the Royal Society of Edinburgh. One problem which faces us when organizing visits is that of finding suitable venues within easy travelling range of Edinburgh. We are just too far away from antibiotic production plants in the west of Scotland and several other suitable sites.

The practical sessions in the laboratory have ranged from elementary handling of micro-organisms to DNA extraction and transformation. In these we are fortunate that we currently host a full-time development officer and technician in ICMB, funded by the Science and Plants for Schools (SAPS) programme of the Gatsby Foundation. Another teacher is seconded part-time to develop practical protocols to illustrate the new syllabi. These teachers travel widely within Scotland (and further afield) training teachers and technicians in schools. We have also been able to call on the services of the National Centre for Biotechnology Education (NCBE) at Reading and our attendees have been educated and entertained by Dean Madden and John Schollar.

While the teachers certainly spend an exhausting time catching up with recent advances in these areas of biology, all have found it a worthwhile experience as well as an opportunity to make contact with Edinburgh University. A few even managed to spend some time in the University Library, reading up the background to the material they were working on.

The Summer Schools have been made possible through the financial support of the Wellcome Trust, Unilever plc and ICI plc, for which the attendees and organizers are most grateful. Summer schools such as this enable Scottish teachers to learn of developments in rapidly advancing fields such as genetics and biotechnology. The course also provides a very useful link between Edinburgh University and some of the Scottish schools and FE colleges from which it draws its students.

Webwatch

Feedback from participants has been very positive – *'this event has started the process of producing better informed and more ethically aware students, by doing the same for 50 fortunate teachers'.*

Running the Summer Schools has involved a steep learning curve. It draws on a planning committee from Edinburgh University, the Learning and Teaching Scotland Agency, the two development officers, and local school science advisers. It relies heavily on the voluntary input of individuals. This also means that as far as possible, we use local resources. Hopefully in the future, the Scottish Executive will lend its financial support to this key element in the continuing professional development of a section of the teaching profession in Scotland. Our sponsors are also keen that such opportunities should be extended to other parts of the UK. Although we also invite small groups of school pupils to spend a day in the laboratory, by targeting the teachers we hope that we can spread expertise more rapidly and effectively.

● *Professor Ian Sutherland is in the Institute of Cell & Molecular Biology, Edinburgh University, Rutherford Building, Mayfield Road, Edinburgh EH9 3JH. Tel. 0131 650 5331 Fax 0131 650 5392 email i.w.sutherland@ed.ac.uk*

Curriculum 2000

Dariel Burdass

Recent changes to the structure and content of UK post-16 qualifications will affect the knowledge and skills that students will have when they enter university or employment. Dariel Burdass describes the new system.

Changes to post-16 qualifications in England, Wales and Northern Ireland came into effect in September 2000. The new and revised post-16 qualifications are located within the new National Qualifications Framework, which has been developed by the regulatory authorities: the Quality and Curriculum Authority; Qualifications, Curriculum and Assessment Authority for Wales; and Northern Ireland Council for the Curriculum, Examinations and Assessment (see Table 1).

The aim of the changes to the post-16 qualifications is to:

- Ensure that all qualifications are valued and are equally worthwhile
- Encourage a broader programme of study without sacrificing depth
- Raise and widen levels of student participation, retention and achievement
- Provide a greater opportunity to mix general and vocational qualifications and to transfer from one programme to another

The three broad categories of qualifications are:

General (previously termed academic), e.g. Advanced GCE [A level (A2)] and the new Advanced Subsidiary GCE (AS).

Vocation-related, e.g. Vocational A level (formerly Advanced GNVQ) and Vocationally Advanced Subsidiary

Occupational, e.g. National Vocational Qualification (NVQ)

Advanced Subsidiary GCE and Advanced GCE

Most Advanced GCEs will have six units (previously called modules).

The Advanced Subsidiary (AS) GCE will have three units and will be a qualification in its own right as well as being the first half of Advanced GCE. It has been designed to bridge some of the gaps between GCSE and Advanced level studies and also to provide extra breadth in the curriculum. The second half of the Advanced GCE, known as A2, will also have three units but will not represent a qualification as such, but form the second half of study for Advanced GCE. It is thought that students may take four to five AS qualifications in their first year of sixth form study and reduce this to three A2s in their second year.

Most applicants to higher education are likely to have AS grades on their UCAS form, although as it is not obligatory to take the AS assessment at the end of the AS course some students may not have their grades at that stage.

Vocational Advanced Subsidiary and Vocational A level

The Vocational A level will come in two sizes. The Vocational A level will have 6 units and the Vocational A level Double Award will have 12 units. It is expected that the 6-unit qualification will be the most commonly offered of the new Vocational A levels and that it will form part of a mixed programme, e.g. combining qualifications from both the general and vocationally related categories of the framework.

The Vocational Advanced Subsidiary will be a 3-unit qualification that will be available in a limited number of subject areas.

Key skills

A new Key Skills Qualification is also available and is based on the first three skills listed below:

- Application of number
- Communications
- Information technology
- Improving own learning and performance
- Problem solving
- Working with others

Further information about post-16 qualifications can be found in the publication *Changes to Post 16 Qualifications – A briefing for higher education on changes to the post 16 curriculum in England, Wales and Northern Ireland* available from UCAS (www.ucas.com).

● *Dariel Burdass runs education projects in the External Relations Office at SGM HQ. email education@sgm.ac.uk*

Table 1. New and revised post-16 qualifications

Level of attainment	General qualifications	Vocation-related qualifications	Occupational qualifications
Higher level/5			e.g. NVQ level 5
Higher level/4			e.g. NVQ level 4
Advanced level/3 (entry into higher education)	e.g. Advanced Subsidiary (AS) and Advanced GCE (A2)	e.g. Vocational Advanced Subsidiary Vocational A level	e.g. NVQ level 3
Intermediate level/2	e.g. GCSE grades A*–C	e.g. Intermediate GNVQ	e.g. NVQ level 2
Foundation level/1	e.g. GCSE grades D–G	e.g. Foundation GNVQ	e.g. NVQ level 1

Entry level qualifications can provide a basis for progression to qualifications across the framework at foundation level.

The impact of Curriculum 2000

A meeting took place on 10 April at the Biochemical Society Bristol Meeting that brought together representatives from QCA, exam boards, universities and schools to look at the impact the new AS/A levels will have on post-16 education in schools and universities.

Roger Barnes from St Edmunds School, Canterbury summed up the views of many teachers when he reported that schools and students were being overloaded both in terms of class sizes and curriculum content. Class sizes have risen by between 33 and 67 % due to pupils taking extra AS level courses. This is a particular problem with popular subjects such as biology. Larger class sizes have had a direct effect on teaching methods, with hands on practicals being replaced by CD-ROMs and lessons becoming more teacher-focused, leaving little time for debate.

Concerns have also been expressed over the content of the new specifications. The depth of knowledge required by each pupil has not been reduced. So whilst teachers and students welcome the opportunity to study more than three subjects at AS level and increase their breadth of knowledge, the increase in workload has left them little time to develop their independent study skills. There has also been a reduction in the amount of time that students are able to spend on extracurricular activities such as music. This will obviously have a knock-on effect on the skills and experiences that students will take with them to higher education.

Teachers are reporting that retention is not good and many students are dropping back to three AS levels from the four or even five they originally started to study.

Roger Barnes concluded his talk by calling on universities to give clear and unambiguous advice about entry requirements for 2002.

Will the universities still be asking for three A levels? This question was answered in part by an article in the *Times Educational Higher* on 13 April 2001, '*Admissions tutors blamed as AS levels falter*', which reported the finding of a study conducted by London University's Institute of Education which indicated that many universities are barely interested in the new AS level qualifications and even less so in the key skills.

If universities continue to ask for three A levels and students continue to feel under pressure from increased workloads then fewer will choose to opt for the fourth AS level. It appears that the new system is faltering already because the potential consequences were not considered before it was brought in.

● *Dariel Burdass, SGM HQ*

Developments in Education Fund

A roundup of recent projects funded by the SGM

A teacher's guide to studying the virulence factors of the yeast *Candida albicans*

■ Kevin Kavanagh

Candida albicans is a dimorphic yeast capable of inducing a range of superficial and systemic diseases in those immunocompromised as a result of disease (e.g. cancer, AIDS) or therapy (e.g. immunosuppression during organ transplantation, broad spectrum antibiotic therapy). While *C. albicans* is a normal component of the body flora it can induce oral or vaginal 'thrush' in susceptible individuals. The incidence of infection caused by *C. albicans* has risen significantly in recent years due in part to the advent of AIDS and also to new developments in medical therapy. *C. albicans* employs a range of virulence factors to enable it to colonize the host and avoid the attentions of the host's immune system.

This book was produced with the aid of financial support from the SGM and describes experiments to allow class-based examination of the range of *C. albicans* virulence factors. The book is designed for use in the senior cycle of Irish second level schools and provides the means of performing over 60 experiments to evaluate the virulence of this important pathogen. *C. albicans* is a good model for studying microbial pathogenicity since it is an opportunistic pathogen and so should not pose a risk to the health of the worker if a number of basic safety precautions (detailed in the book) are followed*. The book is divided into sections which deal with safety, antifungal drug susceptibility testing, the dimorphic transition in *C. albicans*, adherence to host tissue, cell surface hydrophobicity measurement, extracellular enzyme production and phenotypic switching. Techniques to examine each factor are detailed and suggestions for variations are provided. Using the suggested variations a teacher will be able to select a particular angle in studying a number of the virulence factors. Suggestions for obtaining yeast are also provided and these include purchasing from international culture collections but also obtaining samples from volunteers by using sterile cotton buds to take rubbings of the inner surface of the cheeks. Over 60 % of the population carry this yeast in the mouth so this can represent a good source of the fungus for school use!

The techniques described in this book are in routine use in medical mycology but many have been altered by workers over the years. The collection of techniques was 'road tested' and fine tuned by an undergraduate student and the illustrations were prepared by an art graduate with experience in illustrating scientific textbooks. It is hoped that this book will encourage teachers to examine this intriguing pathogen and will foster an interest in the area of microbial pathogenicity in school leavers. For further details contact the author.

● *Dr Kevin Kavanagh, Medical Mycology Unit, National University of Ireland Maynooth, Co. Kildare, Ireland.*
Tel. +353 1 708 3859; Fax +353 1 7083845
email Kevin.Kavanagh@may.ie

If you have any ideas to promote microbiology teaching, why not apply for an SGM grant? The rules are published on p. 89. Application forms can be downloaded from the sgm website: www.sgm.ac.uk

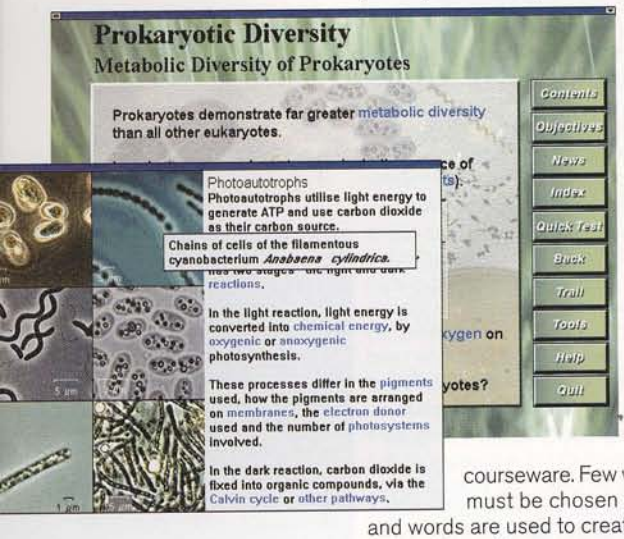
***Safe practice**

These protocols were devised for use in schools in the Republic of Ireland. Different safety rules may apply in other countries. Please obtain advice and carry out a risk assessment before using the book. Safety information for England, Wales and Scotland is available on the SGM website (www.sgm.ac.uk) or email education@sgm.ac.uk

Prokaryotic Diversity: a multimedia courseware unit produced in collaboration with the Virtual School of Biodiversity

■ Linda Thomas

The Virtual School of Biodiversity (formerly the Biodiversity Consortium) began as a network of UK university biology departments dedicated to revitalizing the teaching of biodiversity in undergraduate courses by using multimedia learning technologies. It is now an international group led by Dr Peter Davies based in the University of Nottingham, in collaboration with the University of Hong Kong and the Natural History Museum, London. Together with members of the consortium, as well as Professor Julian Wimpenny, at Cardiff University, I had already co-authored some courseware for this group and it was apparent that prokaryotic diversity needed to be covered.



Multimedia courseware will only attract students if it is well designed, easy to use and enriched with appropriate media. Thus, my first objective was to obtain decent images of micro-organisms and so I contacted microbiologists worldwide requesting their help. The generous response from so many of them (who are credited on the unit), together with pictures I had taken, was critical to the success of the unit. There are many constraints when scripting this kind of courseware. Few words can be used – so these must be chosen with care. Images, diagrams and words are used to create imaginative links from one screen to another, encouraging the student to explore a subject in greater depth and at their own pace (see figures). When I had put the unit together, Dr Will Trewhella of the Virtual School of Biodiversity edited it to match the format of other units and finally the unit was independently refereed.

The courseware unit 'Prokaryotic Diversity' has six tutorial sections:

- An Overview of Prokaryotes
- The Prokaryotic Cell
- Metabolic Diversity of Prokaryotes
- Bacterial Phylogenetic Diversity
- Archaeal Phylogenetic Diversity
- Prokaryotes and Man

Courseware notes accompany the computer-based tutorial, explaining what the unit provides and what is expected of the user. For example, the learning objectives state that after completing the unit one should be able to:

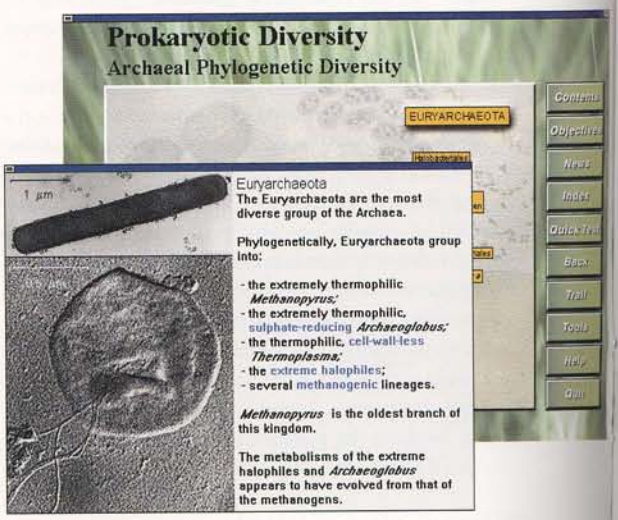
- Distinguish between prokaryotes and eukaryotes, *Bacteria* and *Archaea*
- Describe the diversity of visible characteristics, metabolism and habitats of prokaryotes
- Name and recognize the major taxonomic divisions of the *Bacteria* and *Archaea*, and describe phylogenetic relatedness within them
- Discuss current views on numbers of estimated species, and species concepts
- Describe the importance of prokaryotes to humans

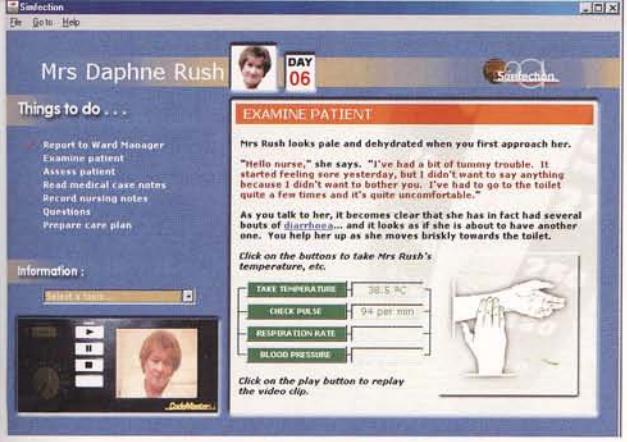
The units are designed to be teaching aids, not textbooks. They encourage students to think and investigate the topic independently, not just on the computer, but also in the library. Discussion topics are suggested, as well as tasks and multiple-choice questions, offering a means of assessment to tutors.

Additional information on the Virtual School of Biodiversity and the unit 'Prokaryotic Diversity' can be obtained from the www home page at http://vsb.nott.ac.uk/vsb/

Alternatively, contact Dr Peter Davies at the Virtual School of Biodiversity, School of Life and Environmental Sciences, University of Nottingham, Nottingham NG7 2RD (Tel. 0115 951 3238; email Peter.Davies@nottingham.ac.uk).

● *Dr Linda Thomas is Senior Research Officer, Technical Services Department, Aplin & Barrett Ltd (Danisco Cultor), 15 North Street, Beaminster, Dorset DT8 3DZ.*
Tel. 01308 862018; Fax 01308 863320
email linda.thomas@danisco.com





A microbial case-based CAL package (Simfection) for nursing students

■ Mike Tait & Yamni Nigam

Simfection is a PC-based CAL (computer-aided learning) package based around three scenarios with a microbiological theme. The aim of the package is to introduce nursing students to aspects of the care of patients with different infections and to develop their skills in problem solving, patient assessment and the development of care plans.

On starting the program, the student has a choice of three scenarios. Each of these starts at day 1 with a video clip of a ward manager who explains the background to the case. To complete the day's work, the student then has to examine and assess the patient, read medical notes, write nursing notes, answer some questions and design a care plan.

Before allowing the student to progress to the next day's work, the program assesses the chosen care plan and allows the user to make changes. Some of the scenarios have a branched structure. This allows the user to make inappropriate decisions and to see the consequences of this before going back in time and changing the care plan.

The Simfection project was funded for 3 months by a grant from the Society for General Microbiology's Education Development Fund. This allowed us to employ a vacation student who acted as multimedia author for the project. To ensure the clinical authenticity of the scenarios, an advisory team comprising nursing lecturers from the School of Health Science and clinical nursing specialists from two local hospitals was formed.

By the end of the 3-month period of the project, one scenario was fully completed. This case featured an elderly woman (Mrs Rush) admitted to hospital with a chest infection who subsequently developed a *Clostridium difficile* infection. The feedback from the students who used this scenario has been very positive and they were keen to try further scenarios. SGM members who would like a free copy of the Rush scenario should contact Mike Tait (m.i.tait@swansea.ac.uk).

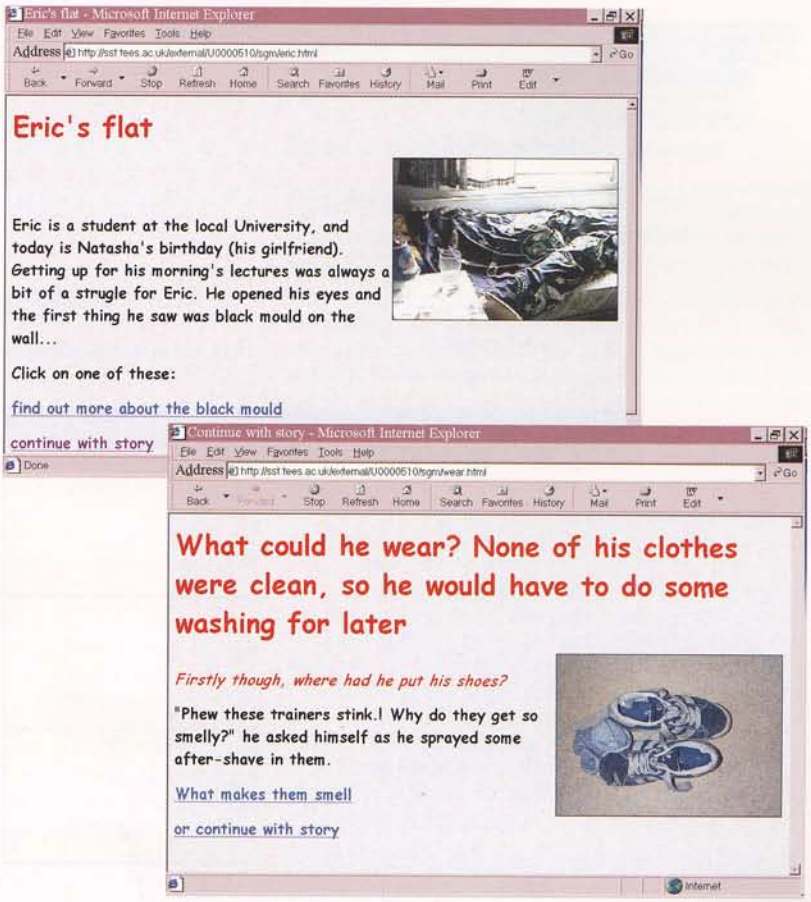
Two further scenarios have been designed, but not yet developed. These are a wound infection scenario and an HIV scenario. Although lack of time prevented us from completing these scenarios, we plan to do this as soon as time permits. The techniques used to develop Simfection are currently being used to develop a new larger package called eWARD (the electronic ward). Details of this and our other projects are on the SHS CAL Website at http://www.shscal.swan.ac.uk/

● *Mike Tait is Senior Lecturer/Head of CAL Unit and Yamni Nigam is a Lecturer, School of Health Science, University of Wales Swansea, SA6 6NL.*
Tel. 01792 703749/703771; Fax 01792 799230
email m.i.tait@swansea.ac.uk

PowerPoint presentation of microbes in everyday life

■ Rob Cumming

The award paid for two second-year students from our BSc Biotechnology course to work for 2 weeks in the summer holiday. The aim of the project was to produce a PowerPoint presentation entitled *A day in the life of a student and his/her microbial encounters*. The presentation was designed for use in schools to aid recruitment to university microbiology courses. Thus the student was portrayed getting up in the morning (late) and rushing for his lectures/labs with meals in between (to introduce fermented foods and especially drinks!). The students wrote the script from a plan I had given them, but decided to introduce some romance in the story (to introduce some new diseases). The illustrations used came from the Internet with the web publisher's permission and acknowledgments are listed on the relevant pages of the story. A difficulty was how much to edit the story. I thought it would appeal to potential students if written by students; but the grammar and spelling had to be reasonable! A feature of the style was to have a picture on each page with accompanying text, to make it attractive to the audience. This meant, unfortunately, that the file size of



the presentation became very large, making distribution of the work difficult. Nowadays the writeable CD-ROM is available and would have neatly solved this problem. As an alternative, we converted it to simple HTML files (not via PowerPoint!). The project can thus be viewed from any school at http://www.sst.tees.ac.uk/external/U0000510/sgm/home.html

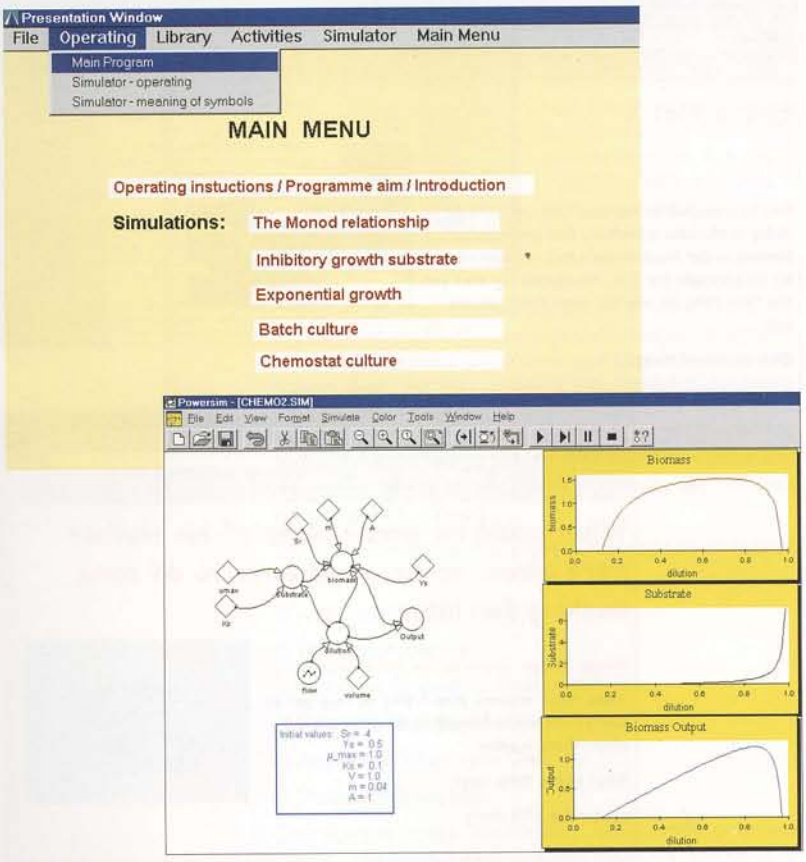
The HTML coding used was very basic, so don't expect any flashing microbes!

The students had great fun doing it; widening their microbiological knowledge in the process. I have since used it at a number of school presentations at my university.

It has occurred to me since converting it to HTML that the project could easily be turned into a worldwide one, with individual universities (or companies) hosting a page from the story with further links to the subject area on their own servers. Thus prospective microbiological students could be made aware of university activities and courses in microbiology.

I thank the SGM for providing the funds for the activity.

● *Rob Cumming is Professor of Microbiology, Applied Sciences, School of Science and Technology, University of Teesside, Middlesbrough TS1 3BA. Tel. 01642 342435; Fax 01642 342474 email R.H.Cumming@tees.ac.uk*



Computer simulation of the dynamics of microbial populations

■ R.O. Jenkins

The dynamics of microbial populations can usually be expressed in mathematical form and such relationships invariably form part of undergraduate programmes incorporating microbiology. For many students of biology, meaningful interpretation of seemingly complex mathematical equations represents a considerable hurdle and their value to understanding the dynamics of microbial populations is often not fully appreciated. This problem can be particularly pronounced if the subject matter is taught using an entirely traditional classroom approach.

Computer-aided learning (CAL) software was developed and designed to enhance student understanding of the dynamics of microbial populations through the use of interactive computer simulations. The software combines the linear authoring capability of Authorware Professional with the dynamic simulation capability of PowerSim. A structured front-end, developed using Authorware Professional, provides background and activities for each simulation. A computer-based library is accessible at any stage via the Menu bar and includes concise definitions of terms, as well as descriptions of relevant mathematical expressions describing growth in batch and continuous culture systems. Students address the activities in the simulation part of the software (developed using PowerSim) by exploring, in a relatively unstructured manner, the influence of change of parameter values on model variables. Simulations of the Monod relationship, inhibitory growth substrate, exponential growth, batch culture and chemostat culture are incorporated. Activities relating to the chemostat culture simulation, for example, involve exploring the influence of saturation constant, maintenance coefficient, growth yield coefficient, limiting substrate concentration and biomass feedback factor on biomass output and of steady-state biomass and substrate concentrations. The 'simulator' provides graphical representations of the changes over a range of dilution rates and students are expected to provide explanations for the effects they observe. The software is essentially modular in design and new simulations can be added with relative ease.

Positive student feedback and evidence of enhanced understanding following use of the software in an undergraduate programme [BSc/BSc (Hons) biological sciences; second year module on microbial technology] has been gained, which suggests that the use of simulation to explore mathematical relationships can represent a powerful approach to learning for students of microbiology.

Copies of the software may be obtained free of charge from the author.

● *Dr R.O. Jenkins is Principal Lecturer in Microbial Physiology, Department of Biological Sciences, De Montfort University, The Gateway, Leicester LE1 9BH. Tel. 0116 250 6306; Fax 0116 257 7287 email roj@dmu.ac.uk*

PublicAffairs

SGM Public Affairs Administrator Tracey Duncombe reports on some recent meetings she has attended which are of importance to bioscientists.

IoB Affiliated Societies

Science Policy Priorities

Science policy issues affecting the whole biological community were given the spotlight recently at a meeting held at the Royal Society. The launch of the Institute of Biology's (IoB) *Affiliated Societies Science Policy Priorities for 2001* paper heralded the culmination of year-long discussions with affiliated societies such as SGM. Over half of all comments received by the IoB related to either the state of UK research or careers and short-term contracts.

The main themes of the document were: science funding; careers in science – short-term contracts; the post-genome challenge; public understanding of science; and science to underpin sustainability. Key contributors to the paper gave presentations at the meeting. Dr Peter Cotgreave of Save British Science made the point that most new money in the science budget goes to the Office of Science and Technology, and that ministries, government departments and universities are losing out. MAFF, for example, would need an 80 % increase to restore its budget to the same level as 15 years ago.

Several parliamentary bodies, including the Parliamentary and Scientific Committee, and the Conservative and Liberal Democrat parties, welcomed the *Policy Priorities* document. Lord Sainsbury (Minister for Science) said that he was pleased that the Affiliated Societies were seeking constructive dialogue with policy-makers.

British Association for the Advancement of Science

Science & Public Affairs Fora

● A code for public trust: advising government on science

It is commonly held that scientists have a responsibility to explain their research, participate in debate and recognize public concerns. However, many scientists feel ill-equipped to do this. At a recent forum sponsored by the Office of Science and Technology, Stephen Byers, Secretary for Trade and Industry, went some way to address their fears and highlighted Government responsibilities towards the public defence of science and scientists.

He said that the Government would not tolerate blackmail or assault of scientists and would ensure that topical issues are debated openly and the outcome included in the decision-making process. In terms of risk management he said that a balanced approach is needed. New technology has undoubtedly made our lives easier and healthier, but there is a '*risk of becoming risk averse*'. Yes, we should err on the side of caution, but that does not mean doing nothing. As government Chief Scientific Adviser Professor David King went on to quote from the Phillips report on BSE, '*an advisory committee should not water down its perception of risk at the risk of causing public concern*'. Recent polls have shown that people are resistant to change, especially if they perceive no real benefit. Issues such as BSE have led to an erosion of public trust. He said that to benefit from scientific advances we '*need to discuss new developments in order to command public confidence*'.

The Code of Practice for Government scientific advisory committees is currently undergoing its second round of consultation. Send any comments for inclusion in an SGM response to Tracey Duncombe by **20 June 2001**.

● What future for agriculture?

Can we do without agriculture in the UK? Not according to Sir Colin Spedding of Reading University, for two reasons. First, the ever-present threats to food security. '*We can't assume food will be there to import that is safe*', said Sir Colin. Nuclear disasters, bio-warfare and global warming are real dangers. Second, agriculture also contributes significantly to countryside management. Over two-thirds of rural Britain is grassland. This is good for recreational use but with it comes a requirement for grazing and farming.

Dr David Shannon from MAFF discussed opportunities for science in agriculture. '*Genomics and proteomics will play an important role in our understanding of natural defence mechanisms*', he said. '*Already we have sequenced Mycobacterium bovis, which could soon lead to diagnostic tests for cattle and vaccines for cows and other animals*.'

Information on the subjects of future SPA Fora can be obtained from events@britassoc.org.uk

Royal Society

Sites of Special Scientific Interest

A recent report by the Royal Society called on conservation agencies to seek the scientific and taxonomic expertise of universities, research institutions and learned societies such as the SGM so that SSSIs can be studied more fully.

'*Most biological SSSIs are designated on the basis of relatively large and well-known organisms, such as birds, plants and larger invertebrates, such as large molluscs or insects. There are far fewer cases of designations for less well-known groups such as fungi, soil micro-organisms and smaller invertebrates, despite the profound role these groups may play within the ecosystem, for example in recycling nutrients*.'

The report also highlights the need for measures to prevent the decline of SSSIs. About 30 % of 'habitat types' in England are in poor condition and are not improving. Professor John Pickett FRS, chairman of the working group that prepared the report, said, '*The European Commission is already taking action against the UK Government for breaching the Habitats Directive that protects SSSIs and it will be nothing less than a national tragedy if we allow the condition of these sites to deteriorate further through neglect. We will have difficulty defending our reputation as an international leader in science if we are unable to look after some of the world's most important natural biological and geographical features*.'

To obtain copies of the report contact Bob King, Press and Public Relations, The Royal Society, London (Tel. 020 7451 2516).

Foot-and-mouth disease – a case study in microbiology education

Tracey Duncombe & Janet Hurst

Table 1. Chronology of the foot-and-mouth disease epidemic in the UK, 2001

20/2	First case is discovered at an abattoir in Essex and a five-mile exclusion zone is set up.
21/2	European Commission (EC) halts all UK food exports and imposes a worldwide ban on shipments of all cattle and meat.
23/2	A case on a pig farm in Northumberland is suspected of being the source of the outbreak. UK Government bans livestock movements throughout the country.
1/3	First suspected case in Northern Ireland. EC announces that vaccination will only be reintroduced in Europe as a last resort.
2/3	First confirmed case in Scotland. Farmers' leaders say that the outbreak is on the verge of an epidemic. Licensed movement of livestock to selected abattoirs.
4/3	France discovers infected sheep imported from Britain.
6/3	EC suspends all livestock markets in the European Union (EU).
12/3	Germany announces the slaughter of livestock imported from UK.
13/3	Confirmed case in Northern France.
15/3	Agriculture Minister Nick Brown announces cull of up to 1 million healthy livestock to prevent further spread of the disease.
22/3	Dutch authorities vaccinate animals within 3km of infected areas. First case in the Republic of Ireland. Government announces £150 million scheme to compensate for culled healthy livestock.
25/3	UK army prepares to bury up to 500,000 animals at a disused airfield near Carlisle. EC grants permission to vaccinate up to 180,000 dairy cattle in disease hotspots Devon and Cumbria.
29/3	Government delays vaccination after signs that the cull is working.
2/4	The general election, which was forecast to take place on 3 May, is postponed.
3/4	Total number of animals slaughtered exceeds 1 million as number of reported cases rises above 1000.
4/4	900 sheep and cattle buried in Co Durham face being exhumed because they threaten to contaminate a freshwater spring.
12/4	Chief Scientific Advisor David King announces that the epidemic has 'plateaued' as the number of reported daily cases remains between 20 and 30.
14/4	Nick Brown is under pressure to reconsider vaccinating livestock after admitting that deadlines to slaughter infected livestock are not being met.
15/4	Government takes emergency powers to bury slaughtered healthy livestock in landfill sites. Government orders a change in policy on vaccination as the number of animals waiting slaughter or disposal approaches one million. Government scientists admit there is no evidence that it is safe to burn infected animals in the open. Britain's largest pyre in Cumbria is halted after protests from local residents about potential health risks.
16/4	Mass burial of thousands of slaughtered animals in mid-Wales is suspended due to pollution fears.
17/4	Supermarkets give support to the vaccination lobby.
18/4	Government fails to get farmers' leaders' backing for vaccination.
19/4	Confidential report from Chief Scientist's own laboratory says that vaccination could do more harm than good.
20/4	Institute of Directors say that the outbreak has cost the UK £20 billion in lost business so far. Restrictions lifted in parts of Northamptonshire and Leicestershire.
21/4	Ireland lifts restrictions.
22/4	Vets fear the disease has spread to deer.
23/4	Department of Health launches investigation as concern grows over release of poisonous dioxin from massive pyres.
24/4	Human case of FMD suspected. Government abandons vaccination as outbreak is 'under control'.
25/4	Government drops its policy to cull healthy animals living near infected farms.
28/4	First suspected human case given all clear.
30/4	Total number of cases to date 1,515; total number of animals slaughtered 2,338,000.

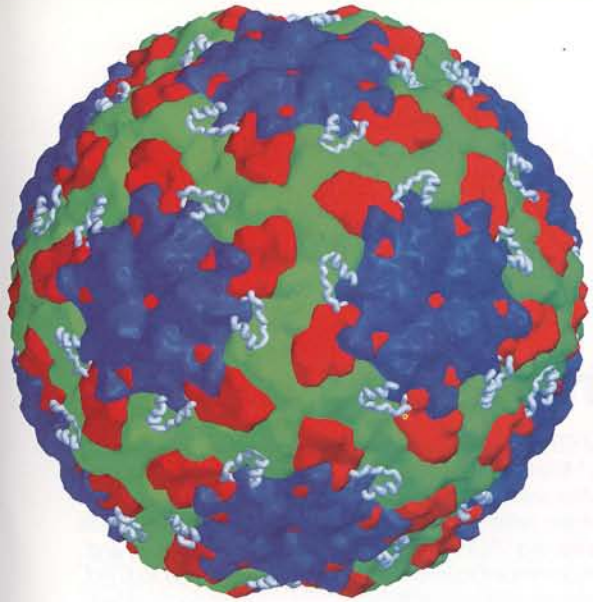
Information taken from reports in The Times, Daily Telegraph, Independent and The Guardian. See www.sgm.ac.uk/PA/mic_news/micro.htm for further updates

Readers worldwide cannot fail to be aware that the UK has been thrown into turmoil due to an outbreak of foot-and-mouth disease in cattle, sheep and pigs. A summary of the events associated with the outbreak is given in Table 1.

A policy of wholesale slaughter around farms with a confirmed infection was introduced by the Government, which itself postponed the general election in response to the situation. Footpaths were closed throughout the country in an attempt to halt the spread of the disease, with the knock-on effect that hotels and tourist attractions lost all their business. People were amazed by the revelations of the complexity and extent of animal movements around the UK, and indeed in Europe, which had contributed to the spread of the virus. The scale of past governments' earlier culls – of the national veterinary service and Ministry of Agriculture (MAFF) staff – was exposed, which meant vets had to be brought in from overseas and veterinary students learnt techniques that they would not use in the small animal practices most aspired to. The public were sickened by the sheer scale of carnage which appeared on television screens daily.

Many heated debates took place. Should we vaccinate? Should we have a general election in the midst of the crisis? Is the countryside 'open for business' or not? The arguments, like the epidemic itself, are on-going, but will hopefully be resolved soon so that Britain can regain its all-important 'disease-free' status. But what lessons have been learnt? There have been public demands to change farming and food production methods in the hope that this may reduce the risk of future epidemics. Some have called for MAFF to be scrapped. Agriculture Minister Nick Brown is keen for reform and has said that a far-reaching government review of UK agriculture would radically change the lives and incomes of farming communities.

Whatever the rights and wrongs and politics of the affair, as we go to press (early May) the measures imposed by scientists and the Government appear to be working – the incidence of confirmed cases is on the wane. Official sources are now predicting that the worst will be over by June. It was decided not to vaccinate. Culling has been scaled down. Media attention has switched to the disposal of carcasses and the possible dangers to health posed by carcinogens from burning pyres and the contamination of water supplies from burial pits. The effects of this disease



have been far-reaching, not only on animal health and the rural economy, but on British tourism, the country's political situation and our international relationships.

A virus has caused this state of affairs. When the editorial board planned this issue of *Microbiology Today*, which emphasizes again and again the need for education in our subject in its broadest sense, we did not know how timely it would be, nor how foot-and-mouth disease would serve to reinforce our message.

● ***Tracey Duncombe, Janet Hurst, SGM HQ***

ABOVE:
A surface representation of the FMDV capsid viewed along the two-fold symmetry axis. The colour scheme is defined in the legend to the image on p. 96. The ordered antigenic receptor-binding loop is shown in pale blue as a thick worm.
COURTESY DAVID STUART, LIZ FRY AND ROBERT ESNOUF, OXFORD UNIVERSITY

BELOW:
A familiar rural scene across the UK.
PHOTO IAN ATHERTON

Letters received from members

FMDV update

Delegates at the Heriot-Watt meeting in March were updated on the foot-and-mouth disease outbreak. In a jam-packed auditorium Dr Nick Knowles from the Institute of Animal Health, Pirbright presented data on the virus and plotted the suspected transmission route to the UK. He reported that the sequencing of UK samples carried out at Pirbright had revealed that a type-O virus was involved, the so-called 'Pan-Asia' strain. This particular strain was identified in India in the early 1990s and subsequently spread through Turkey, Nepal and Malaysia. During the late 1990s there were contained outbreaks of type O in Eastern Europe. But this was followed by re-emergence from India and a more dramatic spread through South East Asia, Eastern Russia and South Africa. Sequence comparisons of UK samples with samples from South Africa were almost identical: only two nucleotides different in the most variable gene. Dr Knowles said, '*This implies that the virus could have spread from South Africa or that they had a common ancestor*'. A more detailed presentation of this data can be found in *Journal of General Virology* (2001), **82**, pp. 609–621. See also *Hot off the Press* on p. 96.

● ***Tracey Duncombe, SGM HQ***

New vaccines for FMDV?

To what extent is the current disastrous outbreak of foot-and-mouth disease a result of complacency? Europe now has a huge susceptible population of farm livestock since the cessation of vaccination in the early 1990s and can only hope to maintain a disease-free status by controlled animal management and continuous high-level surveillance. We in Britain have traditionally managed to ward off the virus by control of animal movement and slaughter when it has appeared. This policy has worked effectively in the past, although we only just made it in 1968.

What have we learned from the current situation? First, swill feeding adds a level of risk that must now be considered unacceptable. Second, the extent of animal movement, registered or otherwise, that has become a feature of modern farming practice seems to have taken even the authorities by surprise. As we have seen, this provides the ideal scenario for the wide dissemination of infection. The situation was made worse, of course, because of the difficulty in diagnosing the infection in sheep compared with other species. During the 30 years since we last had a meaningful outbreak of the disease it is perhaps inevitable that our 'guard will drop' a little – it is hard to justify the maintenance of a large infrastructure to deal with a rare occurrence. On the other hand, the pandemic spread of the particular strain of virus from which we are now suffering has been monitored by the epidemiologists in Pirbright. Should we have been expecting it?

A lot has been said in the media about vaccines. They were, after all, responsible for the elimination of endemic disease in Europe, so why are they not used now? There are a number of problems associated with the current killed vaccines, such as the antigenic diversity of the virus, the security risks associated with growing huge volumes of virulent virus, the difficulty of distinguishing vaccinated from infected animals, the short duration of effective immunity and the absence of secretory immunity. For these reasons the policy in Europe has been to stop vaccination as soon as possible. One result of this decision is that research into the development of superior new vaccines has been of low priority. However, given the current enormous burden to the country, do we need to re-evaluate the question of new vaccines? I feel sure that with the investment of a tiny fraction of the overall cost of this outbreak it would have been possible to develop new and better products.

● ***Professor David J. Rowlands***

A disaster waiting to happen

The two books I recall most vividly from my student days are Macfarlane Burnet's *Biological Aspects of Infectious Disease* and René Dubos's *Mirage of Health*. Both taught me the importance of seeing communicable disease not from a narrow medical or veterinary viewpoint but from a broad ecological perspective. Four decades later, I wonder what Burnet and Dubos would have made of the 2001 outbreak of foot-and-mouth disease in Britain.

They might have reasoned as follows. If we were to design a perfect scenario for a highly infectious (and possibly highly virulent) virus to wreak havoc in a population of animals in Britain, we would need to take two steps.

First, we would resolve not to protect our national herd(s) by immunization and would indeed ban farmers from doing so. This would leave the animals totally vulnerable to the infection.

Second, we would arrange our farming and food practices so that, in contrast to the past, animals are moved frequently and widely between farms, holding farms, markets and abattoirs. This would ensure that, if the virus were to enter the country, it would be disseminated widely and efficiently to other unprotected animals.

These two conditions would create the ideal setting for 'a disaster waiting to happen'. However effective our other precautions to exclude the virus, its eventual accidental (or deliberate) introduction from outside would be inevitable. The danger would be all the greater in the case of a virus that circulates freely in other parts of the world.

This is precisely the scenario we have allowed to develop in the case of foot-and-mouth disease. Of course, existing FMD vaccines, though effective, are imperfect in several ways. Yet we have controlled many other communicable diseases with imperfect vaccines. And eight European countries did precisely that in the case of FMD until about a decade ago (since when vaccine technology has advanced considerably).

I believe that Macfarlane Burnet and René Dubos would have agreed with this analysis.

● ***Bernard Dixon OBE DSc***

Women in science

Tracey Duncombe

The Athena Project

How does gender affect progress in science education and research? Here we examine some of the issues and look at one woman microbiologist's career path.

A 'landmark' year for the Athena Project was completed in February when top academics met with Professor David King, Chief Scientific Advisor, at a reception in London to discuss the realization of the past year's projects and the way forward for Athena.

The Athena Project was established in 1998 with the aim of advancing women in science, engineering and technology (SET) in higher education. Athena works with higher education institutions (HEIs) to develop, share and disseminate good practice. The Athena Project developed out of the agenda of the Committee of Vice Chancellors and Principals' (now Universities UK) Commission on University Career Opportunity which aimed to remove barriers to discrimination of women in HE at all levels and to increase significantly the number of women in top posts by 2007.

David King highlighted the threat to the UK science base as the number of science undergraduates continues to fall. He believes that women are a key part of British science. But at present, although women account for roughly half of all biology graduates, they account for only 9 % of biological science professors. A study carried out by the Wellcome Trust and the Research Councils has shown that women are less likely to apply for research grants. A survey held in February 2000 of 3,090 academic staff found that only 50 % of women had applied for research grants in the past 5 years compared to 59 % of men. Women also made a smaller number of applications, were less likely to be the principal applicant, sought lower levels of funding than their male counterparts and generally applied for grants for shorter periods of time. The inadequacies of specific HEIs in terms of the numbers of senior women scientists were pointed out by Nancy Lane, who is on the Athena Project committee. A league table of UK HEIs puts Cambridge University at the bottom!

In 1999 Athena funded six HEIs to set up local projects to try to identify and tackle some of the issues that prevent women from progressing in their scientific careers. Professor Julia Higgins, Chair of Athena, said, '*All the projects contributed to an improved understanding of the under representation of women in SET in higher education, the differences between the academic careers of men and women and the choices and constraints women face in balancing their career and caring commitments*'.

A major feature of the 1999 projects was mentoring. Mentoring projects lasted between 6 and 9 months and most pairs met between two and seven times. Mentees highly rated having someone impartial to talk to, who helped them to improve their self-image and who encouraged them to do things that they would not have done otherwise. These schemes also had an impact on the senior academics who had become mentors – '*they saw their institution through different eyes and understood the obstacles that young women face in progressing their careers*'.

Career progression in SET in HE is very different for those who are single and childless. The Open University (OU) however, has proved more successful than wider HE in recruiting women academics. A total of 55 % of OU lecturers are women, compared with 21 % elsewhere. Associate Lecturer (AL) positions offer women the chance to work part-time which also allows women researchers to gain experience in HE teaching. '*ALs are a valuable resource of qualified and experienced women who, mainly as a direct or indirect consequence of family and child-care responsibilities, have been excluded from other HE work.*' Flexibility is the key to the success of OU's AL scheme. Most work can be done at home with timetables planned well in advance to arrange for child care.

All of the 1999 Athena projects involved networking, which was recognized by participants as a positive benefit. Networks are not unions – there is a tightrope to tread between campaigning, development and influence. The University of East Anglia (UEA) project was a self-sustaining support network for contract research staff in the science schools and local research institutes. Participants valued the opportunity to ask questions in a single sex environment. They discovered where to go for information on their rights and also recognized that their eyes had been opened to the realities of research careers. The UEA concluded that '*women are too willing to believe that the answer lies in training, when what they need is to have the confidence to actively pursue their own development needs*'.

In September 2000 Athena launched five Local Academic Women's Networks (LAWNs). LAWNs are regionally based networks of women working in SET in HE, research establishments or in related industry and the professions. They will address:

- Institutional culture, values, attitudes and behaviour
- Organizational policies, practices, systems and arrangements
- Personal factors which shape or constrain career choices and outcomes

To contact Athena email athena@ic.ac.uk

● ***Tracey Duncombe is the SGM Public Affairs Administrator***

Further reading

Report on the 1999 Development Programme. Athena Report No. 7. Available from Athena (email athena@ic.ac.uk).

Beating Barriers and Constraints in HE Careers. The Open University, Athena Project No 5.

ResNet 2000. UEA Norwich, Athena Project No 2.

Who applies for research funding? Key factors shaping funding application behaviour among women and men in British higher education institutions (2000). The full report can be obtained (price £15) from the National Centre for Social Research (email info@natcen.ac.uk).

RIGHT:
Left to right: Nancy Lane, Julia Higgins, David King and Margaret Evans.
PHOTO GEOFF WILSON

A job in ... Research & Development

Tracey Duncombe interviews Alison Flanagan from Pfizer about her career.

I met Alison at Pfizer's UK research HQ in Kent. Over 1,500 research staff are employed on this site, making it the largest research facility outside the USA. The site has come a long way since its foundation in 1957 with only six staff.

Q *Why did you choose to work in veterinary medicine?*

'I've always had an interest in veterinary medicine. As a student I spent my holidays working on a farm or in kennels and catteries. During my last year as an undergraduate I spent the summer in a research lab at ILRAD (International Laboratory for Research on Animal Disease) in Kenya. I chose to continue my research in veterinary science for my PhD by studying *E. coli* infection in piglets. As it turned out, this was also of great interest to Pfizer!'

'Everything I've done so far at Pfizer has had an element of microbiology. I came into the company as a subject specialist but quickly had to adapt and manage new projects. I think you need to be an expert in one area to give you the confidence to deal with everything else. I very rarely get to do any lab work nowadays but with my current interest (oral disease of companion animals) I have enjoyed learning some new techniques.'

Q *So, do you miss not being in the lab?*

'Occasionally I do. I had a really keen microbiologist working for me recently and he would often get me to go into the lab to see what he was doing. I found it exciting just looking at samples under the microscope again. I have moved away from the lab partly by choice. My job is so varied now, every day is a little bit different, and I enjoy the variety. I enjoy the unexpected; I know it sounds a bit strange, but I quite like it when things don't go according to plan and you have to find a solution.'

Q *What's a typical day for you at work?*

'I don't really have a typical day. I may spend time doing literature searches and developing ideas for new assays or models or I may have to organize and prepare for a meeting; setting the agenda and making sure that other people know what they have to present, circulating information and generally making sure that everything hangs together, as well as often producing overheads and making a presentation myself. I am co-leader of a project, which means that I have to co-ordinate the activities of the project as well as supervising some of the members of the team. I am often in contact with external people. For example, I may seek advice from vets who are experts in their field on a particular aspect of a disease. We have a group of 30 vets visiting our site soon. I have to plan what information we'll provide and the discussions we'll have about different opportunities within veterinary medicine. Often we have seminars on either a particular project area, or increasingly on topics such as intellectual property and patenting. For scientists this is quite a new thing, so it's important to learn about it.'

Q *You worked in Sweden. Would you consider working abroad again?*

'Actually I was offered a Wellcome fellowship to work for another year in Sweden about the same time as I was offered the job at Pfizer. I did consider it, but the job at Pfizer was permanent and I longed just to have a place of my own and settle down. I still have the opportunity to travel occasionally with Pfizer. At the moment I'm planning a global team meeting with our colleagues in the States.'

'I joined Pfizer in 1995 and was promoted to Senior Scientist a couple of years ago. I'm one of the most senior women in my department. At Pfizer you're given a lot of responsibility early on. Although there's an element of choice in taking on responsibilities, if you refused it you probably wouldn't be offered them a second time.'

Q *Do you think enough if being done to keep women in science?*

'Pfizer recently produced a report that highlighted the fact that there are very few senior women. The figures are very bad and they are particularly bad in veterinary science. Now central management are making a conscious effort.'

'Pfizer recently launched a new initiative for returning to work part-time. This is good if it gives you the choice between returning full-time or staying at home. However, you would obviously progress at a slower rate than those who are full-time.'

'In the past six months we've had a Women's network (men are also invited). The role of the network is partly to provide a forum on issues around gender. We've been discussing trying to get people to realise that men and women do things differently. As well as this we've had wine tasting and pampering days at our social club, which gave us the opportunity to meet women from elsewhere on the site.'

Alison has recently taken a job with GlaxoSmithKline Consumer Healthcare.

Profile

Name Alison Flanagan

Age 32

Present Occupation
Senior Scientist, Pfizer Veterinary Medicine Global Research and Development, Sandwich, Kent

Previous Employment
Wain Fellow, Department of Medical Biochemistry, Göteborg University, Sweden

Visiting laboratory scientist studying intestinal receptor biology

Education
PhD, Rowett Research Institute, Aberdeen
K88 fimbriae of enterotoxigenic E. coli and their receptors in piglet small intestine

BSc (Hons) Microbiology, University of Glasgow

Catching them young...

SPARK is a new bi-annual magazine to promote SET careers to 11–14-year-old schoolgirls.

SPARK provides information to pupils, teachers, careers advisors and parents alike. The magazine includes quizzes, technology tips and lots of examples of young women working in SET.

SPARK is produced by the Department of Trade and Industry.

Copies of *SPARK* can be ordered from Becky at *SPARK* magazine (DTI), Freepost SEA5624, Sevenoaks, Kent TN14 5BR, quoting URN 00/1365.

Society News

February Council Meeting

New Categories of Membership

● As reported in the February issue of *Microbiology Today*, Council has agreed in principle to the establishment of two new categories of SGM membership. Corporate membership at £500 per annum will aim to increase contacts between the Society and its members and industry. Schools membership at £10 per annum should foster closer links with teachers and emphasize the Society's deep commitment to microbiological education, which is vital for future recruitment of scientists in this field and in the wider area of scientific endeavour. Resolutions to alter the Bye-laws to give formal effect to these new classes of membership have been made by Council.

New International Secretary

● **Professor Jeffrey Almond** comes to the end of his term of office as International Secretary in September. Council approved the recommendation of the search committee that **Professor Sir John Beringer** should be approached to serve as his successor, and was subsequently pleased to learn that Sir John had accepted this invitation. A profile will appear in the August issue of *Microbiology Today*.

New Food and Beverages Group

● As reported in the last issue of *Microbiology Today*, Council has approved the establishment of a new Food and Beverages Group (previously referred to provisionally as the Food and Water Group). This should ensure the continuation of the highest standards of food microbiology science at SGM meetings. It will focus on fundamental studies and aims to be complementary to the SfAM Food Safety and Technology Group. A steering committee has been formed to set the new Group in motion and the first Group symposium will be at the Warwick meeting in April 2002. See this page for further details.

SGM Journals at HighWire

● Council spent some time discussing the recent developments in electronic publishing and the rather aggressive stance of the promoters of the Public Library of Science, which is currently urging academics to boycott journals such as those of the Society. It does not feel that this is a simple issue and members may wish to seek further information before signing up to the aims of this group. An extended statement of Council policy is published on p. 50.

● *Alan Vivian, General Secretary*

New Food and Beverages Group

The Food and Beverages group will promote scientific interaction and facilitate education in the area of food microbiology from farm to waste. The remit will cover all aspects of food and beverage microbiology throughout the human and animal food chain.

The six main scientific themes covered will be:

1. Detection, isolation, separation and concentration of food-associated micro-organisms.
2. Physiology of food-associated micro-organisms.
3. Molecular biology of food-associated micro-organisms.
4. Quantitative microbial risk assessment and predictive microbiology.
5. Applied food and beverage microbiology.
6. Epidemiology of food-borne disease.

Within these themes the group will identify specific areas of interest. These will change with time, but currently include the following:

Interest area	Scientific theme					
	1	2	3	4	5	6
Emerging food-borne pathogens	✓	✓	✓	✓	✓	✓
Isolation technology	✓					
Detection methodology e.g. mRNA, post-genomics, biomarkers	✓		✓			
Physiology and virulence of food-associated pathogens		✓	✓		✓	
Gut flora response to food and diet		✓	✓		✓	
Modulation of gut flora by dietary intervention		✓	✓		✓	
Novel food ingredients through microbial biotechnology		✓	✓		✓	
Microbial functional foods and drinks					✓	
Study and development of fermented foods and drinks		✓			✓	
Lactic acid bacteria technology and drinks			✓		✓	
New processing technologies e.g. high pressure		✓			✓	
Viable non-culturable organisms		✓	✓			
Food spoilage by bacteria, fungi, yeasts toxin formation		✓		✓	✓	
Biopreservatives		✓			✓	

The members of the steering committee are: Glenn Gibson, School of Food Biosciences, Reading; Bob Rastall, School of Food Biosciences, Reading; Marie-Louise Baillon, Waltham Pet Centre; Mike Peck, Institute of Food Research, Norwich; Alan Varnam, Food Microbiology Group, University of North London; Tom Humphrey, Department of Veterinary Science, Bristol; Martin Collins, Queen's University, Belfast.

The new Group will make its debut at the 2002 spring meeting at the University of Warwick. The Convener is **Professor Tom Humphrey**, Professor of Food Safety, University of Bristol, The Churchill Building, Langford, Bristol BS40 5DT (Tel. 01179 289 211; Fax 01179 289 505; email tom.humphrey@bristol.ac.uk) to whom all enquiries about the Group should be addressed.

Annual General Meeting 2001

The Annual General Meeting of the Society will be held on **Tuesday, 11 September 2001** at the Society Meeting at the University of East Anglia. Agenda papers, including reports from Officers and Group Conveners, and the Accounts of the Society for 2000 will be circulated with the August issue of *Microbiology Today*.

Staff News

Congratulations to **Jo Couchman**, Staff Editor on *Microbiology*, and husband Martin, on the birth of a 7lb 3oz baby girl, Emma Louise, on 13 March.

Congratulations to **Tracey Duncombe** and **Jane Westwell** on successfully completing the British Red Cross *First Aid at Work* course.

News of Members

Education Secretary, David Blunkett has appointed **Dr Helen O'Sullivan**, Head of Quality Assurance at Liverpool Hope University College, to the E-University's Committee for Academic Quality.

Professor Brian Spratt has been appointed to a Chair in Molecular Microbiology at Imperial College, London.

The Institute of Biology in London has elected the following honorary fellows: **Derek Burke**, former Vice-Chancellor of the University of East Anglia, and **Sir David Hopwood**, John Innes Centre, Norwich.

The Society notes with regret the death of **Dr G. Fraser** (member since 1959).

Prize Lectures

Marjory Stephenson Prize Lecture

This is the Society's principal prize, awarded biennially for an outstanding contribution of current importance in microbiology. The winner receives £1,000 and gives a lecture on his/her work at a Society meeting. The lecture is usually published in a Society journal.

1. The Marjory Stephenson Prize Lecture shall be awarded biennially for an outstanding contribution of current importance in microbiology, without restriction on the area of microbiology in which the award is made.

2. Nominations for the Marjory Stephenson Prize Lecture shall be made by any two members of the Society; the nominee need not be a member of the Society. Nominations should be accompanied by a statement of the contribution to microbiology made by the nominee, supported by reprints or other appropriate documentation. A brief *curriculum vitae* of the nominee and a full bibliography of his or her work should also be included. Alternatively, candidates may submit all of the information listed above, together with the names of two members who are familiar with their work, who will be asked to supply the appropriate statement with regard to the candidate's contribution to microbiology.

3. There shall be no restriction by means of age or nationality of those eligible for the Marjory Stephenson Prize Lecture. Recipients of the Lectureship may not be nominated on a subsequent occasion.

4. The recipient of the Marjory Stephenson Prize Lectureship will be expected to give a lecture based on the work for which the Prize Lectureship has been awarded to a meeting of the Society, normally the spring meeting following the announcement of the award. The recipient will be strongly encouraged to publish the lecture in either *Microbiology* or *Journal of General Virology*, whichever is the more suitable. The choice will be at the discretion of the Editors of the journals.

Peter Wildy Prize for Microbiology Education

This is awarded annually for an outstanding contribution to microbiology education.

1. The Peter Wildy Prize of £500 shall be awarded annually for an outstanding contribution to microbiology education, without restriction on the area of microbiology in which the award is made. Microbiology education for the purpose of the award need not be confined to university teaching. It may also include education of the general public, school pupils or professional groups.

2. Nominations for the Peter Wildy Prize shall be made by any two members of the Society; the nominee need not be a member of the Society. Alternatively, candidates may submit all of the information listed above, together with the names of two members who are familiar with their work, who will be asked to supply the appropriate statement with regard to the candidate's contribution to applied microbiology. Nominations should be accompanied by a statement of the contribution to microbiology education made by the nominee, supported by appropriate documentation if available. A brief CV of the nominee should also be included.

3. There shall be no restriction by means of age or nationality of those eligible for the Prize. Recipients of the Prize may not be nominated on a subsequent occasion.

4. The recipient of the Prize will be expected to give a presentation based on an aspect of educational work for which the Prize has been awarded to a meeting of the Society, normally within a year of the announcement of the award. The presentation may take the form of a lecture, workshop, audiovisual display or any other appropriate activity. The recipient will be strongly encouraged to publish an article based on the presentation in *Microbiology Today*.

Procedure for nominations

In recent years Council has been disappointed by the lack of nominations for the range of prestigious awards made by the Society in recognition of distinguished contributions to microbiology. To facilitate nominations, a form is included in this issue of *Microbiology Today*, together with the rules for each prize lecture due to be awarded in 2002. It is now also possible for self-nominations to be made for all awards. The award panel will consider the submissions in the autumn and their recommendations will be taken to November Council for approval. The outcome will be announced in the February 2002 issue of *Microbiology Today*.

Nominations are now sought for the prize lectures listed here. Please complete the form overleaf and send it to Professor Alan Vivian, Centre for Research in Plant Science, University of the West of England, Coldharbour Lane, Bristol BS16 1QY. Professor Vivian will be pleased to discuss the criteria for nominations, should any queries arise.

The closing date for all nominations is **30 September 2001**.

Fleming Award

The Fleming Lecture is awarded annually for outstanding research in any branch of microbiology by a young microbiologist in the early stages of his/her career. The award is £1,000.

1. Nominees should normally have been engaged in research for not more than 10 years after doctoral qualification or equivalent. Years may be added to this total in respect of career breaks, for parenthood or other substantive reasons.

2. There should normally have been a connection with the scientific activity of the Society, either by means of past and continuing membership of the Society (a minimum of 3 years' membership of the Society would normally be expected), or past presentation(s) at a Society meeting or publication(s) in a Society journal, or an organizational or administrative contribution to the scientific work of the Society.

3. Candidates, who need not be members of the Society, should submit an outline CV including details of qualifications, scholarships, research grants obtained, etc., a list of publications, an outline of their career progression (posts held in postdoctoral research) and the names of two members who are familiar with their work, who will be asked to provide a statement detailing the candidate's contribution to microbiology and merit for the award. Alternatively, members who wish to make a nomination should provide such a statement and should arrange for a second member willing to support the nomination to provide a statement and should ask the candidate to provide the CV and publications list.

4. The recipient will be expected to give a lecture based on his or her work to a meeting of the Society, which will usually not be that which takes place in the spring. He or she may be asked by the Council of the Society to repeat the lecture at another centre in this country or in Europe. Expenses of the lecturer will be paid by the Society. Requests for such a second lecture should be made to the General Secretary and will be considered by Council. The text of the lecture will be published in either *Microbiology* or *Journal of General Virology*, whichever is the more suitable. The choice will be at the discretion of the Editors of the two journals.

5. In the event of there being no successful nominee in any particular year, the Award money will be returned to the funds of the Society. Any given nominee may be chosen once only.

Kathleen Barton-Wright Memorial Lecture

Awarded every other year by the Society on behalf of the Institute of Biology. It is awarded for an outstanding contribution to research in a more applied area of microbiology, or an area where microbiology impinges on other areas of biology and where the topic would be relevant to a wider audience. The prize is £500.

Grants

New grant scheme!

Retired Member Conference Grants

Council is pleased to announce a new scheme to enable Retired Members to attend one SGM meeting per year. They will be able to apply for a grant to cover accommodation and the Society Dinner. The maximum award will be £250. It is hoped that the scheme will enable retired microbiologists both to keep up with their science and to share their knowledge with other members.

Rules

1. The scheme is open to paid up Retired Members of SGM whose membership has not lapsed since the date of their change of status from Ordinary Membership.

2. Applicants may claim for:

(a) the cost of bed and breakfast accommodation in an en-suite room which must be booked through the SGM Meetings Office

(b) the cost of the Society Dinner.

3. The maximum award is £250.

4. Grants are limited to attendance at only **one** SGM meeting in each calendar year.

5. Applications will be considered on a first come, first served basis. A maximum of 50 awards will be made each year.

6. Applications received after the meeting cannot be considered.

Applications are now invited for grants to attend the Society's meeting at the University of East Anglia, 10–13 September 2001.

Forms may be downloaded from the website or obtained from the Grants Office at SGM HQ.

The Watanabe Book Fund

Members who are permanently resident in a developing country are reminded that they may apply for funding to acquire for their libraries books, or possibly journals, relating to microbiology. These annual awards are available as a result of a generous donation from Professor T. Watanabe of Japan. Full details of the scheme were published on p.25 of the February issue of *Microbiology Today*. The closing date for the receipt of applications, which should be made to the Grants Office at SGM Headquarters, is **5 October 2001**.

Details of all Society grant schemes are available on the SGM website at **http://www.sgm.ac.uk** You can also download application forms for most schemes. Click on the Grants & Funding button for details.

Any enquiries should be made to the Grants Office, SGM, Marlborough House, Basingstoke Road, Spencers Wood, Reading RG7 1AG (Tel: 0118 988 1821; Fax: 0118 988 5656; email: grants@sgm.ac.uk).

Education Development Fund Awards

The following Public Understanding of Science grants have been made in recent months.

Dr Susan Assinder, University of Wales, Bangor has been awarded up to £1,000 towards the creation of an *Alphabet of Science* in Bangor High Street during National Science Week 2001.

Professor Roy Postlethwaite has been awarded up to £879 towards the expenses of running an exhibition and lecture on *Aspects of Modern Medical Science* in Cirencester in June 2001.

Dr Joy Perkins, University of Huddersfield, has been awarded up to £817 towards the expenses of running a microbiology taster day for Year 11 pupils in National Science Week 2001: *Food Microbes – the Good, the Bad and the Ugly.*

Education Development Fund 2001

Members are invited to apply for small grants to fund either (a) relevant science promotion initiatives or (b) to support developments likely to lead to an improvement in the teaching of any aspect of microbiology relevant to secondary or tertiary (including postgraduate) education in the UK.

Applications are now invited for either category of award.

Rules

1. Applicants must be members of the Society, currently residing in the UK or Republic of Ireland.

2. *Practical teaching aids*

(a) Applicants may seek support, normally within the range £200–£3,500, for:

(i) purchase of consumable materials, but not capital equipment.

(ii) short-term assistance, e.g. vacation employment of an undergraduate, or exceptionally a postgraduate after expiry of a studentship.

(b) Examples of projects which might be funded include the provision of teaching materials (e.g. videos, slides, posters), the development of reliable, novel practical exercises, new approaches to teaching/learning familiar concepts (e.g. computer simulations or tutorials) or any other appropriate aspect. It is not intended that the Fund should subsidize normal departmental teaching practices; the Society wishes to encourage innovation.

(c) Successful applicants will normally be required to make the results of their work available to Society members within 18 months of the award being made. This will include a presentation at a Society meeting and publication of an article in *Microbiology Today*. Physical materials, whether offprints, videos, slides, computer programs, microbial strains or in other forms, should be readily available to Society members on free or low-cost loan or purchase for a period of at least 5 years after termination of the project.

(d) The Society would encourage commercial or other dissemination of the results of the project to a wider public. All Intellectual Property Rights, including copyright and design rights, in any materials produced as a result of the grant will be vested in the Society.

3. *PUS awards*

(a) Applicants may seek funding of up to £1,000 for small projects to promote the public understanding of microbiology. These might include talks, workshops, demonstrations, posters, leaflets, broadcasts, activities at science festivals and audio-visual or computer-based packages. These activities can take place as part of a SET event at the applicant's place of work, but PUS activities that are part of the programme of an open day to promote the institution are ineligible for funding.

(b) Applicants must provide a detailed description of the proposed initiative, which it is anticipated will take place in 2001/2002, full costings and evidence of any collaborations or other sponsorship. Each application should also include a safety risk assessment and evidence of, or costing for, appropriate public liability insurance cover if the activity is to be held at a public venue. Payments to helpers such as undergraduates who are giving up their free time to deliver the activity may be included in the costings.

Applicants should also indicate how they will assess the success of their event.

(c) Successful applicants must submit a report of the activity to the Society within 3 months of the completion of the project. This should take the form of an article for publication in the 'Going Public' section of *Microbiology Today*. A copy of the results of the assessment exercise (a simple questionnaire or summary of public comments on the event will suffice) should also be provided.

Application forms

Application forms are available from the Grants Office at SGM HQ or may be downloaded from the website.

Please state clearly whether a form is required for a teaching aid or a PUS award.

There is no closing date for applications, which will be considered on a first come, first served basis during the period 1 January to 31 December 2001.

International Research Fellowships

This scheme has been established to allow scientists to travel to or from the UK and Republic of Ireland to carry out a defined piece of research in any field of microbiology. Applicants must be of postdoctoral level or above. The visits may be of up to 3 months duration. The awards cover the costs of return travel, a subsistence allowance and a contribution towards the costs of consumables in the host laboratory. Applications for awards are now invited.

Rules

1. Applicants must be scientists of at least postdoctoral level who are practising microbiologists. Postdoctoral workers in periods between contracts or those who do not have salaried employment are ineligible to apply. Postdoctoral workers must supply a supporting statement from their head of department. All applicants must submit a CV with their completed application form.

2. UK scientists whose salary is provided by a Research Council, government department, major charitable funding body or other organization which runs an international fellowship scheme should supply evidence that sponsorship has been sought unsuccessfully from their funding body.

3. The scheme enables applicants resident and employed in the UK or Republic of Ireland to visit any other country to carry out research in a suitable laboratory, or scientists from other countries to carry out research in the UK or Republic of Ireland.

4. The research work to be carried out in the host laboratory must be clearly defined. It must also be microbiological, but any appropriate area of the science will be considered for funding.

5. The scheme is intended to support new initiatives but applications which offer innovative projects with established collaborations will be considered.

6. A supporting letter from the head of the laboratory to be visited must be supplied.

7. Fellowships will be awarded for up to a maximum of 3 months.

8. Awards are available to cover the cost of travel by the most economical means and route, subsistence at up to £1,000 per month and a contribution towards the cost of consumables at up to £1,000 per month. Fellows will normally be expected to continue to receive a salary from their home institution or other source.

9. Applicants are expected to have adequate insurance arrangements and to provide evidence of this. The scheme does not cover the costs of insurance.

10. On completion of the fellowship, a report must be submitted to the SGM Grants Office within 1 month.

11. FOUR copies of the completed application form and all supplementary documentation must be submitted to the SGM Grants Office for consideration.

There are normally three rounds of applications during each calendar year. The closing dates for 2001 are **30 March**, **31 July** and **30 November**.

Seminar Speakers Fund 2001/2002

The purpose of the Seminar Speakers Fund is to promote talks on microbiological topics in departmental seminar programmes. Applications are invited from higher education institutions where microbiology is taught for grants of up to £200 towards the travel, and if necessary, accommodation, expenses of an invited speaker. Applications will be dealt with on a first come, first served basis during the academic year. Written submissions should be sent to the Grants Office at SGM HQ for consideration.

Rules

1. The scheme is open to higher education institutions in the UK and Republic of Ireland where microbiology is taught. Normally, only one department within an institution will be eligible for an award within each academic year, which is defined as running from September 2001 to June 2002. It is expected that departments will collaborate in selecting a seminar speaker.

2. Applications will only be accepted from departments, not from Student Microbiology Societies.

3. One or two speakers may be funded each year; either two at a maximum of £100 each or one up to a maximum of £200.

4. Seminars must be advertised regionally as sponsored by the Society.

5. Awards will be paid retrospectively on receipt of evidence of the actual expenses incurred.

6. Applications should contain the following information:

(a) The names and addresses of the speaker(s) to be invited and the topic of the talk(s).

(b) Evidence, in the form of a programme, that an active seminar programme is already established in the department(s). Where no previous programme exists, good reason should be given for the request, such as the establishment of a new department.

(c) Details of any sponsorship for seminars that the department already has (or is anticipating).

(d) An indication of the target audience for the seminar, which may include undergraduates and postgraduates.

There is no application form for this scheme.

International Development Fund

Council aims to assist microbiologists in developing countries and Eastern Europe through the International Development Fund. Awards are made by competition.

Purpose

1. Support visits (travel and accommodation) by members of the SGM to laboratories in countries where microbiology is inadequately developed but where its further development may assist education or the economy of these countries. The purpose of the visits must be to give short lecture courses and laboratory training in subjects designed to meet the needs of these countries. The countries may vary from time to time but at present these include many places in the Far East, Africa, South and Central America, the Indian sub-continent and Eastern and Central Europe. Host laboratories are usually expected to provide some evidence of local support for the courses.

2. Allow purchase of basic equipment essential for the needs of such training courses.

3. Provide Society journals, symposia and special publications to established libraries for a limited period of time at reduced or zero cost, especially when it can be shown that these publications are not currently reasonably available in the country concerned.

4. Support national microbiological facilities, e.g. culture collections (which underpin microbiology), where these run into temporary difficulties.

5. Support any other small project to assist in technology transfer from Western Europe to the areas mentioned above for which other sources of funding do not exist. This might include provision of equipment to a nominated centre at which a member is working permanently.

Guidelines

1. Applications for sums between £1,000 and £5,000 will be considered first. No applications above £7,000 will be accepted.

2. Applicants must be members of the Society.

3. In making applications for support for giving short lecture courses or laboratory training, detailed information must be provided about the relevance and quality of the training course and the degree of local support for the course.

4. Each application must be accompanied by full supporting documents.

5. A condition of funding (except for provision of publications) is that a brief report, suitable for *Microbiology Today*, be provided.

Applications to the Fund are now invited. Four copies, including full supporting documents, should be sent to the Grants Office at SGM HQ.

The closing date for applications is **26 October 2001**.

Undergraduate Microbiology Prizes

The prizes are intended to encourage excellence in the study of microbiology by undergraduate students and to promote scholarship in, and awareness of, microbiology in universities. The prizes are awarded annually to the undergraduate student in each qualifying institution who performs best in microbiology in their penultimate year of study for a Bachelor's degree. Each winning student will be awarded £50, a certificate and a free year's undergraduate membership of the SGM.

One prize is available to each university in the UK and Republic of Ireland offering an appropriate microbiology course. The university will be asked to choose the assessed microbiological work for which the prize is awarded. The submission should be supported by formal marks, not an informal assessment. Winning students should have attained at least 2(I) overall in their degree examinations at the stage at which the award is made.

Eligible students may be registered for any degree with a significant microbiology content (e.g. Biotechnology, Applied Biology, etc.) not just a BSc Microbiology. The university must decide which student group studying which microbiological activity is eligible for consideration.

Universities are now invited to nominate a student for a 2001 SGM Undergraduate Microbiology Prize. Submissions can only be accepted on the form which has been sent to all institutions. The full rules and further copies of the form may be downloaded from the SGM website or obtained from the Grants Office at Marlborough House. The closing date for nominations is **31 August 2001**.

ASM/SGM Joint Meeting

San Juan, Puerto Rico, 2–6 October 2001

Biodegradation, Biotransformation and Biocatalysis (B3)

Travel grants

This grant scheme is intended to assist SGM members to attend the meeting. Up to £500 is available as a contribution towards the costs of registration, travel and accommodation.

Guidelines

Members who are eligible should apply for an ASM student travel grant as well as applying to the SGM (see 7 below for details).

1. Applicants must be paid up members of the SGM of at least 3 months standing before 31 May 2001.

2. The following members are eligible for support:

(a) Full-time postgraduate students, including research assistants and similar who hold salaried posts in higher education institutions or publicly funded research institutes and are resident and registered for a PhD at a higher education institution in a country in the European Union.

(b) Postdoctoral researchers in their first position who have been employed on a short-term temporary contract at a university or publicly funded research institute in a country in the European Union for less than 3 years at 1 January 2001.

(c) Established scientists in the UK and Ireland who are employees of universities, Research Councils, the National Health Service, state-aided research establishments, other governmental bodies and profit-making companies set up by universities.

3. Postgraduate students, research assistants and postdoctoral researchers must provide a statement from their head of department in support of their application.

4. Successful applicants will be awarded up to £500 as a contribution towards the costs of registration (at the rate applicable for registrations before 1 September 2001), travel and accommodation.

5. The total funds available are limited and awards cannot be guaranteed to all eligible applicants. Preference will be given to applicants who are making a contribution to the meeting by presenting their work. Evidence of submission of an abstract must be provided.

6. Funding from other sources (with the exception of an ASM Student Travel Grant – see 7 below) will be taken into account when the award is made.

7. ASM Student Travel Grants. Postgraduate students and postdocs in their first year of obtaining a PhD may apply for an ASM Student Travel Grant of US$500 provided they are presenting work and their abstract has been accepted. Anyone who is eligible should apply for an award – see ASM website for details (www.asmusa.org). This will not affect the award that they receive from SGM.

8. Applications must be made on the appropriate form. Completed applications should be sent to: The Grants Office, SGM Headquarters, Marlborough House, Basingstoke Road, Spencers Wood, Reading, RG7 1AG.

Closing date for applications: **31 July 2001**. Applications will be dealt with on a first come, first served basis.

Fellowship announcement

UNESCO-IUMS-MIRCENS-SGM Fellowships

The International Union of Microbiological Societies (IUMS) is a worldwide Federation of National and International Societies and other organizations having a common interest in microbiological sciences. The Microbial Resources Centres (Mircens) is an international network of Academic and Research Institutes spreading biotechnological and microbiological benefits to especially the developing countries. The Society for General Microbiology (SGM), a member Society of the IUMS, is making a separate contribution to this programme from its International Development Fund. The UNESCO-IUMS-MIRCENS-SGM short-term fellowship is a co-operative scheme between the various listed organizations to provide an opportunity to young microbiologists from any developing country to pursue, or to complete, a part of an on-going research programme in a laboratory in a newly industrialized or developed country. Microbiologists in developing countries aggressively pursuing research, often reach a facility *cul de sac* where research plans cannot be accomplished for want of materials, equipment or facilities. The UNESCO-IUMS-MIRCENS-SGM short-term fellowship is designed to ease these problems for deserving microbiologists from developing countries to enable them to overcome their research bottlenecks and to strengthen the bonds of interregional scientific co-operation.

The applicant from a developing country should be a permanent employee in the country of residence, must have adequate work experience, must have completed at least 5 years of postdoctoral training in any of the microbiological sciences and must provide specific evidence in the form of a proposal about the work which is intended to be performed at the host laboratory. Preference will be given to young women scientists and to scientists from Africa. Currently five fellowships are available every year of which two should be served in laboratories in the UK.

The award will be up to US$4,000 for travel and subsistence (room and board) to support the awardee for a maximum period of 3 months. Funds for salary and medical insurance will not be provided. Coverage for life and accident or health insurance is the personal and sole responsibility of the individual or the host organization.

Applications (four copies) must be submitted in English and should consist of a nominating letter from the Head of the organization in which the applicant is working; the applicant's *curriculum vitae*; a letter of invitation or acceptance from the host organization describing facility support for the applicant; and two supporting letters addressing Vice-President IUMS, Department of Microbiology, University of Groningen, Kerklaan 30, 9751 NN Haren, The Netherlands (Fax +31 50 3632154; email W.N.Konings@biol.rug.nl). The deadline is **1 July 2001**.

Soapbox!

Whether you're an undergrad or postgrad, the SGM wants to hear from you. Anything goes as long as it's microbiology.

Win £25 for the best letter published in each issue of *Microbiology Today*. Send your contributions to **soapbox@sgm.ac.uk**

SGM reserves the right to edit letters prior to publication. The content of *Soapbox!* does not reflect the opinion of the SGM.

● If you have any stories or news for publication in Gradline, please send them to Tracey Duncombe at pa@sgm.ac.uk

Here is the £25 winner in this issue.

Dear Soapbox!

As someone coming to the end of their time as a PhD student it was with a great sense of nostalgia that I read of the experiences of the previous contributor to *Soapbox!*

As a person who now clones genes as a matter of routine and could probably prepare and run an agarose gel in my sleep, I still haven't quite forgotten those first days in the lab as a project student when racking a box of pipette tips and successfully autoclaving them was a big achievement! And although those few months gave me a tiny insight into research, nothing could have fully prepared me for the varied highs and lows of life as a PhD student. The first few days were certainly daunting. Removed from the supportive environment of the third year project lab and a distinct lack of familiar faces I felt way out of my depth. There were of course the practical problems of finding my way around a new department and the realization that fresh boxes of gloves didn't just mysteriously appear but actually had to be ordered. But that was as nothing compared to the recognition that from now on and for the next three years I, along with the help of my supervisor, would be solely responsible for my own work and for choosing the direction in which it would progress.

Unlike the previous *Soapbox!* correspondent who writes that a PhD can involve '*days, months and years*' of '*following protocol after protocol without thinking*', in my experience at least, the opposite is true. You may start your PhD with a detailed plan of the experiments you want to perform and the results you want to achieve, but in reality things often do not work out that way. Techniques may be available that should work in theory, and may indeed have worked for virtually everyone you have ever met including someone sitting feet away from you in the lab – but they just don't work for you. Speaking from personal experience you may find yourself spending more time in the library than in a lab coat. But what a sense of achievement when a technique that you yourself have dug out of a dusty paper or from the net actually provides you with the desired result.

PhD students also spend a great deal of their time outside the lab as the Research Councils increasingly emphasize the importance of transferable skills such as written or oral communication. Moreover, it is not all work, work, work. As anyone who has attended an SGM meeting will verify it's almost as much about socializing as science and presents everyone with a chance to catch up with people from other institutions. PhD research also presents great opportunities for international travel. A trip to the ASM's infectious diseases conference in Canada allowed me to present my work in front of a prestigious audience as well as see what scientists who publish in *Nature* actually look like in the flesh!

As to whether research can ever be creative – I suppose that depends on how you define creativity. Research is never just following protocols and I believe that a creative streak is a big asset in terms of problem-solving and when preparing presentations, especially if you don't want to hear the sound of gentle snoring from the back of the auditorium! Of course a PhD is not an easy option when deciding what to do after you graduate; there are definite downsides to it and I believe that the scientific community needs to address the issue of why many postgraduates are choosing to leave research after their PhDs. And as to my future in research – well I'm still not sure what that may be, but overall I can honestly say that my time as a PhD student has provided me with a wealth of unique and positive experiences which I'm sure will prove to be invaluable in whatever career I choose to pursue.

● ***Ireena Dutta, Department of Biochemistry, University of Cambridge***

Dear Soapbox!

As an undergraduate, concepts and the understanding of whole areas of modules only became real or important around exam time. I found, and still find, lectures to be a very passive experience. Understanding the material was always important, but lectures now appear much simpler in this respect. Perhaps it is the smaller scale of the lectures I have had as a postgrad, or that they seem so much more relevant to my work and myself.

Practical work was also considered important as an undergraduate and was a vital component of many modules taken at Nottingham. However, the vast majority of practical courses aimed only to provide an idea of the principles or techniques within the lab. This is not a criticism. Providing large numbers of students with the facilities to do practical work cannot be easy; but it still resulted in a very contrived approach. My final year project was such a change. I went from mixing solution A with solution B and being told I had extracted plasmid DNA, to being responsible (within limits) for making up my solutions and carrying out work with a palpable end point. I have recently started demonstrating in first year practicals and I find it amusing to see how my attitude towards practical work has changed and also how much my technique has improved.

Another notable difference between undergraduate and postgraduate study is time. As an undergrad I often worked week-by-week and never more than a semester at a time. Time was conveniently divided by modules starting and finishing, and the repetitive pattern of weekly lectures/practicals. Exam periods were potent dividers, with a real feeling of completion, followed by a period of relaxation (and excess!), then it all began again. As a PhD student, there isn't that rigid form to the course and it is quite a disturbing prospect to start three years of research with only a rough plan of where it will go.

● ***Mike Sellars, First year PhD student, University of Nottingham***

SGM education and science promotion programme 2001/2002

The Society takes the promotion of microbiology education and careers very seriously. It employs professionals in this field to carry out the work, in conjunction with interested and enthusiastic members and Education Officer Liz Sockett. The staff organize events, produce appropriate resources and deal with all the enquiries that roll in daily by phone, fax, email and letter from teachers, pupils and the general public. Quite often they have to get out on the road and work long hours and at weekends but the team's commitment and enthusiasm rarely wanes! Here are some of the activities that are planned (or have taken place) in 2001/2002.

Events

- **3–6 January 2001: Association for Science Education Annual Meeting, Guildford**

Attended by 4,000 sciences teachers from all over the world. SGM had a large stand, which they shared with the Microbiology in Schools Advisory Committee (MISAC), gave away lots of resources and advice and demonstrated some living algae and protozoa using a video microscope kindly loaned by Martin Adams of University of Surrey. SGM also organized the *Living Science* section of the exhibition for the other bioscience bodies and participated in the Wellcome Trust symposium.

- **2–4 March 2001: Careers Enterprise & Jobs Live, Scottish Exhibition CC**
- **11–12 March 2001: Careers & Jobs Live 2001, Birmingham NEC**
- **26–27 April 2001: UCAS Careers Convention, Bath University**
- **17–18 May 2001: UCAS Careers Convention, Newcastle**

For many years SGM has been attending careers fairs for schools with other learned societies and the Institute of Biology under the banner of *Bioscience at Work*. This year we joined up with the Institute of Physics and Royal Society of Chemistry to promote all areas of science on a much larger stand. This collaboration has been very successful.

- **7 June 2001: Glasgow University**

Teachers' workshop on microbiology and biochemistry, joint with Biochemical Society. John Grainger, former director of NCBE, Chairman of MISAC and a long-standing contributor to SGM educational activities, is running the practical workshop, whilst Tim Mitchell gives a talk on the latest aspects of antimicrobial resistance.

- **4–5 June 2001: Royal Institution Primary School Workshops**

Dariel Burdass has been invited by the Royal Institution to run our popular workshops for primary school children in Staffordshire. These involve creative activities with model microbes, as well as demonstrating the power of yeast to blow up balloons.

- **30 June 2001: Aspects of Modern Medical Science**

Participation in event organized by Cirencester Science Society. We will be mounting a display on food safety.

- **October 2001: BAYSDAY, Royal Albert Hall**

By request from the BA we will be repeating our microbiology workshops for primary school children.

- **November/December 2001: Life Science Careers Conferences Bristol, London and Newcastle**

Saturday events for undergrad and postgrad life science students – lectures, workshops and exhibition + CV analysis service. Joint venture between SGM, BS, BPS, BSI, PS and SEB. SGM does the administration for these events.

Projects

Current resources

- *Classifying Microbes* – a poster and set of teachers' notes for post-16, produced in association with PCET (c.£8)
- *Fermenter Investigations* pack (with NCBE) – pack of student and technical guides for post-16 (£15)
- Poster: *World of Microbes* (over 20,000 printed and distributed free to date)
- Set of three posters: *Microbes & Food* (free)
- Set of two posters: *Microbes & the Environment* (free)
- *Biotech* – teaching resources pack for 16+, with ABPI, BBSRC, BS and Wellcome Trust (now available on the web **www.wellcome.ac.uk**)
- *World of Microbes* – Microbiology teaching pack for primary schools: booklets, teacher's guide and poster on beneficial and harmful micro-organisms linked to Unit 6B Micro-organisms of the Science Curriculum (now available – see inside back cover)
- SGM website – greatly expanded education pages, including range of factsheets. Further work and a revamp in progress **www.sgm.ac.uk**
- *Microbiologists Make a Difference* – careers poster and leaflet (free)
- Set of careers factsheets for 16+ (also on website)
- SGM website – extensive web pages on careers; a separate site **www.biocareers.org.uk** is under development.

In progress or planned

- Microbiology in Schools Advisory Committee (MISAC)
  SGM acts as secretariat and deals with all enquiries from teachers, distributing the wide range of factsheets available (also on web at **www.biosci.org.uk/MISAC**). SGM administers the annual competition:

2001 – *Microbes & Food* – newspaper article (for pupils aged 11–16, in two age groups) judged at Marlborough House in April. Nearly 2,000 entries were received. Food and Drink Federation collaborated.

2002 – *I've got you under my skin* magazine feature on fungal infections (11–16, in two age groups) sponsored by British Mycological Society

- Poster set: *Microbes & the Human Body* (autumn 2001)
- Revision of *Practical Microbiology for Schools* teaching pack (Key Stage 4, GCSE) (summer 2001)
- *TB: A model organism* – factsheet for Key Stage 3
- Development of a set of practical activities for post-16

Teacher & Technician Training

- A programme of training courses in practical microbiology for secondary school science teachers and technicians will be running from September, led by John Schollar of NCBE and John Grainger, Chairman of MISAC.
- Primary schoolteacher workshops will also be available on demand to support the practical activities in the new *World of Microbes* pack.

Year of Science

See p. 71.

Contacts

- **Education Officer: Liz Sockett**
  Tel. 0115 919 4496
  email liz.sockett@nottingham.ac.uk
- **External Relations Manager: Janet Hurst**
  Tel. 0118 988 1809
  email j.hurst@sgm.ac.uk
- **Education: Dariel Burdass**
  Tel. 0118 988 1835
  email d.burdass@sgm.ac.uk
- **Careers: Jane Westwell**
  Tel. 0118 988 1821
  email j.westwell@sgm.ac.uk
- **Public Affairs: Tracey Duncombe**
  Tel. 0118 988 1843
  email t.duncombe@sgm.ac.uk

Meetings

Meetings on the web

Up-to-date information on future Society meetings is available on the website:
http://www.sgm.ac.uk

Meetings organization

The SGM meetings programmes are organized by the committees of the special interest groups, co-ordinated by the Scientific Meetings Officer, Professor Howard Jenkinson. Suggestions for topics for future symposia are always welcome. See p. 105 for contact details of Group Conveners. Administration of meetings is carried out by Mrs Josiane Dunn at SGM Headquarters, Marlborough House, Basingstoke Road, Spencers Wood, Reading RG7 1AG (Tel. 0118 988 1805; Fax 0118 988 5656; email meetings@sgm.ac.uk).

Heriot-Watt meeting

148th Ordinary Meeting
Heriot-Watt University
26–30 March 2001

New Challenges to Health: the Threat of Virus Infection

Symposium volume

This is now available from CUP at a special discount price for members. A review of the book appears on p. 104 and an order form is included in this issue of *Microbiology Today*.

Abstracts book

The full text of the abstracts book is now available as a PDF file on the SGM website.

Future Meetings

AUTUMN 2001 – 149th Ordinary Meeting
University of East Anglia, 10–13 September

● Main Symposium
Mycobacteria – New Developments

Organizers: M. Goodfellow, P.M. Goodwin, H.M. Lappin-Scott, G. Saddler and E.M.H. Wellington

10–11 September
N. STOKER (LSHTM) *Mycobacteria in the 21st century*
M. GOODFELLOW (Newcastle) *Systematics of mycobacteria*
S.T. COLE (Institut Pasteur) *Comparative mycobacterial genomics*
P.J. BRENNAN (Colorado, USA) *Mycobacterial cell wall*
P. FINE (LSHTM) *TB epidemiology and environmental influences*
R.S. CLIFTON-HADLEY (VLA, Addlestone) *Bovine tuberculosis: current epidemiological issues*
D. VAN SOOLINGEN (Bilthoven, The Netherlands) *Contribution of DNA fingerprinting to examine the transmission of tuberculosis*
L.G. WAYNE (Long Beach, USA) *Dormancy in mycobacteria*
B. GICQUEL (Institut Pasteur) *Mycobacterial genetics*
P.D. BUTCHER (St George's, London) *M. tuberculosis gene expression during infection: proteomics and microarrays*
M.J. COLSTON (NIMR) *Interactions between host cells and mycobacteria*
J.M. SHARP (Moredun, Edinburgh) *Pathogenesis and immunopathogenesis of M. paratuberculosis (t.b.c.)*
I.M. ORME (Colorado, USA) *Early events in the lung and consequences for vaccine strategies*
D.B. YOUNG (Imperial College London) *Lipoproteins, glycoproteins and new vaccines*
K. DUNCAN (GlaxoWellcome UK) *New approaches to drug design*
S.H. GILLESPIE (Royal Free, London) *Anti-tuberculosis chemotherapy: past success and future challenges*

● Other sessions

● Microbial lifestyles

Cells & Cell Surfaces Group

13 September. Organizers: J. Armitage (armitage@bioch.ox.ac.uk) & P. Rainey (paul.rainey@plant-sciences.ox.ac.uk).

● Lower respiratory tract infections

Clinical Microbiology Group

13 September. The symposium will cover virulence of *Streptococcus pneumoniae*, conjugate vaccines, fungal infections, cystic fibrosis infections, *Chlamydia pneumoniae*, *Pneumocystis carinii* infection and *Legionella pneumophila*. Organizers: T. Coates (acoates@ sghms.ac.uk) & K. Bamford.

● Research supervision – how to get it right

Education Group

12 September, followed by a Supervisor Training workshop on 13 September (see p. 58 for further details). Organizer: A. Eley (a.r.eley@sheffield.ac.uk).

● Microbial interactions in aquatic environments

Environmental Microbiology Group with British Phycological Society

11 & 12 September. Organizer: G. Underwood (gjcu@essex.ac.uk).

● Bioprocess monitoring & control

Fermentation & Bioprocessing Group

10 September. Organizer: G. Hobbs (g.hobbs@livjm.ac.uk).

● Mobile genetic elements in bacterial virulence

Microbial Infection Group

12 September. Organizers: M. Barer & P.I Langford (p.langford@ic.ac.uk).

● Metabolic engineering

Physiology, Biochemistry & Molecular Genetics Group

12 September. Organizers: N. Bruce & G. Stephens (gmstephens@umist.ac.uk).

● Classification and identification of clinically significant actinomycetes

Systematics & Evolution Group

12 September. Invited contributors are M. McNeil (CDC), A. Hassan Fahal (Khartoum), B. Beaman (California Davis), I. Sutcliffe (Sunderland), G. Alderson (Bradford), G.H.W. Bowden (Manitoba), P. Boiron (Lyon). A limited number of oral presentations can be slotted in; posters are welcome. Titles and abstracts to Gerry Saddler (g.saddler@cabi.org) by **31 May 2001**.

● WellcomeTrust Genome Meeting

12 September. Complete genome sequence data are now available for *M. tuberculosis*, *M. leprae* and work on *S. coelicolor* is in its final stages. Analysis of these genomes has revealed interesting synteny between these organisms. The Wellcome Trust has therefore funded this meeting on *Comparative Genomics of Mycobacteria and Streptomyces* to discuss the impact of the sequencing projects and establish priorities for future directions. The meeting will include presentations on the analysis of the genome, proteome and metabolome of these bacteria as well as discussion of the bioinformatics strategies being developed. Organizers: N. Stoker, T. Keiser, J. Parkhill, P. Goodwin & M. Dunn (m.dunn@wellcome.ac.uk).

● Promega Prize Final

11 September. Promega sponsors this competition to encourage excellence in scientific communication by young scientists. Group Committees have now judged recent oral or poster presentations by members who are postgrads or first postdocs. The finalists from each Group or Branch go forward to compete for Promega Prizes at a special session of short oral presentations on their research. There are two prizes of £200 to be won and in 2001 the winners will go on to compete for the title of *Young Life Scientist of the Year* against finalists from other learned societies.

● Social events

Following the popularity of the events at Heriot-Watt, further evening activities have been arranged for UEA:

10 September. *Trade & Welcome Reception*

11 September. *Society Dinner at Blackfriars Hall, Norwich*

12 September. *Pub Quiz – entrance fee for charity Prizes!! for the winning team*

● Offered posters

The deadline for the receipt of title/abstracts was **11 May 2001**. Contact the session organizer direct if you still wish to submit a paper or poster.

● Meeting flyer – please display

A small poster to advertise the UEA meeting is enclosed with this issue of *Microbiology Today*. Please display it on your departmental noticeboard or pass it to colleagues. Further copies are available from the Meetings Office.

SPRING 2002 – 150th Ordinary Meeting

University of Warwick
8–12 April 2002

● Main Symposium Signals, switches, regulons & cascades: control of bacterial gene expression

Organizers: S. Busby, R. Dixon, D. Hodgson, H. Jenkinson, G. Salmond & C. Thomas

The following topics will be covered: Regulation of the stress response/ DNA topology and regulation of gene expression/DNA rearrangements and regulation of gene expression/ Structure of RNA polymerase/ Sigma factors/Anti-sigma factors/ Activators of transcription/ Repressors of transcription/ Complex regulators/Transcription anti-termination/Post-transcriptional regulation/Phosphorelay gene regulation/Quorum sensing in Gram-positives/Two-component systems/Quorum sensing in Gram-negatives

● Other symposia, workshops

● Gene expression in natural environments

Cells & Cell Surfaces/ Physiology, Biochemistry & Molecular Genetics/ Environmental Microbiology Groups

Organizers: M. Woodward, N. High & N. Minton

● New approaches to vaccination

Clinical Microbiology Group

Organizer: D.A.A. Ala-Aldeen

● Virus infections in immunocompromised and transplant patients

Clinical Virology Group

Organizer: D. Westmoreland

● Careers in microbiology

Education Group

Organizer: P. Handley

● Fermentation studies: post-genomics era

Fermentation & Bioprocessing Group

Organizer: G. Hobbs

● Normal flora

Microbial Infection Group

Organizers: D. Devine & S. Patrick

● Aeromonads & Vibrios

Systematics & Evolution Group

Organizer: B. Austin

● Infections of the nervous system

Virus Group

Organizers: J. Fazakerley & L. Hoey

● Virus replication of cellular architecture

Virus Group

Organizers: G. Smith, T. Wileman & R. Everett

● Launch of new Food and Beverages Group

● Offered posters

Offered posters are welcome but each one should be associated with a Group. General Offered Posters will no longer be accepted. Titles and abstracts should be sent to the appropriate Convener, preferably by email. The subject content should be relevant to the remit of the Group (see website for details); it does not have to relate to the topic of the Group Symposium taking place at the particular meeting. Abstracts are required in a standard format – see website for details or contact the Events Administrator. Deadline: **8 December 2001**.

AUTUMN 2002 – 151st Ordinary Meeting

University of Loughborough
16–20 September 2002

● Main Symposium *Staphylococcus*

Irish Branch

Microbial Genome Environment Interactions

Queen's University of Belfast
6–7 September 2001

Organizers: Martin Collins (m.collins@qub.ac.uk) and Mike Larkin (m.larkin@qub.ac.uk)

For details of Irish Branch activities contact the Convener, Martin Collins (m.collins@qub.ac.uk)

Group News

Environmental Microbiology Group

The Group would like to thank Professor Hilary Lappin-Scott for her 7-year contribution to activities, 5 as Convener! She has done a fantastic job in advancing the profile of environmental microbiology within the SGM.

Other Events

● Joint ASM/SGM Meeting

2–6 October 2001

Caribe Hilton, San Juan, Puerto Rico

Biodegradation, Biotransformation and Biocatalysis (B3)

Organizers: D. Gibson, H. Lappin-Scott, G. Sayler, J. Tiedje & G. Toranzos

Following the successful first joint meeting of the ASM and the SGM at the University of Aberdeen in 1995, the two societies are pleased to announce the second joint meeting in tropical San Juan, Puerto Rico, with its diverse landscape and numerous natural wonders. The 3-day meeting will have plenary sessions on each topic, invited speakers, offered papers and posters. Full details of the programme are available on the SGM website and at **www.asmusa.org** The SGM contact is Hilary Lappin-Scott (h.m.lappin-scott@exeter.ac.uk).

● REGISTRATION

SGM members are entitled to register for the meeting at the same concessionary rates as ASM members and Student Members may apply for ASM travel grants. See **www.asmusa.org** for registration details.

● BURSARIES

Grants are available for SGM members wishing to attend the meeting. See p. 91 for details.

● Viral Zoonoses

9–11 January 2002

Royal College of Physicians, London

SGM Clinical Virology Group, European Society for Clinical Virology and the European Society for Veterinary Virology

The meeting will cover the latest medical and veterinary aspects of viral zoonoses. Offered papers and posters on any subject relevant to clinical virology or veterinary virology are welcome. Titles and abstracts should be sent to the SGM Meetings Office by email (meetings@sgm.ac.uk) by **12 October 2001**.

Organizers: T. Wreghitt (Fax 01223 242775) & J. Best (jenny.best@ kcl.ac.uk)

● IUMS Congresses

28 July–1 August 2002, Paris, France

The World of Microbes

Xth International Congress of Bacteriology and Applied Microbiology
Xth International Congress of Mycology
XIIth International Congress of Virology

A flier about the congresses is enclosed with this issue of *Microbiology Today*. See **www.iums-paris-2002.com** for further details. SGM members will be able to apply for grants to attend the congresses. Details will be published in a future issue of the magazine.

Hot off the Press

Microbiology Today Editor Meriel Jones takes a look at some papers in current issues of the Society's journals which highlight new and exciting developments in microbiological research.

A global view of FMD

The importance of foot-and-mouth disease (FMD) in the UK has coincided with publication in JGV of research by Alan Samuel and Nick Knowles of the Institute for Animal Health at Pirbright in Surrey. They analysed 105 isolates of FMD virus (FMDV) to give the most comprehensive picture so far of its spread and diversity around the planet. They used information held by the OIE/FAO World Reference Laboratory for FMD at the Institute, which has been built up since 1924, and now includes the latest genetic sequence information as well as samples of the virus and reports on outbreaks.

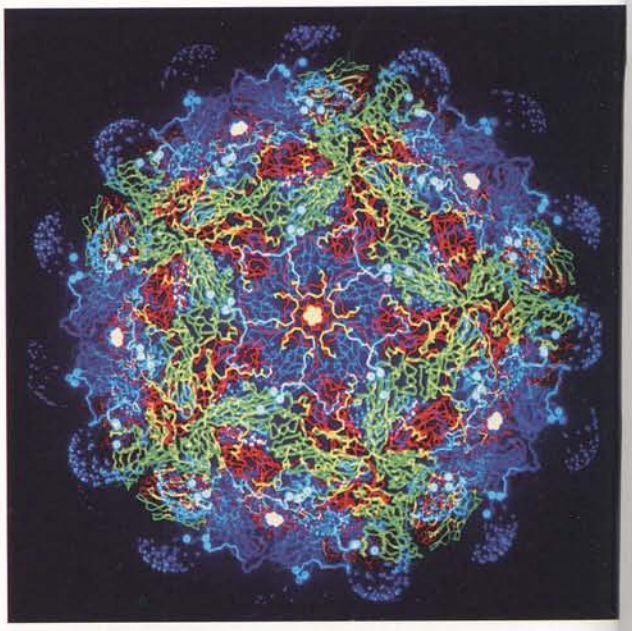
All the isolates were of serotype O, the type involved in the current UK outbreak. This is one of the seven immunologically distinct types of FMDV, although there is considerable variation within each group. To detect this, the researchers now use the sequence of the FMDV genome, which allows the identity of isolates to be checked with great precision. The Reference Laboratory has over 1,000 sequences of part or all of the genome of FMDV serotype O isolates, and the researchers picked ones that would give them a good picture across the whole planet. When they put all the sequence data into a computer program that could cluster the sequences together based on their similarities, it sorted the isolates into eight distinct genetic lineages, called topotypes, each predominantly in particular geographical regions.

When the researchers looked closely at exactly which isolates were in each group, this revealed part of the history of FMD. FMDV belongs to a group of viruses which are very prone to acquire small changes in their genomes quite rapidly. However, some isolates showed surprisingly little variation despite having been isolated years apart. The best explanation for this came from the fact that they were all similar to ones that have been used to make vaccines, with the implication that some of the disease isolates originated from improperly prepared vaccine, giving a new angle on the use of vaccination against FMD.

Other clusters echoed the movements of people around the world. For example, European and South American viruses formed one group. This matches with the first appearance of the disease in Argentina in 1870, in the livestock of European immigrants. They evidently took their disease, as well as their animals, with them. This topotype has probably continued to travel in cattle, because the researchers spotted that an FMDV isolate from Angola was also in this group, and may have come from animals imported from South America in the 1970s.

Some isolates were in unexpected clusters, probably explained by world trade. This might have been the origin of an isolate from Moscow which was most similar to others found half a world away in China, since it came from an outbreak thought to originate from imported pig meat. The disease may also be lasting evidence of clandestine activities, as in an isolate of a topotype usually confined to Ghana, Ivory Coast and Guinea that appeared in Algeria and might have come from illegal movements of Zebu cattle in 1999.

Samuel, A.R. & Knowles, N.J. (2001). Foot-and-mouth disease type O viruses exhibit genetically and geographically distinct evolutionary lineages (topotypes). *J Gen Virol* **82**, 609–621.



THIS PAGE:
The 'face of FMDV', as portrayed on the cover of *Nature* (R. Acharya *et al.*, 1989, *Nature* **337**, 709–716). The capsid is viewed down a five-fold axis of the icosahedral virus with the constituent proteins drawn as Calpha traces, colour coded such that VP1 is blue, VP2 is green, VP3 is red and VP4 is yellow. This is the structure of the native virus where the major antigenic loop cannot be visualized owing to its flexibility. Large dotted blue spheres define the approximate position it would occupy on the surface. Subsequent studies of virus treated with DTT (D. Logan *et al.*, 1993, *Nature* **362**, 566–568) permitted the visualization of this loop, which also contains the receptor attachment RGD motif.
COURTESY DAVID STUART, LIZ FRY AND ROBERT ESNOUF, OXFORD UNIVERSITY

OPPOSITE PAGE:
Cryoultrathin section of *Mycoplasma pneumoniae*. The cytoskeleton is visible in the tip structure. Bar, 100 nm.
PHOTO COURTESY JAN HEGERMANN, INSITUT FÜR MIKROBIOLOGIE UND GENETIK, GÖTTINGEN, GERMANY

FMD in pigs

A further report from the Institute for Animal Health concerns FMD in pigs. Infected pigs are powerful emitters of air-borne FMDV and cattle are highly susceptible to infection by inhalation. The pattern of wind-borne spread of FMD over more than 10 km is thus invariably from pigs at source to cattle downwind. This investigation into the early stages of the disease was carried out before the recent outbreak in the UK, in biosecure isolation buildings, with careful precautions to minimize suffering to the animals, as well as to ensure that the virus could not escape.

To start the infection, the researchers injected four pigs with the virus: within 3 days the animals were so unwell that they would not stand up. At this point, eight healthy pigs were brought into their room, left for 2 hours and then returned to their own individual cubicles. The researchers then killed the sick pigs and disinfected the room, their clothing and anything else that had been in contact with the pigs. Over the next 4 days, they observed the condition of the other pigs and selected two each day to be clinically examined and then killed, keeping blood and other tissues to test later.

One of the difficulties with FMD is to detect its presence, or confirm its absence, in apparently healthy animals. There are several ways to do this, and the basis of the project was to compare the sensitivity of a method based on detecting the viral genome with one that actually measured how infective the virus was by growing it in cultured animal cells. The amount of virus increased very rapidly in some parts of the pigs, reaching as much as 100 million virus particles per gram of tissue. The measurements by both methods matched, with the advantage that figures based on the amount of virus genome were not influenced by the immune response of the pigs to the disease. This tended to decrease the infectiousness

of the virus when its numbers were reaching their highest levels after 3 or 4 days.

When the scientists looked at the pigs' organs, everything seemed normal, apart from the disease lesions on feet, gums, tongues and snout by 3 days after infection. However, the tests for FMDV could detect some virus in almost all tissues tested. There were moderate amounts of FMDV in the pharynx within 24 hours of infection, because this was probably where the virus was first deposited and began to multiply. The highest amounts of virus were in the disease lesions, although even regions of the tongue and skin that looked normal contained large amounts of virus.

Soren Alexandersen, S., Oleksiewicz, M.B. & Donaldson, A.I. (2001). The early pathogenesis of foot-and-mouth disease in pigs infected by contact: a quantitative time-course study using TaqMan RT–PCR. *J Gen Virol* **82**, 747–755.

Minimalist microbes

Mycoplasma pneumoniae causes bronchitis in young people that occasionally develops into pneumonia, but usually clears up of its own accord. Although it is not impressive as a pathogen, it has the distinction of pushing the boundaries of a living cell to their lowest limits. Its cells attach themselves as closely as possible to the human cells covering the surface of the respiratory tract and have evolved to exploit this close association to the extent of relying on their involuntary host for many essential compounds. As well as discarding biosynthetic abilities, *M. pneumoniae* has shed its cell wall and replaced it with some sort of internal skeleton. One consequence is that *M. pneumoniae* has one of the smallest genomes of all known bacteria with only 688 genes, all of which were sequenced about 5 years ago.

The stripped-down nature of its cells may make the job of finding out what everything does much easier than in more self-sufficient organisms. One of its unusual components is the presumed internal protein skeleton, which appears as shadowy images in electron microscopic pictures after the rest of the cell's proteins have been gently washed away with salt and detergent. The tip seems to be essential for *M. pneumoniae* to stick to human cells. A group of German microbiologists have been trying to discover what the presumed cytoskeleton is really like, and in particular, what proteins are in it.

After isolating the best protein skeletons that they could, they separated out every individual component as tiny spots within a slab of jelly. Then to identify each one, the researchers delicately picked out the spots and analysed each in a machine that could record at least part of the order of the amino acids in each one. The trick to using this to identify the proteins relied on the fact that they already knew the sequence of all the genes in the bacterium. The sequence of a gene includes the instructions for the order of the amino acids in the protein that is made from it, so from knowing the arrangement of a short length of amino acids, the researchers had a good chance of being able to name the protein.

They found over 100 proteins associated with the fibres from the cells and managed to identify 41 of them. Several of the proteins were ones that had already been fingered as part of the tip of the skeletal structure, along with several others whose role was previously unknown. However, for many of the proteins, it was not clear whether they were really a normal part of the skeleton, or had simply attached to it as the cells broke open. The next step for the German researchers will be to test how some of these proteins are organized within the cell.

Regula, J.T., Boguth, G., Gorg, A., Hegermann, J., Mayer, F., Frank. R & Herrmann, R. (2001). Defining the mycoplasma 'cytoskeleton': the protein composition of the Triton X-100 insoluble fraction of the bacterium *Mycoplasma pneumoniae* determined by 2-D gel electrophoresis and mass spectrometry. *Microbiology* **147**, 1045–1057.

'FreeTree' taxonomy program

Biologists are very interested in characteristics that make individuals unique and that allow them to be grouped together. Ideas about what defines a species, its relationships to other species, and their evolution, are important to ecologists, epidemiologists and sociobiologists, as well as to taxonomists. The application of molecular methods to taxonomy has solved some problems that were out of reach by traditional methods, but has caused further debate. For example, is it more valid to base taxonomy on the molecular details of a single gene, or on a number of them?

As well as philosophical arguments, there are some technical differences between these two approaches. Many readily available computer programs apply mathematical methods to molecular data from a single gene and include statistical procedures to assess the reliability of the results. In contrast, very few programs can do the same when the data come from a large number of genetic loci. Scientists at Charles University in Prague and the Academy of Sciences of the Czech Republic have been remedying this omission, and a recent paper in IJSEM describes the application of their new program, FreeTree, to 731 characteristics, scattered across the genome of ten species of trichomonads. This program gathers similar organisms together according to several criteria, draws diagrams of its results and carries out statistical tests that can be interpreted in terms of confidence in its conclusions. The program will run under Windows 95/98/NT and is available from the IJSEM's supplementary data facility at **http://ijs.sgmjournals.org/vol51/issue3/**

The trichomonads are a group of flagellate protozoans that infect animals. *Trichomonas vaginalis* is perhaps the best known, because it causes non-gonococcal urethritis in humans, while other species live within mammals, birds and reptiles. The researchers analysed characteristics from 42 trichomonad strains using FreeTree and demonstrated the importance of assessing the reliability of any taxonomy. The results clearly indicated that *Trichomonas vaginalis* had an ancient origin, compared with the trichomonad-like species *Tritrichomonas suis*. However, the program's statistical analysis indicated that no firm conclusions could be drawn from details within the *Trichomonas vaginalis* grouping. In contrast, the statistics indicated that it was safe to infer that the intermixing of harmless isolates of *Tritrichomonas suis* from the intestine of pigs, with pathogenic ones of *Tritrichomonas foetus* from the urogenital system of cattle supported previous suggestions that they are in fact the same species.

Hampl, V., Pavlicek, A. & Flegr, J. (2001). Construction and bootstrap analysis of DNA fingerprinting-based phylogenetic trees with a freeware program FreeTree: application to trichomonad parasites. *Int J Syst Evol Microbiol* **51**, 731–735.

Online submission to SGM journals

Microbiology and IJSEM have recently started using the ESPERE online submission and peer-review system. This involves authors submitting a single PDF file of their paper to a secure website. An encrypted URL is forwarded to the Editor who then forwards it to the chosen reviewers. Reports are submitted to the Editor using our online report form.

It is early days yet, but ESPERE should result in a reduction in the time taken to make a decision, thus helping in more rapid publication, and will also result in savings in postage and courier charges. The fact that it is web-based means that it will be easier to get reports rapidly from all over the globe.

We hope that authors, reviewers and Editors will appreciate the benefits of online submission and will embrace this exciting development.

Supplementary data

As mentioned in the February issue of *Microbiology Today*, the supplementary data facility is now in operation. A variety of data types have been attached to papers, including video, figures, tables, large sequence alignments and even a free computer program (FreeTree, see p. 97 of this issue). The system should help contain the size of the printed journals and also provide added value to our online services.

Order! Order!

One of the most obvious things about bacteria is that they all look much the same. This rapidly drove researchers on a quest for other characteristics. Microbiologists have now carefully catalogued around 4,518 species in 998 genera, many of which are defined on features including their patterns of nutrition, the nature of their cell walls, particular types of chemicals in their cells, their typical habitats and, increasingly, information about their genes. John Young, from Landcare Research in New Zealand, has described, in a recent issue of IJSEM, the ways that taxonomists use this information to classify bacteria and the challenges that may come from increased knowledge about bacterial genetics.

Classification is the ordering of organisms on the basis of their relationships, e.g. grouping similar strains into species, and species into genera. Phenetic classification is based on overall similarity by equal weighting of all known characters and it can make use of all sorts of information about bacteria, from the shape of cells, or nutritional requirements, to characteristics of the DNA and RNA. Polyphasic classification is based on a consensus of all available methods, phenotypic and genomic.

These two systems can conflict with another goal in systematics, which is to group organisms together based on ancestral relationships (phylogenetic classification), because the possession of a common features does not necessarily mean that organisms evolved from a recent common ancestor. An obvious example of this among animals is that although both birds and bats have the power of flight, it is almost 250 million years since they shared ancestors. Bacteria have left very little in the fossil record, so all inferences about their ancestry have to come from measurements of differences between the sequences of their genes and assumes that all the changes relate to historical relationships. A problem with phylogenetic classifications is that they sometimes give views on relationships between bacterial isolates that rely on subjective decisions about which gene to investigate. Some recent proposals for new bacterial genera depend on differences in sequence within only one gene, leaving open the question of whether the same degree of difference applies to all the other genes in the two isolates.

One ability of bacteria that would certainly affect the assumptions of phylogenetic classifications is the way they can pick up and retain genes that are beneficial to their survival from unrelated bacteria. The extent of this genetic exchange is still being evaluated, but is certainly much greater than anyone once imagined. For example, it seems as if about 18% of the genome of *Escherichia coli* comes from the stable integration of transferred genes. John Young says there is already speculation that the conserved regions that make one gene particularly valuable for creating phylogenetic classifications, simultaneously make it a prime candidate for transfer between bacteria! As a final thought, he suggests that we might come to view bacterial species and genera as groups of organisms which share a collection of genes, but have access to many others from outside the group. This would certainly be a challenge to some current concepts in bacterial taxonomy.

Young, J.M. (2001). Implications of alternative classifications and horizontal gene transfer for bacterial taxonomy. *Int J Syst Evol Microbiol* 51, 945–953.

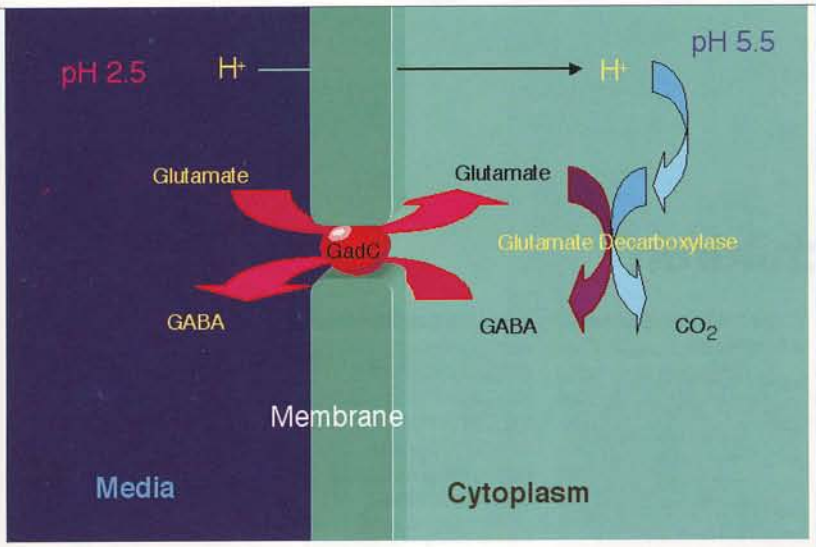
Surviving acid attack

Although *Escherichia coli*, the well known-inhabitant of the human gut, does not like acidic surroundings, it can tolerate even pH 2 for a few hours. Indeed, pathogenic strains have to be able to survive the extremely acidic stomach if they are to reach the intestines and set up an infection. Researchers at the University of South Alabama College of Medicine in the USA have discovered that the cells have at least three distinct ways to protect themselves through this dangerous time in their lives. The researchers have now focused on trying to understand how one system is influenced by the cell's environment. It involves the enzyme glutamate decarboxylase and requires a source of the amino acid glutamate to mop up any acid that enters the cell.

They created strains of *E. coli* that as well as containing the genes encoding the enzyme also had the DNA instructions that switch these genes on or off attached to a so-called reporter gene. Reporter genes encode proteins that are particularly easy to detect. The idea was that the cells would respond to their surroundings as normal, but the reporter gene would make it much simpler to see exactly when glutamate decarboxylase was present. In particular, the researchers wanted to know whether other proteins, called sigma factors, that help recognize the DNA sequence at the start of genes, were involved in switching on production of glutamate decarboxylase. They also looked at what happened when they changed the growth medium to mimic the nutrient-poor stomach, or the nutrient-rich intestine.

They discovered that the enzyme was present when rapidly growing cells experienced mildly acid conditions, but only if they were in a nutrient-poor environment. In contrast, if the cells were about to stop growing, acidity triggered increased enzyme production above a modest level, regardless of the nutrients in the environment, provided the cells also contained a particular sigma factor, called σ^S. As a further feature, the researchers worked out that another protein, which detected how much of the sugar glucose was in the environment, was also involved in regulating enzyme production. The complexity of the system for detecting and counteracting acidic surroundings makes the researchers certain that it is very important to the survival of *E. coli*.

Castanie-Cornett, M.P. & Foster, J.W. (2001). *Escherichia coli* acid resistance: cAMP receptor protein and a 20 bp *cis*-acting sequence control pH and stationary phase expression of the *gadA* and *gadBC* glutamate decarboxylase genes. *Microbiology* 147, 709–715.



Watching evolution

How can you study evolution and see living creatures really changing over time? Do all changes improve their abilities to live, and reproduce, or are some of them purely accidental? Bacteria offer an almost unique opportunity to study this. Not only are they very small, with short lifespans, but they can be grown in very tightly controlled environments. Even better, their cells can be deep-frozen and then revived to capture the characteristics of any generation.

A group of microbiologists at Michigan State University has tried this out with a strain of soil bacterium from the genus *Ralstonia*. They inoculated twelve flasks of liquid, so the conditions around each cell would be uniform, and also six sets of agar plates where the bacteria would experience gradients of nutrients and their own excreted products. As a way to keep track of the bacteria, they all had resistance to one of two antibiotics. After a thousand generations the researchers compared the appearance and several other properties of each population, as well as the starting, ancestral cells, and were surprised at the extent and variety of the changes.

Almost all the new cells stuck to surfaces more tenaciously than their ancestor and their appearance had also changed, with the cells in one population now 4.7 times longer, while those in three others had shrunk. When the researchers checked whether the cells could use any of 95 different nutrients, no two of the new populations were the same and all differed from their ancestor. The only pattern to the changes was that the cells that had evolved in liquid environments split into two groups, depending upon the antibiotic resistance of the founding population. For other features, like the fats within the cells, ones grown on solid agar retained a spectrum very similar to their parent, while those from the liquid environments had changed.

After the researchers put all the information on the cells together, they could make some guesses at what it meant. One of the themes that showed through was that all the new *Ralstonia* cell populations were better suited to their environments, despite their very different characteristics. Almost all the cells had lost the surface coating, called a capsule, of their ancestor and its absence could account for changes in their nutritional requirements, as well as increased adhesion. Of continuing interest to these workers is the great variability of the changes and the speed at which the changes accumulated. The organism continues to be studied because of this apparent plasticity.

Riley, M.S., Cooper, V.S., Lenski, R.E., Forney, L.J. & Marsh, T.L. (2001). Rapid phenotypic change and diversification of a soil bacterium during 1000 generations of experimental evolution. *Microbiology* 147, 995–1006.

ABOVE:
Glutamate-dependent acid resistance in *E. coli*. The diagram represents a proposed mechanism for glutamate-dependent acid resistance. GadC is a membrane-bound antiporter that exchanges glutamate from the medium for cytoplasmic γ-aminobutyric acid (GABA), the by-product of glutamate decarboxylation. When *E. coli* is present in the extreme acid of the stomach, protons (H^+) pass through the cell membrane and threaten to acidify the cytoplasm to a lethal level. However, the intracellular decarboxylation of glutamate consumes a proton and alkalinizes the cytoplasm. This proposed proton sink is maintained by continually bringing more glutamate into the cell via GadC in exchange for GABA which is expelled into the medium. Synthesis of this system increases when cells are exposed to acidic environments or enter into stationary phase.
COURTESY J.W. FOSTER, UNIVERSITY OF SOUTH ALABAMA COLLEGE OF MEDICINE, MOBILE, USA

Photo 2001

Are you a keen photographer? Do you have any good images of micro-organisms, scientists at work, food, farming, the environment, industry, biotechnology or academia?

If so, why not enter our photographic competition? Entries may be used in *Microbiology Today*, perhaps even on the cover, or in SGM educational resources.

Entry forms may be downloaded from the SGM website: http://www.sgm.ac.uk

● Rules

Entries should be submitted as a labelled transparency (from 35 to 70 mm) and as prints (6×4" minimum to 10×8" maximum), or, alternatively, they may be emailed to j.meekings@sgm.ac.uk as a high quality TIFF or JPEG file with a file size of no more than 1.5 Mb. Do not send pictures in glass mounts, as these can break in the post. Your name and address must be written on the slide mount of each transparency or on the back of each print. All entries must be accompanied by a signed entry form. The Society does not accept any liability for lost, delayed or incomplete entries.

Entries will be retained by the Society and signature of the form by the entrant acknowledges the right of the Society to use the photographs in Society publications and on the website at http://www.sgm.ac.uk

In the event of their use, credits will include the name of the photographer.

Entries will be displayed and judged by a panel at the Autumn 2001 Society meeting in September at the University of East Anglia. The panel's decision will be final. The winner will receive a certificate and cash prize of £250, to be presented at the Society Dinner on Tuesday 11 September.

Send your entries to: Janice Meekings, *Microbiology Today*, Marlborough House, Basingstoke Road, Spencers Wood, Reading RG7 1AG, UK.

The closing date for entries is **31 July 2001**.

If you would like your name to be added to our database of book reviewers, please complete the book reviewer interests form now available on the SGM website.

A classified compendium of book reviews from 1996 to the present is also available on the website.

Books for children

Horrible Science Series

Published by Scholastic Children's Books

1. Bulging Brains
By Nick Arnold (1999)
£3.99, pp. 155
ISBN: 0-590-11319-4

2. Nasty Nature
By Nick Arnold (1997)
£3.99, pp. 159
ISBN: 0-590-19126-8

3. Ugly Bugs
By Nick Arnold (1996)
£3.99, pp. 127
ISBN: 0-590-55808-0

4. Chemical Chaos
By Nick Arnold (1997)
£3.99, pp. 158
ISBN: 0-590-19125-X

5. Blood, Bones and Body Bits
By Nick Arnold (1996)
£3.99, pp. 158
ISBN: 0-590-55807-2

6. Suffering Scientists
By Nick Arnold (2000)
£7.99, pp. 224
ISBN: 0-439-01211-2

7. The Awfully Big Quiz Book
By Nick Arnold (2000)
£5.99, pp. 100
ISBN: 0-439-99750-X

8. Evolve or Die
By Phil Gates (1999)
£3.99, pp. 128
ISBN: 0-590-54282-6

9. Microscopic Monsters
By Nick Arnold (2001)
£3.99, pp. 142
ISBN: 0-439-99501-9

Many readers with younger children will have encountered the *Horrible Histories* books, in which the emphasis is on the more gruesome aspects of life as, say, a Roman or a Victorian. The books are extremely popular with the 9–12 age group, and having hit on a winning formula the publishers, Scholastic Books, have extended their reach into other areas of the curriculum including geography (*Odious Oceans and Violent Volcanoes*) and science.

I use the word 'curriculum' intentionally, because although outwardly these books would like you to believe that they offer a comic book approach to the subject, I'm afraid I have to blow the gaff and reveal that these delightfully wacky-looking, enticingly illustrated volumes contain an enormous amount of serious stuff cunningly designed to look like light-hearted fun.

Of course, this is the whole point. The premise of the books is that science is something children are forced to endure at school, that it is a subject that is so boring that either you go to sleep or, if you manage to stay awake, you only take in half the facts and can make no sense of any of them. (Science teachers will no doubt groan at this point.) These books are an antidote to that and intend to lure the unsuspecting and reluctant student into learning something without realizing it. The 'blurb' promises that there will be lots of gore and goo, supposedly fascinating to children. True, there is a liberal scattering of 'rude words' such as wee, poo and bum, which owe their presence to the well-documented British obsession with scatological humour, and a number of grisly anecdotes, like the story of Antoine 'Luckless' Lavoisier's unfortunate end on the guillotine. But the books are far more than excuses for a giggling fit. They are panoramic in their scope, covering the key points of their topic in an economical style that nevertheless includes all the important points.

The level of humour is nicely judged and shows a thorough acquaintance with the *Beano* and the *Dandy*, since the illustrations use all the common conventions found in comics – speech and thought bubbles, exaggerated physical characteristics and vocalized noises like 'snigger' and 'chortle'. Readers are expected to be sufficiently familiar with these conventions to be able to cope with a fairly complicated page layout. Although the books are loosely arranged in chapters, inserted panels containing mini questionnaires, potted biographies of famous scientists and so on constantly interrupt the narrative, and for some readers keeping hold of the thread of the 'story' may be difficult.

It is interesting that female scientists are given a reasonably high profile wherever possible, including some whom few readers will have come across. In *Suffering Scientists* Rosalind Franklin (dubbed Forgotten Franklin in typical alliterative style) is given a whole chapter, although Watson and Crick do get a mention. Caroline Herschel is credited with ensuring her brother William's success as an astronomer. Anonymous cartoon scientists appearing as commentators are just as likely to be female as male and the message is clearly that science is for girls as much as for boys.

Despite the claim that 'science has never been so horrible' (a claim which practitioners may dispute) the books are mines of all kinds of scientific information presented in a very enjoyable form. Schools may find them useful as a way of stimulating interest and encouraging further research, and as additions to the child's home library they can help to promote the idea that science does not exist only in the school lab, but is part of all of our lives every day.

■ ***Hilary Fraser is doing a PhD on Darwinism and Children's Literature at Reading University***

Book reports

Bulging Brains

Bulging Brains is a book from the *Horrible Science* series exploring all corners of science. Many of the jokes are about science teachers and there are funny captions and speech bubbles with the brilliant drawn cartoons by Tony De Saulles. Every now and then a quick quiz pops up and a tea-break teaser for a teacher. I liked the memory chapter because it has loads of facts and was very funny. I would give this book 9 out of 10.

Blood, Bones and Body Bits

This book tells you everything from how many times you change your body position every night and which man eats metal without getting indigestion. There are more quick quizzes and teacher tea-break teasers and there were more brilliant cartoons. My favourite part was about sleep in the brain chapter because it was interesting and full of facts. I would give this book 9 out of 10.

Suffering Scientists

I liked *Suffering Scientists* because it had lots of little biographies about famous scientists and their earlier lives. It told you what they discovered and what theories they got wrong. I liked the part about Newton because it told you a lot about his life and I could understand it. It had lots of entries from pretend diaries. I would give this book 9½ out of 10.

RIGHT:
Rosalind and Eleanor Fraser review the *Horrible Science* series of books.
PHOTO RON FRASER

Books for grown-ups!

Ugly Bugs

Ugly Bugs is another exciting book in the *Horrible Science* series. There is a chapter for loads of kinds of bugs and what they eat and drink. There are lots of strange bugs and common ones with facts you didn't know. There aren't many teacher tea-break teasers, but there are a few experiments to do. My favourite part was the spider fact file because you can find out about what disgusting things they eat and what they can do to humans. I give this book 8 out of 10.

■ ***Rosalind Fraser, aged 12***

Evolve or Die

Evolve or Die is a book about dinosaurs, fossils and the first mammals. Delve into this book to find hilarious cartoons drawn by Tony De Saulles and mini-tests, brain teasers and the teacher quizzes. Find out...

- Spotting a species
- A story about Alfred Lothar Wegener
- How the greatest stink bomb was made
- Why continents drift

Find all this out in *Evolve or Die* written by Phil Gates.

This book was great. I give it 8.7 out of 10.

Chemical Chaos

Chemical Chaos is a book about ... CHEMICALS! Again Tony De Saulles illustrates the book to make it much more fun. See how much you know about chemicals in the tests and also test your Science teacher. Find out...

- What different gases do
- What happens when you take laughing gas
- And about people who have worked with gases.

All that and much more in this book *Chemical Chaos* written by Nick Arnold.

I really liked this book and give it 8½ out of 10.

Nasty Nature

Nasty Nature: the book where you find all the gory details of nature! Again it is fun-packed with Tony De Saulles cartoons and the many brain teasers and teacher tests. Find out...

- Which fish cleans out another fishes mouth
- What a koala does all day
- How to tell what your pet is thinking

All that and a terrific amount more with this book *Nasty Nature* written by Nick Arnold.

I really enjoyed this book and give it 9 out of 10.

The Awfully Big Quiz Book

The Awfully Big Quiz Book is an awfully big quiz book. Answer questions on...

- Medicine
- Physics
- Astronomy
- Chemistry
- Biology

And many more in *The Awfully Big Quiz Book* written by Nick Arnold.

I thought this book was an ingenious idea and give it 8½ out of 10.

■ ***Eleanor Fraser, aged 10⅔***

Microscopic Monsters

The long-awaited microbiology edition of this *Horrible Science* series, 'science with the squishy bits left in', hit the bookshops early this year. All 'grown-up' practising microbiologists should have a copy to see microbiology made accessible to kids. Yes, the book is riddled with bad jokes, slightly selective scientific histories and tenuous links between all things small and microbiology, BUT it is fun, engaging and popular with a target audience of 8–11-year-olds. It explains that '*most bacteria do us no harm and are actually good for us*', citing tales of autotrophy, vitamin K synthesis and sewage treatment. It tempers this message with sterner stories such as 'terror in the toilet' and 'methanogenesis exploding dead bodies'. The book's closing statement '*once you've peered down that* (microscope) *eyepiece and glimpsed this strange place* (the microscopic world), *the outside world will never seem the same again*' is marvellous recruitment PR for microbiology!

■ ***Liz Sockett, aged 30 something and ¾***

Other educational books reviewed by SGM

Microbes, Bugs and Wonder Drugs: Potions to Penicillin, Aspirin to Addiction

Fran Balkwill & Mic Rolph with Victor Darley-Usmar
Portland Press (1995)
£12.99, ISBN: 1-85578-065-8

Planet Ocean

F. Balkwill
Portland Press (1997)
£6.99, ISBN: 1-85578-094-1

Poo, You and the Potoroo's Loo

David Bellamy
Illustrated by Mic Rolph
Edited by Fran Balkwill
Portland Press (1997)
£6.99, ISBN: 1-85578-095-X

Brainbox

S. Rose & A. Lichtenfels
Illustrated by Mic Rolph
Edited by Fran Balkwill
Portland Press (1997)
£6.99, ISBN: 1-85578-096-8

Biology Now! 11–14 (1) Pupil's Book; (2) Teacher's Resource Book

P.D. Riley
John Murray (Publishers) Ltd (1998)
(1) £9.99, ISBN: 0-7195-7548-6
(2) £35.00, ISBN: 0-7195-7549-4

Emerging Diseases of Animals

Edited by C.Brown & C.Bolin
Published by American Society for Microbiology (2000)
US$99.95, pp. 324
ISBN: 1-55581-201-5

Do not be misled by the title as the animal diseases in question have been selected on the basis that they also pose a health hazard to man. Current human population pressures on this planet force us to live in closer association with animals, whether domesticated or free living, and the outcome of this is the emergence of new diseases or, more frequently, the re-emergence of old ones. This collection of reviews is bang up-to-date and is essential reading for any scientist interested in 'One Medicine' as eschewed by Rudolf Virchow. The outlook is almost totally from a North American perspective which may limit its attraction elsewhere in the world, but institutions with interests in zoonotic infections should buy this book. Chillingly topical is a chapter on agroterrorism which discusses in fine detail how terrorists could lay waste a country's livestock industry by the introduction of a highly infectious disease. Foot-and-mouth virus is top of the list.

■ ***Willie Donachie Moredun Research Institute***

The Addison-Wesley Science Handbook for Students, Writers, and Science Buffs

By G.J. Coleman & D. Dewar
Published by Addison-Wesley/Pearson Education
£20.99, pp. 281
ISBN: 0-201-76652-3

A useful fusion of biological, chemical and physical facts into one book. Helpful to students or researchers who are trying to decipher scientific units or terminology on the edge of microbiology. Highlights include tables giving interconversions between units of power, pressure, energy and force, correct Greek or Latin scientific prefixes; names of human arteries veins and muscles; correct anatomical position terms used in development; common bond lengths in molecules, electrochemical potentials of ions and metals; solubilities of salts, K_a values for acids, suitable pH indicators and their ranges, half-lives of radio-isotopes, properties of nuclear particles, reminders of geological time scales, statistics on the Earth's physico-chemical properties, including average chemical composition of the atmosphere and seawater. Weak points include the continued use of the five kingdom classification system. This book reminds microbiologists of previously learned but long-forgotten physical, chemical, medical and geological terms and is very useful in multi-disciplinary research.

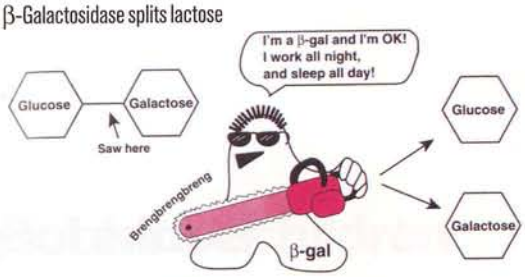
■ ***Liz Sockett University of Nottingham***

Molecular Motors. Essays in Biochemistry, Vol. 35

Edited by G. Banting & S.J. Higgins
Published by Portland Press (2000)
£19.00, pp. 200
ISBN: 1-85578-103-4

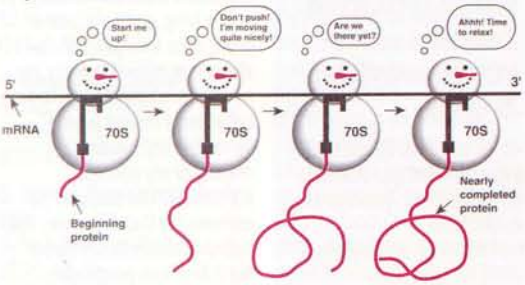
Do cell biologists know that prokaryotes exist? This book claims to feature '*all of the main motor systems*', which it defines as mechanisms converting the chemical energy of ATP into movement. The broader-minded editors include proton-driven F1-ATPase, but then disconcertingly omit bacterial flagellar motors. Moreover, despite excellent chapters on microtubule-associated processes and kinesin-driven organelle movement in animal cells, we find nothing on chromosome segregation or FtsZ-driven septation in bacteria. Microbes are not omitted entirely – Woolley writes excellently on eukaryotic cilia and flagella. Moreover, although I counted the word 'bacteria' only once, there is an admirable chapter by

β-Galactosidase splits lactose



Alternative version of alternative tail site selection

Polysome – several ribosomes work on one mRNA



ABOVE:
Examples of cartoons from *Molecular Biology Made Simple and Fun*
COURTESY CACHE RIVER PRESS

Szczelkun on type I and III restriction endonucleases and another on translation elongation factor. The book is well written, beautifully illustrated and fulfils the series' brief to tackle areas poorly covered by student textbooks. Most students will not be able to afford it, but it should be an essential addition to any biological or biomedical science library.

■ ***Ian Hancock***
University of Newcastle

Teaching Science for Understanding: A Human Constructivist View

Edited by J.J. Mintzes, J.H. Wandersee & J.D. Novak
Published by Academic Press (1998)
£39.95, pp. 360
ISBN: 0-12-498360-X

This is a companion volume to *Assessing Science Understanding* by the same authors, (reviewed for *Microbiology Today*, vol. 27, May 2000). I hoped it might include analysis of case studies showing why certain teaching methods work better in science. This is included to an extent in chapters 7–10 but the remaining ten chapters are heavily devoted to the history of ideas on teaching and the psychology and sociology of the classroom setting. This balance makes the book poorly suited to science academics (who are probably not its primary target). A chapter that I did like was one on using analogies in teaching, something that I employ in my lectures. In conclusion, the *Assessing Science Understanding* companion volume to this one seems a better purchase for institutional libraries. It contains more practical suggestions for the science academic, based on similar teaching and learning methods (V diagrams, concept maps) to those described here.

■ ***Liz Sockett***
University of Nottingham

Molecular Biology Made Simple and Fun, 2nd Edition

By D. P. Clark & L.D. Russell
Published by Cache River Press (2000)
US$34.95, pp. 470
ISBN: 1-889899-04-6

This entertaining American book is aimed at university students, despite the cover picture of a chimp playing with GATC building blocks! I find it ideal in first-year genetics tutorials for a variety of bioscience undergraduates and also when explaining science to the public. It introduces concisely the principles behind a variety of molecular genetic processes and techniques, including RT-PCR, RAPD, automated DNA sequencing, protein folding, transposition, transgenic technologies, molecular evolution and taxonomy. Illustrations include cartoons, sketches and some corny jokes, very like the shorthand that students use in their own lecture notes. The DNA sequencing explanations in this book are the most undergraduate-friendly of all texts I have tried. Purists may be irritated by its lack of molecular detail, but this book is an ideal primer that allows students to pick up the basic concepts and then look up the details in 'proper textbooks'. A must for your office!

■ ***Liz Sockett***
University of Nottingham

Clinical Virology Manual, Third Edition

Edited by S. Spector, R.L. Hodinka & S.A. Young.
Published by ASM Press (2000)
US$124.95, pp. 644
ISBN: 1-55581-173-6

The third edition is an updated and expanded version of the previous ones. The first section gives detailed descriptions of the laboratory procedures for detecting clinically important viruses. The length of each chapter doesn't reflect how widely each procedure is used. For example, complement fixation tests, described in 15 pages, have been largely superseded in the majority of laboratories by enzyme immunoassays, to which only 12 pages are devoted. It is unfortunate that neuraminidase inhibitors have been omitted from the chapter on drug susceptibility testing. The second section describes groups of viruses under headings of biology, pathogenesis, epidemiology, diagnosis and treatment. Appendices in the final section give details of US virus laboratories and the services provided by them. There are a number of other clinical virology manuals on the market and, although they may not cover the subject in quite as much detail, are much more affordable, particularly for students.

■ ***Chris Ring***
GlaxoWellcome R&D, Stevenage

Microbiology: Diversity, Disease, and the Environment

By A.A. Salyers & D.D. Whitt
Published by Fitzgerald Science Press (2000); d/b Blackwell Science
£27.99/US$59.95, pp. 608
ISBN: 1-891-786-01-6

Aimed as a freshman introduction to microbiology, this text is written in an unusual 'pre-digested' style that also characterized the excellent *Bacterial Pathogenesis* written by the same authors in 1994. The authors map out for students the major concepts in microbiology, without the plethora of examples found in most other texts. This approach may well answer the undergraduate cry '*but what do we have to know for the exam*?' The book begins with microbial biology, then human microflora and immune defences, infectious diseases covered organ by organ. The final section has only 80 pages covering microbial communities, nutrient cycles, plant–microbe interactions and genetic engineering technology. The lack of illustrations (only 14 colour plates in total) is relieved by interesting anecdotes and simple diagrams. Lecturers adopting this book need a good independent supply of images for their lectures, but their students should grasp core microbiological concepts well from the text.

■ ***Liz Sockett***
University of Nottingham

Methods in Yeast Genetics: A Cold Spring Harbor Laboratory Course Manual, 2000 Edition

By D. Burke, D. Dawson & Tim Stearns
Cold Spring Harbor Laboratory Press (2000)
US$75.00, pp. 205
ISBN: 0-87969-588-9

The Cold Spring Harbour *Yeast Genetics Course Handbook* has long been an essential reference work for all laboratories working in the field and is an ideal resource for newcomers. At one level, it provides a concise source for the recipes and protocols of everyday laboratory work. It provides an authoritative answer to those irritating questions that sound easy, but can be hard to nail, e.g. what's the correct concentration of leucine in minimal medium? This year's edition goes much further; it contains full details of the recent modifications and new resources that have made the awesome power of yeast genetics even easier to exploit. The list of techniques covered includes two-hybrid analysis, synthetic lethal screens, epitope tagging, GFP fusions, immunocytofluorescence, gene deletions using the powerful PCR-mediated gene disruptions (so you don't even have to clone the gene) and the generation of conditional mutations using degron fusions. As well as complete and easy-to-follow protocols, there are excellent commentaries introducing the rationale of the procedures and problems that can arise. For teachers it provides a short-cut to what would be a very sophisticated and rewarding practical course. In short, a brilliant resource for yeast biologists and teachers at all levels.

■ ***Peter Sudbery***
University of Sheffield

Basic Virology

By E.K. Wagner & M.J. Hewlett
Published by Blackwell Science (1999)
£27.50, pp. 466
ISBN: 0-632-04299-0

This book is a welcome addition to the short list of good virology textbooks. The price puts it just within the student budget and it is a must for microbiology libraries. The knowledge, expertise and experience of 40 aggregate years teaching shines through, with thoughtful, well explained and interesting text, accompanied by useful figures and tables. Virtually all areas of the topic are covered. The order of chapters, with diseases, etc. before structure and function, diverges from the usual – but works well.
The book has excellent glossary and reference sections (including web addresses) and, as is often the style of books from the USA, punctuates each section with a series of discussion points and study questions. One downside for students is that no answers are given to the questions.
The title, in my opinion, is a bit misleading – this excellent book is a little more than *Basic Virology*.

■ ***Dick Killington***
University of Leeds

The DNA of God?

By L.A. Garza-Valdes
Published by Hodder &Stoughton (2000)
£6.99, pp. 196
ISBN: 0-340-75637-3

Do not be put off by the title!
This is a plausible account of how the carbon dating of the Turin Shroud may have been invalidated by microbial contamination. Garza-Valdes maintains that the sheen observed on the Shroud is caused by a bioplastic material of microbial origin which skews carbon dating, making the Shroud appear more recent than it in fact is. Part autobiography, this is a serious attempt by an avowed Catholic to show that carbon dating of archaeological material can be influenced by microbial contamination. The title by the way refers to the fact that the author is certain that blood from a Jewish male is present on the Shroud. To prove it he provides a partial DNA sequence. Christian microbiologists can either relax or be disappointed by the author's suggestion that such an incomplete sequence could never be used to re-resurrect Jesus! A fascinating in-flight read.

■ ***Milton Wainwright***
University of Sheffield

Environmental Microbiology

By R.M. Maier, I.L. Pepper & C.P. Gerba
Published by Academic Press (2000)
£64.95, pp. 585
ISBN: 0-12-497570-4

This book, published in 2000, provides a good source of reference of many of the important concepts relating to environmental microbiology. Within the book, the authors have managed to cover many fundamental microbiological concepts as well as the more complex issues surrounding environmental microbiology. It would be a useful text for undergraduate students with interests in this area of microbiology. The book can be divided into four main sections: (i) introductory chapters; (ii) ecosystem microbiology covering terrestrial, air and aquatic environments; (iii) methodologies, including sampling, microscopy, culturing and molecular biology, and (iv) microbial functioning in the environment, including cycling, microbe–pollutant interactions and pathogenic behaviour. The information is well written and presented and is supported by good figures and tables, as well as case studies, which are effectively used to highlight particular issues. My only real complaint about this book is that some of the references are a bit old; otherwise, it is very good.

■ ***Kirk Semple***
University of Lancaster

Environmental Microbiology

By A.H. Varnam & M.G. Evans
Published by Manson Publishing (2000)
£19.95, pp. 160
ISBN: 1-874545-78-2

I could not shake the impression that this book had come from the Dorling Kindersley stable. [For those without children, D-K publish illustrated information books (see www.dk.com).] The level of the text is definitely not for kids though, and would challenge many an undergraduate. The book is lavishly illustrated (Evans is a photographer), to the point that I think it was a design imperative that no page should be without a picture. In a further echo of the D-K style, the text is a series of vignettes rather than a coherent explanation. It is easier to dip into this book than to read it through. In a rapidly developing field the information felt dated in areas; I was unable to find references later than 1996. In summary, this is an inexpensive little book well worth looking at as a valiant attempt to make the subject more accessible.

■ ***Dave Roberts***
The Natural History Museum, London

The Surprising Archaea: Discovering Another Domain of Life

By J.L. Howland
Published by Oxford University Press (2000)
£19.95, pp. 204
ISBN: 0-19-511183-4

Some readers will find John Howland's little book *The Surprising Archaea* to be something of an enigma, much as the organisms he lovingly describes were first treated. And indeed, there are aspects of this text which are odd. The title is unusual! The level of presentation is also somewhat confusing. The earlier chapters are clearly aimed at the fledgeling undergraduate biologist or the non-biologist, but never at the researcher in biology, whatever the dust-cover might say. Later chapters are more detailed. In delving deeper into the molecular and physiological properties of *Archaea*, Howland finds it necessary to explain some fairly basic biological concepts - such as the structure and function of RNA, the techniques of microbial culturing and what PCR is. In summary, this is an informative little book, written in a relaxed and accessible style. However, I fear that SGM members will find the explanatory material distracts from the core content.

■ ***Don Cowan***
University College London

Clostridium difficile. Current Topics in Microbiology and Immunology, Vol. 250

Edited by K. Aktories & T.D. Wilkins
Published by Springer-Verlag (2000)
DM169.00/öS1,234.00/sFr153.00/ £58.50/US$94.00, pp. 143
ISBN: 3-540-67291-5

Despite the fact that *Clostridium difficile* was first implicated as a causative agent of disease in man less than 30 years ago, a considerable amount of information has been accumulated on the bacterium and its toxins. This small volume provides a concise and comprehensive description of the microbiology and epidemiology of *C. difficile* and its *modus operandi* as a human pathogen. Although each chapter is written from a different perspective there is inevitably a degree of overlap, particularly between the four chapters dealing with the clostridial toxins. While this is understandable, the Editors might have been expected to ensure a common system of nomenclature for the toxins which are variously referred to as Toxin A/Toxin B and TcdA/TcdB. This is, however, a minor complaint. The book will be an essential reference for laboratories working with *C. difficile*, and of interest to toxicologists and microbial pathologists in general.

■ ***Wilf Mitchell***
Heriot-Watt University

Infections Associated with Indwelling Medical Devices, Third Edition

Edited by F.A. Waldvogel & A.L. Bisno
Published by ASM Press (2000)
US$99.95, pp. 471
ISBN: 1-55581-177-9

A sound knowledge of the pathophysiology and treatment options for medical implant infections is critical in a range of medical and surgical specialities. Clinicians dealing with the often devastating consequences of medical device infection need a well written summary of current options in treating specific implant infections to aid their management of patients and improve liaison with clinical microbiology departments. This book satisfies this requirement and provides extensive up-to-date references. I would also recommend it to anyone, at both undergraduate and postgraduate level, with an interest in medical-device-associated infection. It makes a very good starting point for research and would certainly be a worthwhile purchase for medical departmental or postgraduate reference libraries.

■ ***Simon Pickering***
Derby Royal Infirmary

NMR in Microbiology: Theory and Applications

Edited by J.-N. Barbotin & J.-C. Portais
Published by Horizon Scientific Press (2000)
£84.99, pp. 500
ISBN: 1-898486-21-2

This book presents a matrix of NMR techniques and microbiological problems. It is stronger on applications than theory, and chapters can be taken in isolation, depending on the interests of the reader. The first chapter, covering an introduction to NMR theory, can be avoided, as it is not well written, and subsequent ones provide their own introduction where necessary. Overall there are

too many contributions on analysis of metabolic pathways, while there is a single, well written chapter describing protein structure determination. It was pleasing to see some niche areas such as biofilms receive mention, while the final two chapters on combining genomics with flux measurements signal an important new horizon for *NMR in Microbiology*. I recommend this book to microbiologists or spectroscopists interested in what can be done, provided they then get together to work out how to do it.

■ ***Rob Cooke, GlaxoSmithKline, Stevenage***

Handbook of Enology: Vol. 1 The Microbiology of Wine and Vinifications; Vol. 2 The Chemistry of Wine Stabilization and Treatments

By P. Ribéreau-Gayon, D. Dubourdieu, B. Donèche & A. Lonvaud (Vol. 1); P. Ribéreau-Gayon, Y.Glories, A. Maujean & D. Dubourdieu (Vol. 2)
Published by John Wiley and Sons (2000)
Vol. 1: £75.00, pp. 454
ISBN: 0-471-97362-9
Vol. 2: £75.00, pp. 404
ISBN: 0-471-97363-7
2-Vol. set: £125.00
ISBN: 0-471-49865-3

Both volumes are extremely readable translations of the original French texts. The authors provide a comprehensive treatise of the microbiology, biochemistry, grape production, process methodology, chemistry and stabilization techniques underpinning European wine production. Although not exhaustive in every aspect, and clearly not intended to be, there are sufficient citations to enable the reader to delve deeper if required. Aimed at winemakers and students of enology, the texts explain the scientific principles and practices involved in wine production in such a way that little prior knowledge is required. This is a book that deserves space on library bookshelves in colleges where food-related courses feature. Buy it as a reference book and you won't be disappointed. Read it as an informed amateur and you'll gain much from its content. I walked away from the books feeling informed and greatly saddened at the British climate!

■ ***Glyn Hobbs Liverpool John Moores University***

The Ecology of Cyanobacteria. Their Diversity in Time and Space

Edited by B.A. Whitton & M. Potts
Published by Kluwer Academic (1999)
NLG650.00/US$345.00/£215.00
ISBN: 0-7923-4735-8

This is an extensive and well structured book that combines the collective expertise of many of the top researchers working in the cyanobacterial field. By writing a general introductory chapter, the Editors have opened up what is an essentially specialist book to the general microbiologist. Cyanobacteria are examined from every conceivable angle from their fossil record through their phylogeny to their interactions in a number of complex and extreme environments. Descriptions of molecular responses to environmental stress, significance of genomic repetitive DNA and production of toxins expand the ecology further. Whereas most chapters describe the cyanobacterial diversity in a given environment, two cyanobacteria, namely *Nostoc* and *Spirolina* merit their own individual chapters based on their ubiquity and commercial importance respectively. As the book is clearly written, well presented with excellent colour plates and extensively referenced it is an ideal reference book for those working in or entering this area of microbiology.

■ ***Roger Pickup CEH-Windermere***

SGM Symposium Vol. 60 Review

New Challenges to Health: The Threat of Virus Infection.

SGM Symposium Vol. 60

Edited by G.L. Smith, W.L. Irving, J. McCauley & D.J. Rowlands
Published by Cambridge University Press (2001)
Non-members: £70.00/US$125.00
Members: £28.00/US$50.00
pp. 339, ISBN: 0-521-80614-3

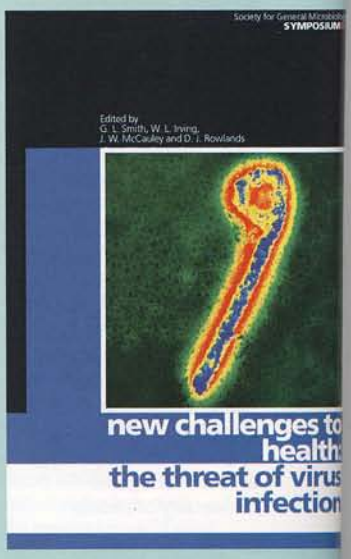
Although the last few decades have seen advances in our understanding of the biology of virus infections that would probably amaze the pioneers of virology – who knew viruses merely as 'filterable agents' capable of causing disease – the threat of virus infection still hangs over our heads like the sword of Damocles. At the start of a new millennium the human race and its attendant species (pets and livestock) face a bewildering variety of virus species, all able to cause significant morbidity or mortality. This volume is thus timely. The 15 chapters give a comprehensive, detailed and informative insight into the molecular biology, pathology and epidemiology of some of the most important viruses affecting the globe today. A notable exception, which with the benefit of hindsight would have made the volume even more opportune, is foot-and-mouth disease virus. However, I am sure that this omission will be more than adequately compensated for in other publications in the near future.

The book starts from a moralistic standpoint with a chapter by C.J. Peters. In describing the emergence of so-called 'exotic' viruses such as Sin Nombre he lays the blame squarely on the shoulders of the West, berating the failure of western governments to support the developing world. The chapter moves from geological history to modern epidemiological detective work and ends with some dire predictions for the future – in an era of great change the threats posed by viruses (and indeed other microbes) are ignored at our peril. This is an accessible chapter, easily read by the informed layman or scientist alike.

The second chapter, by Bryan Grenfell, stands alone in that it describes the mathematical modelling of epidemics, with emphasis on the author's own study of measles virus. There follow chapters on pathogens such as bunyaviruses, influenza, hepatitis viruses and dengue virus amongst others. These chapters vary in their emphasis but in general focus on the molecular biological aspects, interspersed with some epidemiology. All of the contributions provide a broad review of their allocated subjects, with the exception of the chapter on prion diseases which sets out to mainly review work in the author's (Charles Weissmann) own laboratory. Personally speaking the most enjoyable chapter was that written by Liv Bode and Hanns Ludwig, dealing with Borna disease virus. This chapter provides an in-depth account of our knowledge of the biology of this fascinating virus that is implicated in the aetiology of neurological diseases such as schizophrenia. Both molecular and clinical aspects of Borna disease virus are comprehensively and eloquently covered. The volume finishes with a consideration of antiviral drugs by Graham Darby, highlighting the development of anti-HIV drugs and the problems of resistance.

I believe that this book will be of use to virologists at all stages in their careers, from the motivated undergraduate wishing to get those extra marks in final year exams, to those involved in virology teaching and research. Unlike many review volumes this one will not be out-of-date before it is published and I recommend that you add it to your library now!

■ ***Mark Harris University of Leeds***



An order form for the book is included in this issue of *Microbiology Today*.

AddressBook

Council 2000–2001

Officers

President
PROF. SIR DAVID HOPWOOD

John Innes Centre,
Norwich Research Park,
Colney, Norwich NR4 7UH
Tel. 01603 450000
01603 450338 (direct)
Fax 01603 450045
email david.hopwood@bbsrc.ac.uk

Treasurer
MR PETER F. STANBURY

Department of Biosciences,
Faculty of Natural Sciences,
University of Hertfordshire,
Hatfield Campus,
Hatfield AL10 9AB
Tel. 01707 284550
Fax 01707 285258
email p.f.stanbury@herts.ac.uk

General Secretary
PROF. ALAN VIVIAN

Centre for Research in Plant Science,
Faculty of Applied Sciences,
University of the West of England,
Coldharbour Lane,
Bristol BS16 1QY
Tel. 0117 344 2470
Fax 0117 344 2904
email alan.vivian@uwe.ac.uk

Scientific Meetings Officer
PROF. HOWARD JENKINSON

Department of Oral and Dental Science,
Division of Oral Medicine, Pathology and Microbiology,
University of Bristol Dental Hospital and School,
Lower Maudlin Street,
Bristol BS1 2LY
Tel. 0117 928 4358 (direct)
0117 928 4304 (office)
Fax 0117 928 4428
email howard.jenkinson@bristol.ac.uk

International Secretary
PROF. JEFF W. ALMOND

Senior Vice President of Research and Development,
Aventis Pasteur SA,
Campus Mérieux,
1541 Avenue Marcel Mérieux,
F-69280 Marcy-L'Etoile,
France
Tel. +33 4 3737 9453
Fax +33 4 3737 9157
email jeffrey.almond@aventis.com

Professional Affairs Officer
PROF. DONALD A. RITCHIE

School of Biological Sciences,
Donnan Laboratories,
University of Liverpool,
Liverpool L69 7ZD
Tel. 0151 794 3624
Fax 0151 794 3655
email d.a.ritchie@liverpool.ac.uk

Education Officer
DR LIZ (R.E.) SOCKETT

Genetics Division, School of Clinical Laboratory Sciences,
Queen's Medical Centre,
University of Nottingham,
Nottingham NG7 2UH
Tel. 0115 919 4496
Fax 0115 970 9906
email liz.sockett@nottingham.ac.uk

Editor, Microbiology Today
DR MERIEL G. JONES

School of Biological Sciences,
Donnan Laboratories,
University of Liverpool,
Liverpool L69 7ZD
Tel. 0151 794 3605
Fax 0151 794 3655
email meriel.jones@liv.ac.uk

Editor-in-Chief, Microbiology
PROF. CHRISTOPHER M. THOMAS

School of Biosciences,
University of Birmingham,
Edgbaston,
Birmingham B15 2TT
Tel. 0121 414 5903
Fax 0121 414 5925
email c.m.thomas@bham.ac.uk

Editor-in-Chief, JGV
PROF. STUART SIDDELL

Institute of Virology and Immunology,
University of Würzburg,
Versbacher Str. 7,
97078 Würzburg,
Germany
Tel. +49 931 201 3896
Fax +49 931 201 3970
email siddell@vim.uni-wuerzburg.de

Members

DR ULRICH DESSELBERGER

Regional Public Health Laboratory, Level 6,
Addenbrooke's Hospital,
Hills Road,
Cambridge CB2 2QW
Tel. 01223 216816
Fax 01223 242775
email ulrich.desselberger@addenbrookes.nhs.uk

PROF. RICHARD M. ELLIOTT

Institute of Virology,
University of Glasgow,
Church Street,
Glasgow G11 5JR
Tel. 0141 330 4024
Fax 0141 337 2236
email elliott@vir.gla.ac.uk

DR COLIN R. HARWOOD

Department of Microbiology & Immunology,
University of Newcastle,
Framlington Place,
Newcastle upon Tyne NE2 4HH
Tel. 0191 222 7708
Fax 0191 222 7736
email colin.harwood@ncl.ac.uk

PROF. COLIN R. HOWARD

Department of Pathology & Infectious Diseases,
The Royal Veterinary College,
Royal College Street,
Camden,
London NW1 0TU
Tel. 0207 468 5302
Fax 0207 383 4670
email choward@rvc.ac.uk

DR KEITH JONES

Department of Biological Sciences, IENS,
University of Lancaster,
Lancaster LA1 4YQ
Tel. 01524 593993
Fax 01524 843854
email k.jones@lancaster.ac.uk

PROF. DAVE J. KELLY

Department of Molecular Biology & Biotechnology,
Krebs Institute,
University of Sheffield,
Firth Court,
Western Bank,
Sheffield S10 2TN
Tel. 0114 222 4414
Fax 0114 272 8697
email d.kelly@sheffield.ac.uk

PROF. HILARY M. LAPPIN-SCOTT

School of Biological Sciences,
Exeter University,
Hatherly Laboratories,
Prince of Wales Road,
Exeter EX4 4PS
Fax 01392 263700
email h.m.lappin-scott@exeter.ac.uk

DR LYNNE E. MACASKIE

School of Biological Sciences,
University of Birmingham,
Edgbaston,
Birmingham B15 2TT
Tel. 0121 414 5889
Fax 0121 414 5925
email l.e.macaskie@bham.ac.uk

PROF. TONY A. NASH

Department of Veterinary Pathology,
University of Edinburgh,
Summerhall,
Edinburgh EH9 1QH
Tel. 0131 650 6164
Fax 0131 650 6511
email tony.nash@ed.ac.uk

PROF. IAN R. POXTON

Department of Medical Microbiology,
University of Edinburgh Medical School,
Teviot Place,
Edinburgh EH8 9AG
Tel. 0131 650 3128
Fax 0131 650 6531
email i.r.poxton@ed.ac.uk

PROF. IAN S. ROBERTS

School of Biological Sciences,
1.800 Stopford Building,
University of Manchester,
Oxford Road,
Manchester M13 9PT
Tel. 0161 275 5601
Fax 0161 275 5656
email isrobert@fs1.scg.man.ac.uk

PROF. GEORGE P.C. SALMOND

Department of Biochemistry,
University of Cambridge,
Tennis Court Road,
Cambridge CB2 1QW
Tel. 01223 333650
Fax 01223 333345
email gpcs@mole.bio.cam.ac.uk

Group Conveners

Cells & Cell Surfaces
DR DAVID (C.D.) O'CONNOR

Division of Biochemistry & Molecular Biology, School of Biological Sciences, University of Southampton, Bassett Crescent East,
Southampton SO16 7PX
Tel. 02380 594336; Fax 02380 594459
email doc1@soton.ac.uk

Clinical Microbiology
PROF. STEPHEN H. GILLESPIE

Department of Medical Microbiology, Royal Free & University College Medical School, Rowland Hill Street, London, NW3 2PF
Tel. 0207 794 0500; Fax 0207 794 0433
email stepheng@rfc.ucl.ac.uk

Clinical Virology
DR TIM WREGHITT

Clinical Microbiology and Public Health Laboratory,
Addenbrooke's Hospital, Cambridge CB2 2QW
Tel. 01223 257030; Fax 01223 242775
email tim.wreghitt@msexc.addenbrookes.anglox.nhs.uk

Education
DR PETER WYN-JONES

School of Sciences, Darwin Building, University of Sunderland,
Wharncliffe Street, Sunderland SR1 3SD
Tel. 0191 515 2520; Fax 0191 515 2531
email peter.wyn-jones@sunderland.ac.uk

Environmental Microbiology
PROF. HILARY M. LAPPIN-SCOTT

Department of Biological Sciences, Exeter University,
Hatherly Laboratories, Prince of Wales Road, Exeter EX4 4PS
Fax 01392 263700
email h.m.lappin-scott@exeter.ac.uk

Fermentation & Bioprocessing
DR GLYN HOBBS

School of Biomolecular Sciences, Liverpool John Moores University,
Byrom Street, Liverpool L3 3AF
Tel. 0151 231 2198; Fax 0151 207 4726
email g.hobbs@livjm.ac.uk

Food & Beverages
PROF. TOM HUMPHREY

Professor of Food Safety, University of Bristol, The Churchill Building, Langford, Bristol BS40 5DT
Tel. 01179 289 211; Fax 01179 289 505
email tom.humphrey@bristol.ac.uk

Irish Branch
DR MARTIN A. COLLINS

Department of Food Science, Agriculture and Food Science Centre,
The Queen's University of Belfast, Newforge Lane,
Belfast BT9 5PX
Tel. 028 90 255314; Fax 028 90 668376
email m.collins@qub.ac.uk

Microbial Infection
DR PETRA C.F. OYSTON

Microbiology, Medical Countermeasures, CBD, Porton Down,
Salisbury SP4 0JQ
Tel. 01980 613641; Fax 01980 613284
email poyston@hotmail.com

Physiology, Biochemistry & Molecular Genetics
DR DAVID A. HODGSON

Department of Biological Sciences, University of Warwick,
Coventry CV4 7AL
Tel. 024 7652 3559; Fax 024 76 52 3701
email dm@dna.bio.warwick.ac.uk

Systematics & Evolution
DR GERRY SADDLER

CABI Bioscience, UK Centre (Egham), Bakeham Lane,
Egham, Surrey TW20 9TY
Tel. 01491 829065; Fax 01491 829100
email g.saddler@cabi.org

Virus
PROF. GEOFFREY L. SMITH

Wright-Fleming Institute, Imperial College School of Medicine,
St. Mary's Campus, Norfolk Place, London W2 1PG
Tel. 0207 594 3971/2; Fax 0207 594 3973
email glsmith@ic.ac.uk

Diary

july 2001

SIGNALLING HOMOESTASIS (BIOCHEMICAL SOCIETY)

Trinity College, Dublin
11–13 July 2001

CONTACT: Meetings Office, Biochemical Society, 59 Portland Place, London W1N 3AJ (Tel. 020 7580 5530; Fax 020 7323 1136; email meetings@biochemistry.org; http://www.biochemistry.org/meetings/)

INTERNATIONAL COURSE ON THE IDENTIFICATION OF FUNGI OF AGRICULTURAL AND ENVIRONMENTAL SIGNIFICANCE

Egham, Surrey
16 July–24 August 2001

CONTACT: CAB International Training, Bakeham Lane, Egham, Surrey TW20 9TY (Tel. 01491 829080; Fax 01491 829100; email s.groundwater@cabi.org; http://www.cabi.org/training/main.htm)

AMERICAN SOCIETY FOR VIROLOGY 20TH ANNUAL SCIENTIFIC MEETING

Madison, Wisconsin, USA
21–25 July 2001

CONTACT: Sidney E. Grossberg, Secretary-Treasurer, American Society for Virology, Dept of Microbiology and Molecular Genetics, Medical College Wisconsin, 8701 Watertown Plank Road, Milwaukee, WI 53226-0509, USA (Tel. +1 414 456 8104; Fax +1 414 456 6566; email segrossb@mcw.edu; http://www.mcw.edu/asv)

3RD INTERNATIONAL GEMINIVIRUS SYMPOSIUM: A MEETING ON PLANT SINGLE-STRANDED DNA VIRUSES AND THEIR INSECT VECTORS

John Innes Centre, Norwich
24–28 July 2001

CONTACT: carol.aab@hri.ac.uk or gemini-2001.enquiries@bbsrc.ac.uk (http://iltab.danforthcenter.org/symposium.html)

august 2001

53RD HARDEN CONFERENCE: PROTEOGLYCANS: MESSAGES IN THE MATRIX (BIOCHEMICAL SOCIETY)

St Martin's College, Ambleside, Lake District
16–21 August 2001

CONTACT: Meetings Office, Biochemical Society, 59 Portland Place, London W1N 3AJ (Tel. 020 7580 5530; Fax 020 7323 1136; email meetings@biochemistry.org; http://www.biochemistry.org/meetings/)

BIO CHINA 2001

Beijing, China
22–25 August 2001

CONTACT: Dr Liang Hui, Guantong Building, No. 44 Hua Yuan Beilu, Haidian District, Beijing, China 100083 (Tel. +86 10 82081644/62046728; Fax +86 10 82079384; email bio2001@china.com or bjwrc@public.fhnet.cn.net; http://chinabio.org or http://china-expo.com)

ORPHAN VACCINES – BRIDGING THE GAPS

Palm Cove, North Queensland, Australia, 25–29 August 2001

CONTACT: Michele North, Far North Queensland Destination Management (Tel. +61 7 4099 4308; Fax +61 7 4099 4569; email michele@orphan-vaccines-conference.com; http://www.orphan-vaccines-conference.com)

september 2001

11TH INTERNATIONAL WORKSHOP ON *CAMPYLOBACTER, HELICOBACTER* AND RELATED ORGANISMS (CHRO2001)

Freiburg, Germany
2–5 September 2001

CONTACT: Prof Dr Manfred Kist, National Reference Centre for *Helicobacter pylori*, Institute of Medical Micribiology and Hygiene, Hermann-Herder-Str. 11, D-79104 Freiburg, Germany (Tel. +49 791 203 6590; Fax +49 791 203 6562; email kistman@ukl.uni- freiburg.de; http://www.chro2001.de)

SEVENTH EUROPEAN WORKSHOP ON VIRUS EVOLUTION AND MOLECULAR EPIDEMIOLOGY

Leuven, Belgium
5–12 September 2001

CONTACT: Dr Anne-Mieke Vandamme, Rega Institute and University Hospitals, AIDS Reference Laboratory, Minderbroedersstraat 10-12, B-3000 Leuven, Belgium (Tel. +32 16 332180; Fax +32 16 332131; email annemie.vandamme@uz.kuleuven.ac.be)

BIOLOGY OF TYPE IV SECRETION PROCESSES. EUROCONFERENCE ON THE MEDICAL AND ECOLOGICAL IMPLICATIONS

Castelvecchio Pascoli, Italy
7–12 September 2001

CONTACT: Dr J. Hendekovic, European Science Foundation, 1 quai Lezay-Marnésia, 67080 Strasbourg Cedex, France (Tel. +33 388 76 71 35; Fax +33 388 36 69 87; email euresco@esf.org; http://www.esf.org/euresco)

PSEUDOMONAS 2001

Brussels, Belgium
17–21 September 2001

CONTACT: Pierre Cornelis, Laboratory of Microbial Interactions, Vrije Universiteit Brussel, Paardenstraat 65, B-1640 Sint-Genesius-Rode, Belgium (Fax +32 2 3590399; email pcornel@vub.ac.be; http://homepages.vub.ac.be/ ~ pcornel/pseudomonas2001.htm)

VIROLOGY FOR THE NON-VIROLOGIST

Harrington Hall, London
21 September 2001

CONTACT: Management Forum Ltd, 48 Woodbridge Road, Guildford GU1 4RJ (Tel. 01483 570099; Fax 01483 536424; email info@management-forum.co.uk; http://www.management-forum.co.uk)

HALOPHILES 2001 – INTERNATIONAL CONFERENCE ON HALOPHILIC MICRO-ORGANISMS

Sevilla, Spain
23–27 September 2001

CONTACT: Dr Antonio Ventosa, Dept of Microbiology and Parasitology, Faculty of Pharmacy, University of Sevilla, 41012 Sevilla, Spain (Fax +34 954 628162; email ventosa@cica.es; http://www.farmacia.us.es/halophiles)

2ND INTERNATIONAL CONFERENCE ON INFECTION IN THE IMMUNOCOMPROMISED CHILD

Dublin, Ireland
27–28 September

CONTACT: Conference Secretariat, Index Communications Meeting Services, Crown House, 28 Winchester Road, Romsey, Hampshire SO51 8AA (Tel. 01794 511331/511332; Fax 01794 511455; email icms@dial.pipex.com)

9TH ASIAN CONFERENCE ON DIARRHOEAL DISEASES AND NUTRITION

New Delhi, India
28–30 September 2001

CONTACT: Prof. M.K. Bhan, Conference Secretary (email ascodd2001@delhi.as; http://www.ascodd2001.delhi.as)

october 2001

EUROPEAN MEETING ON VIRAL ZOONOSES

St Raphael, France
13–16 October 2001

CONTACT: info@euroviralzoon.com (http://www.euroviralzoon.com/)

may 2002

VIII PLANT VIRUS EPIDEMIOLOGY SYMPOSIUM: FIRST STEPS INTO THE NEW MILLENNIUM

Aschersleben, Germany
12–27 May 2002

CONTACT: t.kühne@bafz.de (http://virus-2002.bafz.de)

june 2002

RRI-INRA 2002: BEYOND ANTIMICROBIALS – THE FUTURE OF GUT MICROBIOLOGY

Aberdeen, 12–15 June 2002

CONTACT: Dr R.J. Wallace, Rowett Research Institute, Bucksburn, Aberdeen AB21 9SB (Fax +44 1224 716687; email rjw@rri.sari.ac.uk; http://www.rri.sari.ac.uk/RRI-INRA2002)

july 2002

AMERICAN SOCIETY FOR VIROLOGY 21ST ANNUAL SCIENTIFIC MEETING

Lexington, Kentucky, USA
21–25 July 2002

CONTACT: Sidney E. Grossberg, Secretary-Treasurer, American Society for Virology, Dept of Microbiology and Molecular Genetics, Medical College Wisconsin, 8701 Watertown Plank Road, Milwaukee, WI 53226-0509 USA (Tel. +1 414 456 8104; Fax +1 414 456 6566; email segrossb@mcw.edu; www.mcw.edu/asv)

september 2002

FIFTH INTERNATIONAL CONFERENCE OF THE HOSPITAL INFECTION SOCIETY

EICC, Edinburgh
15–18 September 2002

CONTACT: Concorde Services/HIS2002, Unit 4b, 50 Speirs Wharf, Port Dundas, Glasgow G4 9TB (Tel. 0141 331 0123; Fax 0141 331 0234; email his@concorde-uk.com; http://www.his2002.co.uk)

Comment

Microbiology education in 2001

Microbiology education in our schools, colleges and universities is in a state of rapid flux. We have moved on from regarding micro-organisms just as pathogens (plant or animal) and come to regard them as co-inhabitants of our environment with uses and benefits as well as threats. We have recognized through biotechnology that many micro-organisms and their products are commercially useful and can replace chemicals in some industrial processes to provide biological and pharmaceutical products more efficiently and cheaply. We have now entered the era of genetically modified micro-organisms which can be applied to a wider range of processes. The potential for the exploitation of fungi and bacteria for mankind's benefit has never been greater.

So how do we impart this excitement to students and the young people who will follow us?

School syllabuses recognize the part micro-organisms play in our lives, and teachers are increasingly aware of the interaction between microbiology and subjects such as immunology and molecular biology. This trend is to be encouraged and interdisciplinary co-operation promotes microbiology and shows biology can be studied in a modern integrated way. Part-time and continuing professional development also make a significant contribution to education later in careers.

In universities we have a problem in retaining and communicating our enthusiasm in the face of increasing numbers of students moving away from biological science, and indeed from science generally. The attractions of degrees in media, business, sports studies and computing are powerful and the perception by students that some courses may offer a better prospect of good employment and be less intellectually demanding is enough to swing the pendulum away from science, no matter that we may be turning out a generation of leisure centre managers.

Many departments of microbiology have lost their identities, being swallowed up in schools or divisions of (for example) biological sciences and the special nature of the subject has been eroded. To keep numbers up and achieve a more 'efficient' (what does that mean?) staff/student ratio, students are taught in larger numbers with those on other courses and this has exacerbated the loss of identity which they feel. Coupled with reductions in unit funding, this trend has set us new challenges in the last 10 years. Microbiology is above all a practical subject and the reduction in laboratory time does not help students in their eventual search for employment. Employers and sandwich year laboratories bemoan the reduction in students' ability to perform elementary tasks such as calculation of dilution factors or setting up a microscope, even though they may be thoroughly conversant with complex molecular biological concepts or immunological theory.

To reverse the swing away from our subject we must get the message across that the successes of the new 'sexy' subjects of molecular genetics, genomics and biotechnology are largely dependent on knowledge of the whole biology of micro-organisms. Multimedia and other innovations have contributed new ways of learning microbiology. Today's textbooks all have colour illustrations and many include CD-ROM packages. The internet provides a wealth of information and also teaches students discrimination in what they read, since not all web-based information is wholly accurate. Professional microbiologists outside academia are often willing to collaborate in training schemes and this can result in future employment prospects for the right candidates.

The very real research/teaching divide within the profession needs to be recognized and removed. Too many researchers still regard teaching as something which should be done by others. No one would argue that well-funded researchers should be forced to undertake 300 hours student contact a year, but there is a strong case for students learning directly from them if we are to produce graduates with up-to-date skills and approaches to science. Similarly teachers should seek to be involved in research and promotion of others' work. The excellent ideas we see in some of the Education Development Fund applications are testament to the ingenuity and originality of teachers which should be encouraged. We should see ourselves as microbiologists, not divided into researchers and teachers; most of us came into the trade because we liked the idea of working with micro-organisms – we should now view those who learn from us as our apprentices and we must help them develop the same interest and fascination that we had.

None of this will help however unless the HE science sector as a whole is recognized for what it tries to do, which is to stimulate students to question, to investigate, to innovate and thus contribute to knowledge and prosperity. As teachers we have to be at the beginning of that process. We may have no difficulty in communicating enthusiasm, but we need adequate support from good university management working in concert with its staff, and proper resourcing by Government. We will then see a recovery in morale in HE and as microbiologists we will be able to provide for our students the experience to which they are entitled. Modern microbiology is a wide-ranging, vibrant and exciting subject which offers splendid careers; our task is to get that message over to students and the public, to ensure that it continues to lead and underpin so many other areas of science.

Peter Wyn-Jones, Convener of the SGM Education Group

I am grateful to members of the Education Group Committee for helpful comments.

● Please note that views expressed in *Comment* do not necessarily reflect official policy of the SGM Council.