Quarterly

SGM

VOLUME 25 PART 1

FEBRUARY 1998

- Meningitis
- Tobacco Mosaic Virus – 100!
- Microbiology in your attic
- Deep-sea biotechnology
- Beyond the naked eye
- Community science

PUBLISHED BY THE SOCIETY FOR GENERAL MICROBIOLOGY

Quarterly

Volume 25
Part 1 • February 1998

CONTENTS

Articles

Regular Features

Other Items

Front cover: This image of a rotting strawberry was used in a recent 'Natural World' documentary on BBC2. See article on p. 16. Photo courtesy of BBC Natural History Picture Publicity.

REMEMBER! Always quote your Membership number in any correspondence.

SGM Headquarters: Marlborough House, Basingstoke Road, Spencers Wood, Reading RG7 1AE (Tel. 0118 988 1800; Fax 0118 988 5656; Email quarterly@socgenmicrobiol.org.uk).

SGM Web site: http://www.socgenmicrobiol.org.uk

Editor: Dr Dave McL. Roberts

Managing Editor: Janet Hurst

Production Editor: Ian Atherton

Production Assistant and Book Review Manager: Janice Meekings

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

ISSN: 0142-7547

COPY DATES

Last dates for receipt of copy at Marlborough House are:

Issue	General Copy	Advertisements (camera-ready copy)
May	6 March	14 April
August	15 May	15 June

Advertisements *– all enquiries should be sent to Ina Cocks, NWH Sales Ltd, Cedar House, Cedar Lane, Frimley, Surrey GU16 5HY (Tel. 01276 685111; Fax 01276 685011).*

Special Mailings *– all enquiries should be sent to Janice Meekings, SGM Headquarters (Tel. 0118 988 1802; Fax 0118 988 5656; Email j.meekings@socgenmicrobiol.org.uk).*

COMMENT

Post-Dearing, Post-Graduate Education

A member of the Dearing Committee prefaced a recent talk on his work with a quote from Blaise Pascal (*Lettres Provinciales 1657*): "I have made this letter longer than usual only because I have not had the time to make it shorter". He was, of course, making a sideswipe at the Dearing Report itself: many words, and about as prolix as a Thomas Hardy novel, but nevertheless short on guidance on some key issues. For example, many microbiologists were disappointed by the absence of a clear strategy to maintain the standard of PhD degrees in the post-Dearing era.

Several members of SGM Council met to discuss this and other issues during the consultative phase of the Committee's activities. We were concerned that measures were needed to ensure that future PhDs in microbiology from British universities were (a) of a standard comparable with those awarded in the past, and (b) were recognized as equal to PhDs awarded by other Western countries. We were motivated to express a view on this issue because of a strong general impression that BSc students of today are less well prepared for progression directly to a PhD programme than they were 10 or 20 years ago and that the quality of the finished product may be falling.

Reflect on the following: the present student may well have done balanced science at GCSE (rather than separate O-levels in biology, chemistry and physics), modular A-levels (which are a piecemeal version of the real thing) and a BSc course from which much of the practical content has been pared away (do any of our degree courses have as much practical work as they did 20 years ago?). He/she then enters a PhD programme in which there is a much greater emphasis on skills other than those learned at the bench (communication, self-management and planning, computing, etc.). He/she may be required to attend structured courses on anything from philosophy of science through statistics and data handling to bio-safety risk assessment and be required to take more time out than ever before to write interim reports (many universities require at least two – at 6, 12 or 18 months). Laudable developments perhaps! The problem, however, is that the PhD is now tightly shoe-horned into a 3 year time-slot. Funding ceases comprehensively after month 36 (no chance these days for a little DSS subsidization of the science budget) and students who have not written up in the 12 months that follow are deemed by research councils to have 'failed', with consequent penalties for the parent institution. Nevertheless, we expect and require that the students achieve a standard comparable to that of their peers in continental Europe or the USA where the programme may be twice as long.

Recognizing how tight this has all become, some of us had hoped that Dearing would make a strong recommendation for an extra year to be inserted at some stage. There are various possibilities, some of which are already being experimented with. One that has received much publicity recently is the MRes degree which some universities started 2 or 3 years ago and proposed as a means of giving students the opportunity to see whether they were suited to research and to provide institutions with a fairer and more reliable means of assessing their prospects. It was also intended to be a year in which students would gain good experience, including personal transferable skills as well as technical and research skills. However, it is still far from clear whether an MRes qualification will become a requirement for those wishing to enter a PhD programme. At present, most PhD students enter directly from a BSc and therefore miss out on what is, no doubt, a valuable extra training year. Nevertheless the expectation is that they will reach the same standards as those who have been fortunate enough to do an MRes. Dearing fails to comment on whether MRes should become the norm, merely noting that "evidence is emerging from the pilot MRes programmes that there is a demand for it from students and employers and that it fulfils a number of useful functions". The report endorses the continuation of the MRes with the condition that "its utility should continue to be reviewed with changes introduced as necessary". This ducks the issue of whether all of us should be building an MRes year into our PhD programmes. An alternative would be to lengthen the programme to 4 years for students without an MRes (indeed, the Wellcome Trust is already experimenting with this option). Either way, the extra year is desirable and we must certainly avoid a situation in which there are two standards of PhD graduates. Unfortunately, lengthening the time required to obtain a PhD may make it less attractive, particularly to the highest flying of our undergraduates. On offer could be 4 further years of financial hardship, no real improvement to employment opportunities, a poor career potential, and a long term disadvantage over pension contributions, etc. Moreover, in the future, students will be completing their BSc courses with substantial debts – incurred not only from living expenses but also from fees. The temptation to jump out of education into the first well paid job will be huge.

Taking advice from bodies such as the UK National Committee for Microbiology and UK Life Sciences Committee, the universities and the research councils need to consider the future of PhD degrees and how they are to be financed. They need to recognize that a large portion of UK science's output comes from PhD students and therefore it is vital that the courses continue to attract our very best graduates. They should also acknowledge that a PhD is not only a defined period of training in a given laboratory – it is the end-product of having carried out a series of well thought out investigations which have either supported or disproved a soundly based hypothesis. Above all, the PhD course must include sufficient time for the students to think!

Jeff Almond, Professor of Microbiology at the University of Reading

In this issue ...

Many scientific anniversaries take place in 1998; we focus on two centenaries: the discovery of the Golgi apparatus (pp. 14–16) and the pioneering work on Tobacco Mosaic Virus which is considered by many microbiologists to mark the origin of the science of virology (p. 9). Beijerinck, the discoverer of TMV, also features in a search through the attics of the University of Delft which has produced many fascinating artifacts of past microbiologists (pp. 8–9).

On a more topical note, the deaths of young people from meningitis are causing public concern. Jon Saunders and Tony Hart provide the facts on this terrible disease and discuss what hopes there are for prevention and cure in the future (pp. 6–7).

Is there nowhere on earth that microbiologists are not to be found at work? Jean-Paul Raffin discusses the potential uses of thermophilic microbes isolated from the depths of the oceans (pp. 10–12), whilst on pp. 12–13 Andrea Thomas tells how PCR can help sufferers of leprosy and TB in Nepal.

Other topics featured include a range of initiatives to promote science to policy-makers and the public (pp. 2, 5, 16–17, 18–19 & 24), careers in microbiology (pp. 23–24) and a novel teaching aid for training students in practical microbiology (pp. 20–21).

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

Please note that views expressed in this Comment do not necessarily reflect official policy of the SGM Council.

PLANNING SOCIETY STRATEGY

Charles Penn

Twelve months ago Council approved the establishment of a working party with the remit to consider all aspects of current and future activities of the Society and recommend priorities for future development. Members of the group are Howard Dalton, Ron Fraser, John Fry, Anne Glover, Allan Hamilton, Janet Hurst and Charles Penn. The working party, which sought suggestions both from Council and from the membership by means of a notice in the May 1997 *Quarterly*, will make its final recommendations at the Council meeting in February 1998.

There are several reasons for undertaking such a review. First, the Society is a complex organization, with more than 20 (constantly changing) members of Council who are not only separated geographically from each other, but also from the 30 permanent staff based in Reading. There is further interaction between Council and the Group Conveners and their committees, whose input ensures that the Society can offer a wide-ranging programme of international scientific meetings. This complexity tends to dictate that much of our energy and creative effort is expended in simply maintaining routine activity and reacting to external demands on us, without necessarily pausing to consider whether there are new opportunities or needs to move in specific new directions. While the Society has in fact always maintained a lively and forward looking programme of development of its activities, this is perhaps best guaranteed for the future by a more structured effort to review our plans formally from time to time.

Second, the Society operates in fast-changing spheres of human activity, such as publishing, where electronic media and communication may largely supersede the movement (though perhaps not the use) of paper within the next decade. The majority of our members are in universities, which as foci of learning and creativity, are being forced to change more rapidly (and teach more students) than ever before, to the ongoing jeopardy of their research and scholarship. Learned societies must therefore develop in parallel, perhaps taking on new roles and functions, and responding to outside pressures to maintain their activities in the interests of both their members and the disciplines they represent.

Third, this Society, through prudent management of its income and investments during recent decades, has developed a strong financial base on which to build its activities. It enjoys, as a registered charity, tax exemption and other privileges which oblige us to ensure that our resources are used as effectively as possible towards our charitable ends: *to advance the art and science of microbiology*. Currently it meets these objectives through the major activities of publishing learned journals and holding international scientific meetings, and also by promoting microbiology in its broadest sense through its grants schemes, support of educational projects and so on.

For these reasons and others, the working group was set up and has met several times for a free-ranging discussion of ongoing activities and possibilities for the future. The topics covered include publicity and professional affairs, education and public understanding of microbiology, publications, meetings, membership services and recruitment, international affairs and relations with other professional bodies. In the next issue, after Council has considered them, I will outline some of the conclusions and their implications for the Society.

Charles Penn, General Secretary

REQUEST FOR INFORMATION

The International Committee on Systematic Bacteriology Subcommittee on the Taxonomy of the Genus *Bacillus* and Related Organisms is compiling a list of workers with interests in this group of organisms (not just in their taxonomy), including *Amphibacillus*, *Aneurinibacillus*, *Bacillus*, *Brevibacillus*, *Halobacillus*, *Paenibacillus* and *Sporosarcina*, and I would be glad to hear from any reader with such an interest. It is our intention to make the list available to all by the internet.

Dr Niall A. Logan (Secretary of the Subcommittee), Department of Biological Sciences, Glasgow Caledonian University, Cowcaddens Road Glasgow G4 0BA, UK (Tel +44 (0) 141 331 3207; Fax 3208/3242; Email N.A.Logan@gcal.ac.uk).

APOLOGY

In the report of the Promega Prize meeting on p. 135 of the November 1997 issue of the *Quarterly* Emma Cannell's name was mistakenly given as Elaine. The production staff apologize for this error.

Letters to the Editor

Dear Editor

I read with interest and some degree of scepticism recent articles in the *Quarterly* concerning the changes being made to JGV. It has to be accepted that there have been welcome improvements, mainly in presentation and marketing, to JGV recently. However, I feel that the negative side of the JGV operation should also be stated.

The fact is that JGV is run by a self-perpetuating clique of about a dozen individuals. Although there have been some recent cosmetic changes in the Editors of JGV, these remain mainly British or ex-patriot British, and the journal has made little progress in meeting the aspiration to become a European journal. The so-called new European perspective is largely a sham.

I feel that there is a real need for a high quality European virology journal, but until the present situation is changed, the best European papers will continue to be sent to American journals as a first choice.

May I suggest the following changes, which would go some way to making JGV a true European, rather than British, journal?

1. The biggest change that has to occur is a change of attitude. Although it is clear that the ownership of JGV will remain with the SGM, and responsibility for sales, marketing and the employment of staff will remain with them, they should relinquish absolute control over editorial and scientific policy and the appointment of Editors and the Editorial Board.
2. Suggestions for the appointment of Editors and the Editorial Board should be sought from members by a letter enclosed with other literature (e.g. the *Quarterly* or election papers).
3. Suggestions for the above should also be sought from as many other European societies as possible; not only for people within their own jurisdiction but also from among a wider international field. I assume that SGM Headquarters has a list of such societies; if not, it could probably be obtained from FEMS.
4. The final appointment of both Editors and the Editorial Board should be made by a committee which contains members from other European societies, in consultation with the Chief Editor, and based on the suggestions made.

Clearly care would have to be taken to choose individuals with expertise in the different fields covered by the journal, which would continue to be the responsibility of the Chief Editor. The SGM would be represented but would be in a minority. Much of the business of this committee could be carried out by e-mail and it would not necessarily have to physically meet.

Professor Gregory J. Atkins, Virus Group, Department of Microbiology, Moyne Institute of Preventive Medicine, Trinity College, Dublin 2, Ireland (Tel. +353 1 6081415; Fax +353 1 6799294; Email gatkins@tcd.ie).

In reply...

For 30 years, the *Journal of General Virology* has provided virologists throughout the world with the opportunity to publish the results of their scientific research in a high-quality, peer-reviewed journal. This has been made possible by a large number of scientists, who give their time and expertise, essentially free of charge, and a dedicated Editorial Office staff. On their behalf, we feel it is necessary to address the criticisms made by Prof. Atkins.

He suggests that the Journal is "run by a self-perpetuating clique". The appointment of Editors and Editorial Board members is the responsibility of the SGM Council which is comprised of representatives elected by the membership of the Society, and the Officers of the Society elected by Council. SGM is a registered charity: as the trustees of the charity, Council members have a legal duty to safeguard the assets of the Society (including JGV) and ensure that they are deployed to advance the science of microbiology.

Editors and Editorial Board members are chosen by Council on the recommendation of the Editor-in-Chief (after twice-yearly consultation with all current serving Editors and Editorial Board members). Nominations from other virologists are also received and given careful consideration. Editors are chosen on the basis of their scientific standing, specialist expertise and willingness to do the job. We believe that this system is appropriate and results in Editors and Editorial Board members of outstanding quality.

Editors serve a five-year term but this may be extended up to a maximum of eight years. Only two of the Editors serving in 1994 remain as Editors today.

Prof. Atkins suggests that "the European perspective is largely a sham". As of January 1998, 8 of the 14 JGV Editors are based in continental Europe and the majority are neither British nor ex-patriot British. The picture with the Editorial Board is similar. There has been a very positive move to increase the representation and influence of European scientists on the Journal and it is our aim to make JGV the first choice for publication of quality papers in virology from Europe.

We believe that JGV is Europe's leading virology journal and that, in terms of scientific quality, publication time, presentation and marketing, it compares favourably with American journals. JGV is published without page charges; colour plates and the first 50 reprints are free. The contents page of each issue, abstracts of articles and, indeed, entire review articles can be freely viewed and downloaded from the JGV Web site. Electronic access to full text articles will become available by a variety of routes during 1998. We are confident that JGV provides the scientific community with an excellent journal and we will do our best to improve it further. We encourage all virologists to support us in our efforts.

Dr Graham Darby
Professor Stuart Siddell
JGV Editors-in Chief

A Vacation Student Writes ...

Dear SGM

I would like to thank you for the Vacation Studentship. I have done well academically at university and so I assumed that I would continue on to a career in research. Luckily over the summer I had a taste of daily bench science, followed by an industrial placement, and I found that my talents lie with people and science, not Gilsons and microfuge tubes! My career path now will lead me into industrial and food microbiology management, possibly auditing and accreditation, or as an environmental health officer, but always keeping an eye on current research. I am sure that the Vacation Studentships spur many on into a research career. I have learnt a great deal from the opportunity that you gave me, and this will be particularly useful when I carry out my third year project.

Samantha Howorth
University of Central Lancashire

Samantha carried out her research project under the supervision of Dr Reg England at the University of Central Lancashire. She studied 'Nucleotide production following the stringent response in E. coli'. Further Vacation Studentships are available in 1998 – see November 1997 Quarterly p. 130 for details.

Save British Science Society – Annual General Meeting

Ron Fraser

The Save British Science Annual General Meeting was held on 26 November 1997 at the London School of Economics. Before the formal business of the meeting over a hundred members of SBS heard an address by the guest speaker, The Right Honourable Margaret Beckett MP, President of the Board of Trade. As such, she is the Minister representing science, engineering and technology, at Cabinet level.

She started by saying that she was a scientist herself, having trained as a metallurgist, and that she now put science first amongst her personal responsibilities in the Department of Trade and Industry. She saw the future of UK earnings from trade as being based on goods and services of quality, derived from the benefits of the science base. The interaction between science and industry in the UK was seen as being good by international standards but could still be built on, especially by industry becoming more receptive and involved.

Turning to a number of concerns that SBS had expressed during the previous administration, Mrs Beckett said that there would be no further move down the path of short-termism in government funding. She wanted to look over a longer time-scale than a single parliament. While she recognized the problem of the run-down infrastructure in universities, the Chancellor's overall spending limits for the first two years of the new parliament had to be recognized. However, the consequent absence of a public expenditure survey (PES) round this year freed up manpower resources within government and gave an opportunity to look at the priorities for expenditure in a more radical way than previously. (An optimist might take this as a sign of more favourable funding of science, although elsewhere the Minister identified a continued need for selectivity and hard choices).

Mrs Beckett reaffirmed the commitment given by her Minister of State with responsibility for science, John Battle MP, to bring science into the heart of government and the development of policy. In particular Professor Sir Robert May, Chief Scientific Adviser, had issued guidelines to departments on how to use science more effectively. These included greater involvement of the science community in decision making, and making data available for discussion at an earlier stage. There was also a need to take greater account of public concern on safety matters and ethical issues, and to foster an understanding of how evidence was evaluated.

Mrs Beckett finished by highlighting two issues of personal concern to her.

- The very distorted male/female ratios amongst those working in science, especially in the physical sciences and engineering.

She drew strong support for her argument by referring to the sex ratio of the SBS audience! Heads of research councils and their Director General would be carrying out more monitoring of male and female success rates in the award of grants and fellowships and would be tackling the problem of low application rates from women scientists. The recent publication *Cracking It* sponsored by her Department and other bodies in science and engineering addressed the wider issues.

- The problems of career management and development for contract research staff were also recognized.

These problems tainted the image of science and hampered the transfer of knowledge to industry. Practical solutions were required.

The Minister did not take questions.

The AGM itself heard that 1997 had been a busy year for SBS with the change of government and the Dearing Report particular areas of activity. SBS had met with John Battle in June and had set up a briefing meeting for journalists and opinion-formers to publicize the funding and infrastructure crisis. It was felt that the Dearing Report had contained clear recognition of the under-funding of the science base and endorsement of the dual support system.

On SBS funding there had been a good response from learned societies, industry and universities in making commitments for the next three years. This would underpin the current moves to appoint a new director in place of Dr John Mulvey who was standing down after 10 years of sterling service.

Ron Fraser, SGM – Executive Secretary

Meningitis and Meningococcal Disease

Jon Saunders and Tony Hart

Fatal cases of meningitis have been reported in the media. What are the facts behind the headlines?

The months from November to March mark what may be regarded as the meningitis season in the UK. This winter there have been numerous high profile press reports of outbreaks of meningitis in British University student residences. Whilst meningitis is actually much more common in young infants, these events have drawn attention to much feared disease symptoms which arise from infection and inflammation of the meninges and brain. They have perhaps obscured the fact that the rapid fatality possible in such cases is a function of massive bloodstream infection, rather than meningitis *per se*. Meningitis may be caused by various viruses, bacteria and other micro-organisms crossing the blood–brain barrier. In general, viral meningitis is less likely to be life-threatening but is untreatable by chemotherapy. Of bacterial causes, *Neisseria meningitidis* (the meningococcus) and, less commonly, *Streptococcus pneumoniae* are the most important. *Haemophilus influenzae* type b, which was until relatively recently a significant cause of infantile meningitis, has now been largely banished by the introduction of the Hib vaccine to childhood vaccination regimens. The meningococcus is the most likely culprit during outbreaks of meningitis in the UK. Although uncomplicated meningococcal meningitis is rarely responsible for death, the bloodstream form of meningococcal infection, which may or may not accompany the classic features of meningitis, may result in fulminant septicaemia which is often fatal within hours of presentation. It is this characteristic of *N. meningitidis* infection that causes most alarm amongst the public rather than meningitis itself.

N. meningitidis should perhaps be regarded more as a human commensal than a full-blown pathogen. Approximately 10–15% of the healthy adult population carry the organism asymptomatically at any one time in their nasopharynx. Carriage rates have been estimated to rise to as much as 25% amongst young adults of university age. In contrast, attack rates for meningococcal disease vary from 0.8 to 4.4 per 100,000 population in the UK. Disease caused by *N. meningitidis* is most prevalent amongst infants and especially in the first year of life. A lower attack rate is experienced amongst 18–22 year-olds, but this is still higher than in younger teenagers or older adults. It is most likely that cases of meningococcal disease result from an infection via a healthy carrier. However, in most clinical cases, carriers in the same family do not present with disease and may carry serologically unrelated meningococci. Nevertheless, close family contacts of a case of meningococcal disease are at an approximately 1000-fold greater risk than the general population.

Meningococci isolated from cases are almost invariably capsulate and the capsular polysaccharide is used as a means to type the organism into 12 serogroups of which groups A, B and C are the main causes of disease. Group A meningococci are rarely encountered in Europe, but are responsible for epidemics and endemic infection in the sub-Saharan meningitis belt. Most cases in Europe and the USA are sporadic and involve group B and C meningococci. Group C strains seem to be increasingly isolated from outbreaks involving students and others living in crowded conditions. Carriers are frequently colonized by acapsulate strains, suggesting the importance of the capsule in allowing the organism to cause invasive disease.

Effective polysaccharide vaccines are available for A and C serogroups, but group B presents a problem because its capsule is composed of a homopolymer of sialic acid, a polysaccharide that is chemically very similar to polysaccharides found on the surface of human cells. Consequently, the bacterium is effectively camouflaged from the human immune system. Even if available, the induction of antibodies to a normal human cell surface component would be intrinsically undesirable. Although vaccines based on other meningococcal surface components are under development, there is currently no effective means of vaccine-based control of disease caused by group B meningococci. Young infants have a poor ability to produce antibody responses to polysaccharide antigens, which may explain the increased infection rate in infants by capsulate bacteria after protection by maternal antibody has disappeared. Some of the problems of poor antigenicity have been overcome by the development of conjugate vaccines where group C or A meningococcal polysaccharide is conjugated to an immunogenic polypeptide such as diphtheria- or tetanus-toxoid. The triggers for overt disease in older children and adults are more problematical. Predisposing factors that have been implicated in meningococcal disease include prior respiratory virus infection and immuno-compromise. Smoking, overcrowding and climatic conditions may also influence susceptibility to disease. It may also be that prior colonization by non-pathogenic commensal species such as *Neisseria lactamica* confers immunity to meningococcal colonization and disease. One particular factor in disease in young adults may be associated with change in environment and social interactions consequent on leaving home and joining new communities where they may become exposed to strains of *N. meningitidis* to which they have no immunity.

In addition to the capsule, which prevents desiccation of the organism when outside the body and may protect against the bactericidal effects of serum, *N. meningitidis*, like its close relative *Neisseria gonorrhoeae* (the gonococcus), exhibits an array of variable surface components, including pili, outer-membrane proteins and lipopolysaccharide. Quantitative and qualitative variations in surface chemistry modulates pathogenesis, and variable components may be present or absent, vary in quantity and/or antigenic and functional properties amongst different cells in the infecting meningococcal population. Most isolates of *N. meningitidis* produce pili, filamentous protein hairs that are the only component to extend beyond the polysaccharide capsule. Pili are responsible for permitting the meningococcus to adhere to epithelial surfaces and colonize host mucous membranes. On the other hand, pili may be disadvantageous at the point of invasion and so perhaps logically are subject to a pronounced phase variation in which expression is switched on and off. The variable nature of pili also seems to permit the organisms to exhibit differing affinities for epithelial and endothelial cells, a useful attribute during infection as different tissues are encountered by the pathogen. Likewise, variable expression of outer-membrane opacity (Opa) proteins, which also act as adhesins, alters interactions of the bacteria with the surface of human membranes and phagocytes. Uniquely, meningococci produce an additional outer-membrane protein, Opc, which is required for invasion and whose expression is also subject to an on/off switch and quantitative changes in degree of expression.

A notable characteristic of *N. meningitidis* is that it releases large quantities of outer-membranous material into the surrounding medium (Fig. 1). The resulting blebs contain large amounts of endotoxin (lipopolysaccharide/lipo-oligosaccharide) which promotes the production in the human host of pro-inflammatory cytokines, including Tumour Necrosis Factor (TNF), resulting in damage to endothelial surfaces and tissues. Indeed, the general response to meningococcal septicaemia is no different to that of other Gram-negative septic shock reactions. The difference and particular threat in meningococcal disease lies in the rapidity with which fulminant septicaemia can progress in patients. Even

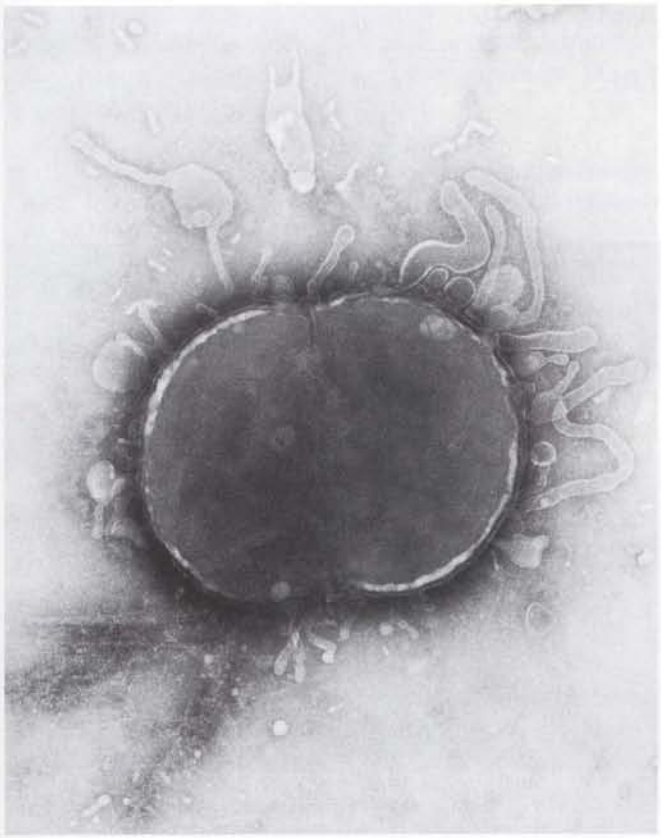


Fig. 1. *N. meningitidis* showing characteristic blebbing of outer-membrane vesicles (×45,000).

if the infecting organisms are killed by antibiotic therapy, previously released lipopolysaccharide may continue to produce profound inflammatory responses. These may cause the symptoms associated with meningitis and, most importantly, septic shock following septicaemic infection. The damage induced during septicaemia causes blood cells to leak from capilliaries, producing the characteristic rash found sometimes only sparsely, if at all, in uncomplicated meningitis, but often on a large scale in septicaemic conditions. The presence of a petechial rash, which retains its red appearance even when subjected to pressure, is characteristic of the disease. The rash can evolve rapidly over a matter of hours from small pin-point spots (petechiae) to larger bruises (purpura) to involve whole limbs (ecchymoses). At this stage, the patient is profoundly shocked and has a 25–30 % risk of dying.

Despite the sporadic nature of meningococcal disease, it continues to tax medical authorities. Control could be improved by introduction of group C meningococcal vaccination to immunization regimens. Public health education, particularly encouraging recognition by parents of infants and by young adults of the signs of septicaemia, such as the presence of the petechial rash, are also of prime importance. Early administration of penicillin by general practitioners has decreased mortality, and in hospital it is important that patients are admitted to intensive care. New therapies, for example with recombinant bactericidal-permeability-inducing protein, could reduce mortality further in the future. However, a vaccine to protect against group B meningococcal disease (which accounts for 60–70 % of cases) would make the greatest contribution to lessening the toll of this dreadful disease.

Jon Saunders and Tony Hart are Professors of Microbiology and Medical Microbiology, respectively, in the University of Liverpool.

When Did You Last Check Your Institute Attics? Microbiology History Could Be Up There!

Lesley Robertson

The University of Delft has housed many pioneering microbiologists. What have they left behind besides their distinguished reputations?

It is impossible for a microbiologist to work in Delft and not be aware of the history of the science. However, there is much more to the picture than assorted monuments to Antonie van Leeuwenhoek. Not long after I came to Delft, more than 20 years ago, I was shown the 'Museum' of the Laboratory of Microbiology. Just after the unexpected death of Prof. Kluyver, the Microbiology Department moved to our current building and the contents of the Professor's office were simply transferred into a small room in the attic. There they have remained until this day, disturbed only by visitors to the lab (many of whom like to be photographed sitting in 'The Chair') and occasional historians looking for background material on scientists known to have had associations with Kluyver or Beijerinck. Among the star items in the Museum are a full set of the laboratory journals of Prof. Beijerinck, the buttons alleged to be from his lab coat (although I've never seen a picture of him wearing one), and the posters painted by his sister to illustrate his lectures on everything from micro-organisms to plant galls, seaweed and bioluminescent fish. Henrietta Wilhelmina Beijerinck was, and is, one of the unsung heroes of Delft Microbiology. A very talented artist, she seems to have spent much of her life producing meticulously-detailed paintings (a little bit larger than A0 format) for her famous brother, but receiving little or no recognition for her work.

Above: Part of the museum at the Kluyver Institute, showing the desk and chair used by both Professors Kluyver and Beijerinck. *Opposite page, top*: Painting to illustrate microbial ecology by A.W Wijkniet. It originally hung in Beijerinck's laboratory but is now in the entrance hall of the current microbiology laboratory. Loosely translated it says "Happy are they who begin now".

The Museum has been a source of endless fascination for me over the years – Prof. Kluyver doesn't seem to have thrown anything away (we even have his Congress badges and hotel bills) – every time I go up there, I find something else unexpected: woodblocks to illustrate publications, First World War newspaper clippings, Second World War papers from the University administration keeping contact with students doing forced labour in Berlin and other places, Kluyver's lecture notes, all sorts of things. In a recent clear out of another part of the attics, we found more (commercially produced) giant teaching posters up in the rafters and a small mountain of superb early glass electron micrographs formatted to fit our magic lantern. Other items have arrived from less obvious sources. For example, an unknown colleague kindly left a box full of Beijerinck's plant gall samples in my office, each in its own pill box (and some with neat holes where the occupants had eaten their way out).

Paintings by Beijerinck's sister, Henrietta. Top left, an unknown yeast, described as 'azijnaethergist' (*Brettnomyces*?); Top right, *Bacillus cyanofascieus*; Bottom: *Stichiococcus bacillarius*.

We recently took the decision to merge the Beijerinck/Kluyver collection with that of Gerrit van Iterson, Professor of Microscopical Anatomy and then Technical Botany (pupil of Beijerinck and PhD supervisor of Kluyver). I had been under the impression that this would involve "a couple of boxes of papers", but inspection of the attics over our Biochemical Engineering Department showed that Prof. van Iterson had been no more enthusiastic about throwing things out than Prof. Kluyver. His papers will take some time to sort as they're mostly collected in tin boxes, rather than filed. There is also another complete set of (entirely botanical) paintings by another artist, Hilda Kern. As the clear out of the attics began to approach completion, Henk Dullaart, our electrician, discovered a big box of handwritten books pushed into a corner right under the roof tiles. They proved to be van Iterson's notebooks from his days as an undergraduate in the 1890s right through to his Professorship – a complete snapshot of the education of a biosciences student at the turn of the century.

As I write, we are waiting to hear the outcome of a grant application for money to allow us to catalogue the collection, and to improve its presentation and storage. In co-operation with the Techniek Museum of Delft, we are competing against collections from other disciplines, and it has been a slightly surreal experience to have had to prove that Beijerinck, van Iterson and Kluyver were 'important' enough for their papers to be worth preserving.

Many colleagues, worldwide, have kindly sent letters of support and these letters are proving very useful in proving the worth of the collections. By the time that this article appears, we should know whether or not we have been successful, but if anyone is interested enough to help, more letters establishing the importance

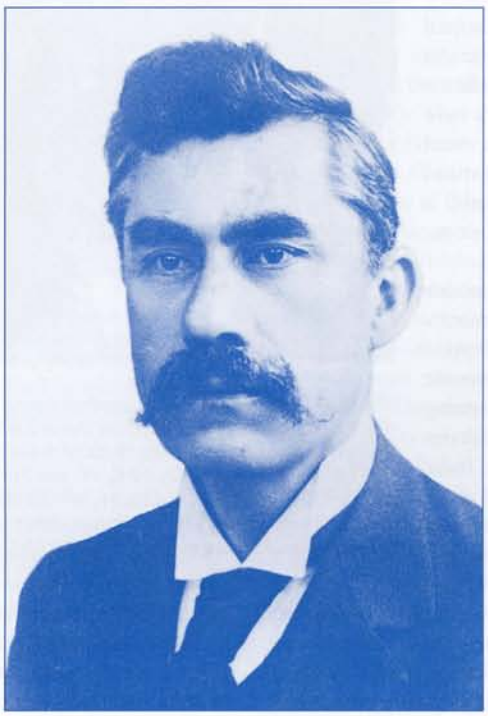
of the collection will be valuable in further fund-raising attempts. Suggestions as to other organizations to whom grant applications might be sent would also be welcome (just in case the current application fails – I'm never an optimist!).

Dr Lesley A. Robertson FIBiol, Kluyver Institute for Biotechnology, Delft University of Technology, Delft, The Netherlands (Tel. +31 15 2782421; Email l.a.robertson@stm.tudelft.nl).

Tobacco Mosaic Virus: Pioneering Research for a Century

Bryan Harrison and Michael Wilson

This year, 1998, is the centenary of the publication of M.W. Beijerinck's seminal paper on the causal agent of tobacco mosaic disease, a paper which many virologists (and nearly all plant virologists) consider marks the origin of the science of virology. The background to Beijerinck's paper is now reasonably clear. Dmitrii Ivanowski, a Russian working in the Crimea, had reported in 1892 that the tobacco mosaic disease agent passed through his Chamberland filter, which should have had pores too small to allow the passage of bacteria. However, he thought his filter-candle might have been faulty, despite having found that 'liquids, most favourable to the development of bacteria, remained entirely unchanged for several months after filtration through this candle'. At the time, the Pasteurian view of the role of bacteria as disease agents was a dominant influence. However, Martinus Beijerinck (1851–1931), a Dutchman, reached a different conclusion. He confirmed Ivanowski's filtration experiment to his own satisfaction and conducted several other tests, for instance showing that the tobacco mosaic agent could diffuse through agar gel. His studies led him to conclude that the agent was not a bacterium at all but something quite different, which he called a *contagium vivum fluidum*.



Martinus Willem Beijerinck (1851–1931).
Photo courtesy of Lute Bos.

The true nature of tobacco mosaic virus (TMV) particles, or those of any other virus, did not become clear until nearly 40 more years of searching in tissue extracts had elapsed; a process K.M. Smith (another pioneering virologist) considered to resemble 'looking for a black cat in a dark cellar without being sure it is there'. However, TMV was to remain a key object of research. In 1935, W.M. Stanley (later awarded the Nobel Prize) showed that TMV particles contained protein and, in 1937, F.C. Bawden and N.W. Pirie discovered that they also contained RNA, the first virus particle known to do so. The discoveries continued. TMV particles were the first to be shown to possess a structure made up of repeating units,[1] the first seen in the electron microscope,[2] the first reassembled from their components[3] and understood structurally,[4] and TMV was the first virus whose RNA was shown to be infectious.[5,6] In more recent times, TMV was the first virus to which transgenic resistance was devised[7] and the first for which a host nuclear gene for resistance was cloned and sequenced.[8]

To mark the pivotal role of TMV in this century of virological enlightenment, The Royal Society of Edinburgh, in association with The Royal Society, is organizing a symposium with the same title as this article in Edinburgh on 7–8 August 1998. The aim of this meeting is to review a broad cross-section of recent studies on TMV that have led to new findings and concepts, while casting a historically appreciative eye over what has gone before. The speakers and chairmen comprise a distinguished group, who have never before all met together in a single room. They include J.G. Atabekov (Russia), B. Baker, R.N. Beachy, D.L.D. Caspar, V. Citovsky, W.O. Dawson, H. Fraenkel-Conrat, J.G. Shaw, G. Stubbs, T. Turpen and M. Zaitlin (USA), L. Bos (Netherlands), K.W. Buck and A. Klug (UK), A.J. Gibbs (Australia), Y. Okada (Japan) and M.H.V. van Regenmortel (France). The programme organizers are B.D. Harrison, F.T. Last and T.M.A. Wilson. We confidently expect that the meeting will be a memorable, unique, and indeed historic, occasion. Further details of the symposium and registration forms are available from Theresa Ower at the Scottish Crop Research Institute, Invergowrie, Dundee DD2 5DA (Email: tmv@scri.sari.ac.uk).

Professor Bryan Harrison and Professor Michael Wilson work at the Scottish Crop Research Institute, Invergowrie, Dundee DD2 5DA (Tel. 01382 562731; Fax 01382 562426).

REFERENCES

1. BERNAL & FANKUCHEN (1937). *Nature* **139**, 923.
2. KAUSCHE, PFANKUCH & RUSKA (1939). *Naturwissenschaften* **27**, 292.
3. FRAENKEL-CONRAT & WILLIAMS (1955). *Proc Natl Acad Sci USA* **41**, 690.
4. FRANKLIN, KLUG & HOLMES (1956). *CIBA Symposium on The Nature of Viruses*, p. 39.
5. GIERER & SCHRAMM (1956). *Nature* **177**, 702.
6. FRAENKEL-CONRAT (1956). *J Am Chem Soc* **78**, 882.
7. POWELL ABEL *et al.* (1986). *Science* **232**, 738.
8. WHITHAM *et al.* (1994). *Cell* **78**, 1101.

Younger members of the SGM may be eligible for support to attend the symposium from the President's Fund. *See p. 31 for details.*

Deep-Sea Thermophilic Micro-organisms: Is There Any Real Biotechnological Potential?

Micro-organisms are now being isolated in significant numbers from extreme environments. What are their potential uses in industry?

Jean-Paul Raffin

Communities of organisms associated with hydrothermal vents were first observed in the Galapagos Rift in the 1970s. This started a tremendous interest in organizing cruises with submersibles diving to depths of 2,000–6,000 m (e.g. the French *Cyana* and *Nautile*, the American *Alvin* and more recently the Japanese *Shinkai*). A great part of these cruises has been dedicated to microbiology with the aim of finding new enzymic activities which could be used in industry. Thermophily is often associated with hydrothermal vents, but mesophilic and psychrophilic bacteria can also be isolated due to the thermal gradients encountered near the vents. Most searchers have focused on thermostable enzymes from vent hyperthermophiles which could have applications in high-temperature processes. As a result, a substantial database on these enzymes now exists, but in practice very few are used in industry.

Fig. 1. A 'Hole to Hell' photographed during the HERO-91 cruise on the Eastern Pacific oceanic ridge at a depth of about 2,400 m. Water temperatures near 400 °C have been measured in the venting fluids of these black smokers. The hydrothermal fluid is rich in H_2S (up to 4 mM), CO_2, NH_4^+, H^+ and Fe^{2+} (up to 0.2 mM), Mn^{2+} (up to 1 mM), as well as Cu^{2+}, Zn^{2+}, Ca^{2+}, SiO_2, CH_4, H_2 or CO. Many species of chemosynthetic micro-organisms (bacteria and archaea) are associated either with the rocks or with the animals living in this environment. *Photo courtesy of IFREMER / P. Chevaldonne.*

Which processes can make use of thermostable enzymes? The field of molecular biology represents perhaps the most typical example of the application of thermostable enzymes, mainly DNA polymerase (used in PCR) and DNA ligases, which are becoming increasingly used in diagnostics of inherited diseases (Ligase Chain Reaction). The market for these enzymes is still increasing by more than 30% every year and represents about $80 million. To meet such a demand, the quantities of enzyme that can be produced by an organism on a commercial scale are significant. Thus, at this level of enzyme production, *Escherichia coli* would be the best choice for enzyme expression. Indeed, a wide choice of cloning vectors and strains is available for this system which gives a reasonable chance to express every enzyme needed at the gram level. Also as DNA polymerase and DNA ligase do not need complex post-translational modifications the system works rather well in obtaining thermostable enzymes from the mesophilic host. The enzymes obtained keep their main original properties, at least those connected with their heat stability.

Fig. 2. The research vessel *Atalante* is the first ship able to carry and operate a manned submersible like the *Nautile* to a depth of 6000 m and also carry a robot such as the new Remote Operated Vehicle (ROV) VICTOR 6000 from IFREMER. The equipment on the vessel includes an EM12 dual sounder with the ability to map the ocean floor over a distance equivalent to seven times the height of the water column. *Photo courtesy of IFREMER / G. Vincent.*

For a long time *Taq* DNA polymerase (isolated originally from a microbe growing in a thermal pool in Yellowstone National Park) was the only polymerase used in PCR techniques. One of the main reasons for this was the very clever labelling of Hoffman Laroche's patent since it was based on the molecular mass of the enzyme (and all polymerases share the same molecular mass of about 90 kDa!). New polymerases have been sought with the aim of obtaining enzymes displaying higher fidelity (*Taq* DNA polymerase lacks proof-reading 3′–5′ exonuclease activity), processivity (a property which can be related to the size of the synthesized DNA fragments) or robustness (highly thermostable enzymes would allow more PCR cycles to take place). The most interesting findings from using new DNA polymerases have been obtained when *Taq* and *Pyrococcus furiosus* DNA polymerases were mixed, resulting in an increase in both fidelity and the length of fragments. However, the search for new thermostable DNA polymerases is coming to an end. With respect to DNA ligases, only one thermostable ligase is commercially available at present (two others have been patented) and the search for new ligases still shows promise.

About 10 thermostable DNA polymerases have been commercialized but only two of them were isolated from micro-organisms found in deep-sea hydrothermal vents. Indeed, thermophily was first discovered in more accessible terrestrial hot springs. These springs still have potential for biotechnological research, as demonstrated by the restricted access to the Yellowstone site. However, many of the thermophilic organisms from hydrothermal deep-sea vents found as a result of numerous diving cruises are just waiting for further investigation. The IFREMER collection is now composed of more than 1,000 isolates, a third of which are thermophilic micro-organisms. Only a few of them have been fully characterized at the microbiological level. Most of their physiology and metabolism

Fig. 3. The new IFREMER ROV VICTOR 6000 which is able to perform local tasks like imaging or sampling of water, sediments or rocks, within an area of about 10 km^2. The equipment includes a scientific unit, seven video cameras and two remote manipulator systems. The operating cable (20 kW) has a length of 8,500 m and a diameter of 20 mm. *Photo courtesy of IFREMER / J.F. Drogou.*

remains to be investigated and this is probably the situation for many similar micro-organisms collected all over the world. A recent estimate is that only about 5% of the deep-sea micro-organisms stored in laboratory freezers have been characterized. Therefore, we can guess that an increasing number of enzymes from these organisms will come on the market in the near future.

Let us now consider a large market in enzyme biotechnology, representing several billions of dollars every year – enzymes needed in high quantities such as proteinases (amino acid production from keratins, food processing, baking, brewing, detergents), amylases, pullulanases and glucosidases (glucose and fructose for sweeteners), and xylanases (paper bleaching). A multistage process is required for the bioconversion of starch into sugar syrup. New enzymes from hyperthermophiles should make the process more efficient by reducing the number of steps needed to transform starch into fructose syrup. One should keep in mind that 7,000 tons of amylases are produced every year. If this enzyme had to be expressed from *E. coli*, it would require cultivation and processing of more than 7 million cubic metres of medium. Since these enzymes have to be produced at the lowest cost, other expression systems are currently used in industry. For example, the *Aspergillus* system produces about 40 g recombinant protein per litre of cultivation medium. Another expression system based on *Bacillus* is used to produce the thermostable cellulase 103. Such an expression system is still not available for most thermostable enzymes.

What are the benefits of using high temperature enzymes in industry? For example, during the process of transforming starch to glucose, a high temperature would allow greater solubility of the intermediate products (maltodextrines) and would also substantially lower the risk of bacterial contamination during the process. However, the use of thermostable enzymes can have serious drawbacks in some industrial processes where enzymes have to be inactivated at the end of the process (e.g. in beverage and fruit juice manufacture). The thermostable β-glucosidase from *Pyrococcus furiosus* is an extreme example of what can be called a highly stable enzyme since 10 min boiling in the presence of 1% SDS and high concentrations of β-mercaptoethanol still does not inactivate it. The problem can be solved by using immobilized enzymes. The use of thermostable proteinases was investigated some years ago. Now it is clear that some industries are also looking for enzymes from psychrophilic bacteria.

The potential applications of enzymes from deep-sea hydrothermal vent micro-organisms depends on their particular properties. Thermophily is generally related, not only to the thermostability of the proteins, but also to other characteristics known to be linked with high temperature adaptation, such as halophily. Deep-sea hydrothermal vents are characterized by a very peculiar chemical environment. So, even if most microbial genera isolated from the deep-sea environment have already been found in terrestrial hot springs or shallow water hot environments (only one new genus has been reported up to now, *Pyrodictium* which is also the 'hottest' organism described, with optimal growth temperatures ranging from 97–105 °C), adaptation to the particular environment found near hydrothermal vents should have induced new kinds of enzymic activities.

Another field where novel kinds of enzymic activities could be very innovative is depolymerization of polysaccharides. These molecules are used in many industrial processes such as the manufacture of food, cosmetics and pharmaceuticals (as an alternative to heparin, for example). These polysaccharides of very high molecular mass often have to be cut into smaller molecules to be used. This is performed by a mild acid hydrolysis, a process where it is difficult to control the size of the obtained fragments or to target the sites where hydrolysis takes place. Enzymes with novel specificity could offer an interesting alternative to acidic hydrolysis and thermophilic micro-organisms from hydrothermal vents should be investigated for this application. However, the use of site-directed mutagenesis or DNA shuffling to modify existing enzymes could be valuable alternatives to the screening of deep-sea micro-organisms.

One important factor is the use of adequate expression systems to obtain the necessary quantity of enzymes. As already discussed, if very high quantities are needed a thermophilic alternative to *Aspergillus* or *Bacillus* is unlikely to be found. For other applications, such as the production of enzymes with novel

Fig. 4. The remote operating headquarters for ROV VICTOR 6000. *Photo courtesy of IFREMER / G. Vincent.*

catalytic properties, it is necessary to use a thermophilic expression system. Indeed, problems with the folding of the thermostable protein in the mesophilic host are often encountered or suspected, and re-folding techniques are highly hazardous. Also, if the enzyme is subjected to complex post-translational modifications, the enzymic form expressed in *E. coli* could lack the required properties. Most thermophilic micro-organisms are Archaea. Therefore, some laboratories are presently searching for an archaeal expression system. Some viruses and plasmids, which could represent the basis for such an expression system, are still under investigation. However, searches are progressing slowly and it is likely to take several years to obtain the first thermophilic archaeal expression system. In addition, problems with biomass, anaerobiosis or laws concerning genetically modified organisms will severely limit the industrial application of these systems.

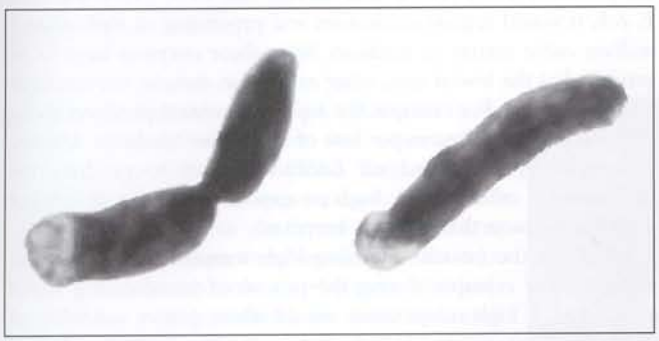


Fig. 5. *Thermosipho melanesiensis*, a new thermophilic anaerobic bacterium recently isolated from a deep-sea hydrothermal vent in the South-western Pacific Ocean. This strain, which grows preferentially in the presence of elemental sulfur, was isolated from the gills of a deep-sea mussel and has an optimal growth temperature of 70 °C. It is the second *Thermosipho* species described so far. *Photo courtesy of IFREMER / E. Antoine.*

Jean-Paul Raffin, Charge de Recherche CNRS, Laboratoire de Biotechnologie des Micro-organismes Hydrothermaux, IFREMER, BP 70, 29280 Plouzané, France (Tel. +33 2 98 22 45 27; Fax +33 2 98 22 47 57; Email jpraffin@ifremer.fr).

FURTHER READING

LEUSCHNER, C. & ANTRANIKIAN, G. (1995). *World J Microbiol Biotechnol* **11**, 95–114.

PENNISI, E. (1997). *Science* **276**, 705–706.

PCR IN NEPAL: A MICROBIOLOGIST'S DREAM OR A REALITY?

Andrea Thomas

Molecular biology in the Himalayas? Modern technology has an important part to play in the eradication of leprosy and TB in a remote corner of the world.

How could anyone possibly consider doing PCR in Nepal, one of the poorest countries in the world? Well, that was certainly one thought that went through my head as I tried to decide if and how some of our Western technology could be brought to this beautiful yet struggling land. But why not PCR? It's certainly proved itself in an enormous range of applications and is easy to do as long as one sticks religiously to the rules.

It seems like a lifetime since I left the cosy environment of the Central Public Health Laboratory (CPHL) in Colindale, England. After 7 years of learning the ropes of molecular microbiology with the latest 'super bug', *Escherichia coli* O157, my husband and I left the UK to work as volunteers for the International Nepal Fellowship (INF), a Christian medical mission. INF is the longest serving international non-government organization in Nepal and is involved primarily in TB and leprosy control and community health projects. With about 150 ex-pat staff and 600 Nepali staff, we are one of the biggest employers in the town of Pokhara.

Most people are surprised when I say that I'm working at a leprosy hospital. 'Do people still get leprosy?' they say. Sadly, they do and there's little chance that the WHO target of eradication by the year 2000 will be reached. While the actual number of patients is not high, with only about 13,000 registered, there are still about 6,000 new cases detected each year. Leprosy isn't really a killer, but it is a major health problem because of the long-term disabilities and associated social exclusion it causes.

Nepal is one of the poorest countries in the world and ranks 151/174 in the UN Human Development Index (for comparison, Canada is 1, the UK is 18, South Africa is 95 and India is 134). A country where the standard of living is so low is just the right environment for TB. About 60% of the adult population is infected with *Mycobacterium tuberculosis*.[1] Although not everyone will go on to get the disease, it's like a time-bomb waiting to go off, especially with the ever increasing threat of HIV round the corner. Forty-five people die of TB every day making it the biggest cause of adult death.

So, where do I fit in? INF has a number of programmes dealing with the control of leprosy and TB. These are mostly concerned with case finding and making sure that patients complete their course of drug therapy. Of course, nothing is straightforward. Leprosy in its early stages is often hard to diagnose, particularly as it can only be cultured in the footpads of mice or the nine-banded armadillo. Drug resistance may also be a problem but trying to determine the extent of this is extremely difficult. Are relapse cases new cases or the result of drug resistance? The occurrence of drug-resistant *M. tuberculosis* is not new but fortunately this can be determined by culture. A growing area of concern with TB, however, is extra-pulmonary TB which now accounts for 15% of cases in Nepal. These are often difficult to differentiate from other conditions. To me, PCR seemed like a good tool to try and tackle some of these questions.

I started by evaluating the potential of PCR, which led me to Dr Paul Roche who runs the Mycobacterial Research Laboratory at Anandaban Leprosy Hospital (ALH), Kathmandu. This hospital is run by The Leprosy Mission and is one of two leprosy referral centres in Nepal, the other being Green Pastures Hospital in Pokhara

Fig. 1. The Mycobacterial Research Laboratory situated at ALH, Kathmandu, Nepal. One of the upstairs rooms has been converted into a PCR suite.

Fig. 2. Rakesh, the research assistant (*left*), and the author (*right*) in the immunology lab where the reaction tubes are prepared for PCR.

run by INF. The laboratory is basic but offers a good service diagnosing leprosy and TB by the detection of acid-fast bacilli in slit skin smears (for leprosy) and sputa (for TB) by light microscopy. Skin biopsies are sometimes taken but these must be sent to the UK for testing. ALH also houses one of the few mouse footpad facilities in the world and is the 'gold standard' for drug sensitivity testing. The laboratory also provides a basic service for in-patients by testing urine, blood, faeces, etc., but this is limited without the benefit of selective media.

The laboratory at ALH is relatively well equipped for research and is already involved in a number of projects such as skin tests for leprosy, epidemiology and treatment of Type I reactions, cellular immunology of leprosy and monitoring drug resistance. It seemed the perfect setting for the introduction of complementary DNA techniques and I have now been 'seconded' to ALH as a research consultant. Through the generosity of the SGM's International Development Fund (providing funds for consumables) and The Leprosy Mission (providing funds for capital purchases), we now have a functioning PCR suite.

One of the most important aspects of this work is the opportunity to 'Nepalize' what we are doing. Dr Roche and myself are the only ex-patriates in the laboratory and we are greatly excited and optimistic about research assistant Rakesh Manandhar, a post-graduate who studied molecular microbiology in Australia. It is a major bonus that his English is much better than our Nepali as it makes the job of training him a lot easier, which in turn means that he will do well at explaining things to the other members of staff.

There are endless possibilities of how we might use PCR in the battle against leprosy and TB, but here is a brief outline of key areas.

1. *M. leprae*

A 320 bp fragment specific for repetitive sequence RLEP (found 28 times in the *M. leprae* genome) is amplified using a set of nested primers.[2] To enable rapid and cost-effective screening, the inner primers are labelled with biotin and digoxigenin to allow the detection of the product by ELISA. This technique will be used for the following.

- ***Detection of M. leprae in slit skin smears.*** Slit skin smears are routinely examined by light microscopy. However, at least 10^4 ml^{-1} are needed for detection. The sensitivity of PCR should improve the detection rate. Small amounts of the skin fluid are collected onto filter paper discs. The *M. leprae* DNA is extracted and processed by PCR. We have had no difficulty in detecting amplification products from about 10 fg of genomic DNA and from extracts of *M. leprae*-infected mouse footpad. However, initial experiments indicate that we are experiencing some inhibition either from the sample (maybe due to trace amounts of blood) or the filter paper.
- ***Detecting rifampicin resistance.*** Although patients receive multi-drug therapy for up to 2 years, the major drug is rifampicin. It has been considered that the reason for relapse cases seen in South Asia may be due to resistance to rifampicin. We are hoping to perform a collaborative study with workers in Europe and with hospitals throughout South Asia to examine skin biopsies from all relapse cases for drug resistance genes.
- ***M. leprae in sputum.*** Leprosy patients are often screened for *M. tuberculosis* by examining their sputum for acid-fast bacilli. This test does not, however, differentiate between *M. tuberculosis* and *M. leprae*. The sputum of new leprosy patients often contains *M. leprae*. Now that we have primers specific for *M. tuberculosis* and *M. leprae* we should be able to differentiate between the two. The clinicians will then be in a more informed position when deciding a patient's course of treatment.
- ***Efficacy of multi-drug therapy.*** 'How much and for how long' has been a source of great debate. Bacteria are often detected following treatment but the significance of their presence is not known, especially since viability cannot be easily determined. Methods have been described based on the amplification of mRNA sequences as a measure of cell viability.[3] This may help us predict the outcome for the patient and to better understand what happens to the bacteria through the course of treatment.

2. *M. tuberculosis*

DNA specific to *M. tuberculosis* is detected by the amplification of a 181 bp fragment of the insertion sequence IS*6110* using nested, biotin- and digoxigenin-labelled primers.[4]

- ***Extra-pulmonary TB.*** Of particular interest is the study of swollen lymph nodes which are often associated with cancer but can be caused by infection with *M. tuberculosis*. Lymph nodes are biopsied and examined for malignant cells. Biopsies are invasive and often painful for the patient. In a study at Patan Hospital, Kathmandu, fine needle aspirates are being tested as a less invasive procedure. Fluid from these aspirates will be tested by PCR in conjunction with histological examination.

I have been encouraged by the good start we've made, although we must accept that things take a lot longer here. There are environmental and other factors: frequent power cuts, machinery that does not work off generator electricity, a mouldy lab in the monsoon, awkward customs officials, amoebic dysentery and most irritating, a brand new thermocycler which had to be returned to the UK with a fault! Fortunately for us, through a bizarre set of coincidences, we managed to locate the (reportedly) one and only person in Nepal with a thermocycler, who is working on cold tolerance genes in rice. It's a good contact to have, especially when we urgently need to borrow a machine!

Progress will be slow but I believe that this is the right sort of technology for Nepal. Our current priority is small-scale, high-quality work with an emphasis on training. In time, we will hopefully be able to expand our range of DNA methodology and its applications. With the interest PCR has already generated here I don't think we'll ever be short of work!

I would like to thank the SGM for contributing to this work, Dr Ruth McNerney (London School of Hygiene and Tropical Medicine), Dr Jon Clewley (CPHL) and Dr Henry Smith (CPHL) for their invaluable help and support and Clive Thomas (my husband) for setting up INF's Email system which has made so much of this work possible and stopped me from feeling totally isolated from the rest of the world!

Dr Andrea Thomas, International Nepal Fellowship, PO Box 5, Pokhara, Nepal [Email (text only please): athomas@inf.wlink.com.np].

FURTHER READING

1. *Tuberculosis in Nepal.* Published by the National Tuberculosis Centre, Nepal. Kathmandu: Sigma Offset Press.
2. JAMIL, S. *et al.* (1994). *Int J Lepr* **62**, 512–520.
3. BHARVIN, K.R. *et al.* (1993). *J Infect Dis* **168**, 799–800.
4. WILSON S.M. *et al.* (1993). *J Clin Microbiol* **31**, 776–782.

Owls' Brains to Angels' Trumpets:
The Troubled Century of the Golgi Apparatus

Keith Vickerman

On the centenary of Golgi's discovery, Keith Vickerman wonders whether continuing uncertainty and controversy are a better passport to scientific immortality than being right first time.

Scientists may sometimes ruefully reflect that, once their work has become part of the main body of science, they are no longer credited by name with the discovery or the idea. Perhaps to ensure enduring fame, their work has to remain controversial. Certainly in the case of the Italian pathologist, Camillo Golgi (1844–1926; Fig. 1), the controversies surrounding his most famous discovery – the Golgi apparatus of the eukaryotic cell – have kept his name in the limelight for the past 100 years since he first described it in nerve cells in 1898. For a start, there is doubt that Golgi was the discoverer. Some attribute the first view of it to St George, not the dragon slayer but a humble slaughterer of garden snails who is reputed to have described it in their spermatocytes in 1867. But was the structure that Golgi saw the same as the one that St George described? As Hamlet said "Ay, there's the rub!"

Golgi's story began on the kitchen table of his modest lodgings in the small town of Abbiategrasso, near Milan, four years after he had gained his medical degree from the ancient University of Pavia. He was then pathologist to a hospital for incurables and had the somewhat ghoulish habit of taking work home with him to try out novel staining methods for the brain. It was in his kitchen-cum-makeshift lab that he discovered that silver nitrate could be used to silhouette neurons by depositing a black precipitate upon them. His discovery revolutionized understanding of the structure of the nervous system and in 1875 he was called back to Pavia to occupy the University's Chair of Pathology.

But Golgi did not always get it right. His silver impregnation technique was refined and modified by his arch-rival, the Spanish histologist Ramon y Cajal, who then used it to refute Golgi's 'reticular theory' of structure of the nervous system (that the nerves form a continuous syncytium within the brain). Both men received the Nobel Prize for their work on the nervous system in 1906, but the Spaniard ignored Golgi at the celebrations in Stockholm, perhaps more out of jealousy than contempt, for it is Golgi's name that has been tagged onto silver-staining techniques ever since. And these techniques are still in use, though how they work in the capricious fashion that they do remains something of a mystery.

In 1898, using his silver impregnation technique, Golgi discovered a stainable network structure inside the Purkinje cells of the cerebellum of the barn owl; he called it 'the reticular apparatus' (you will have gathered by now that Golgi had, so to speak, reticula on the brain!). Histologists soon showed that silver could be deposited on a similar structure in a wide variety of cells, but this structure was not always 'reticular' in form and so it was referred to as the Golgi apparatus. Out of 150 alternative names suggested at various times, this one stuck. There then followed more than half a century of acrimonious dispute over whether the Golgi apparatus (GA) was an artifact of silver staining or whether it was a real organelle with identifiable functions.

Fig. 1. Camillo Golgi: his 'apparatus' has long outlived his 'cycles.' *Photo courtesy of the Wellcome Institute Library, London.*

One of the longest slanging matches was between J. Brontë Gatenby of Trinity College, Dublin and John Randal Baker of Oxford University. Baker was a flitter from flower to flower if ever there was one! Contraception, intersexuality, tropical rain forests, anthropology and the humane killing of crabs all kept him busy at various times but he prided himself on being a cytochemist. He denied that the prominent organelle (dictyosome) visible in living invertebrate germ cells, many protozoa and plant cells had anything to do with the structures revealed only by silver impregnation in nerve cells: the latter he regarded as an artifact. Gatenby took the contrary view. He believed that the Golgi apparatus was a universal feature of nucleated cells and that it most probably had a role in secretion. Amazingly, as long ago as 1913, Ramon y Cajal (yes! Golgi's old sparring partner) had noted the association of mucinogen granules with the GA in intestinal goblet cells and postulated a role for this structure in mucus secretion.

The Golgi controversy came to a head in the 1950s. At a meeting of the Royal Microscopical Society in 1954, Baker, who had failed to find a cytochemical identity for the GA, berated the crude techniques of the Gatenby School:

> *"It is with the greatest difficulty that we can understand how work of this kind [has] survived so long – work of this calibre is not recognized in any other branch of science"*
>
> *"There has been a feeling that the subject is unworthy of serious attention"*

were just some of his pointed remarks. Five years previously, Baker's artifact view had received a boost from two future Nobel Laureates: in 1949 Palade and Claude had claimed to mimic Golgi staining when the dye Sudan black interacted with myelin figures in an *in vitro* system. Gatenby brazenly remarked at the same meeting that he did not consider their study a serious contribution to cytology. And well he might not – for he had up his sleeve a trump card. The Americans Dalton and Felix had sent him the first transmission electron micrographs of sections showing clearly that the Golgi apparatus has a constant form in all cells – including neurons. Poor Baker! No wonder he hated the electron microscope ever after.

The universal Golgi structure revealed by Dalton and Felix is now a familiar image. It consists of a series of closely stacked saucer-like membrane-bound cisternae with peripheral vesicles and tubules in attendance (Fig. 2). The excellent autoradiographic work of Palade, Leblond and their associates showed that at one pole the *cis*-cisterna receives newly synthesized proteins and lipids from the granular endoplasmic reticulum, and that these are glycosylated in the medial

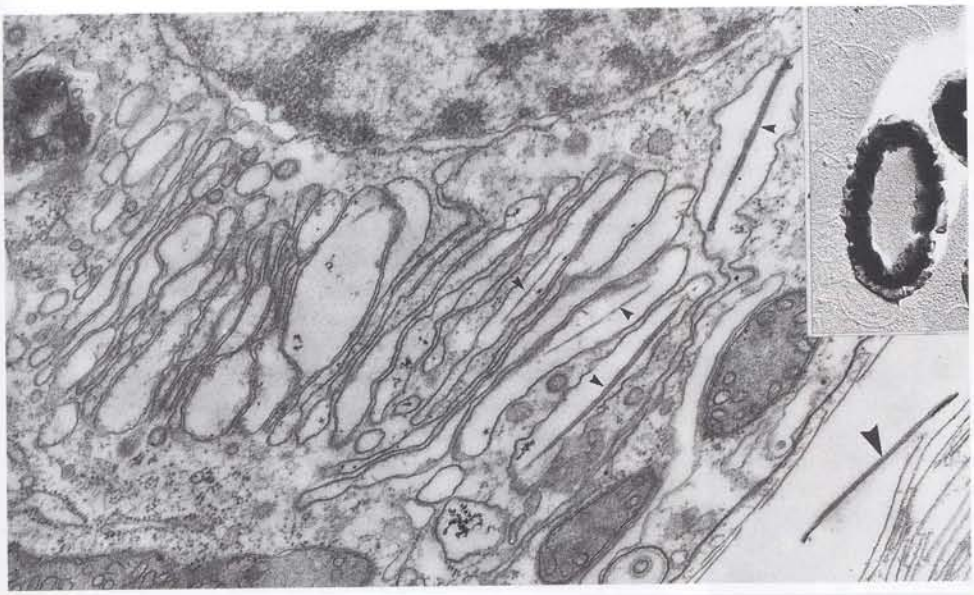


Fig. 2. Transmission electron micrograph of section of the Golgi apparatus of a haptophyte alga, *Pleurochrysis scherffelii*, showing progressive scale formation (×33,600). Small arrowheads indicate developing scales in Golgi cisternae (*cis* to left, *trans* to right); the large arrowhead indicates an externalized scale. The inset shows metal-shadowed uncalcified and calcified scales (×16,800). *Micrographs courtesy of Dr Barry Leadbeater.*

cisternae *en route* to the *trans*-cisternae from which they are sorted and distributed to plasma membrane, secretory vesicles and lysosomes.

Of what interest is the Golgi apparatus to microbiologists? Bacteria do not have one, of course, but it is a near-universal feature of eukaryotes. Studies on unicellular eukaryotes played an important part in convincing cell biologists of the role of the GA in the synthesis, packaging and sorting of secretions. Particularly important in this respect were investigations on flagellates that cover their surfaces with intricately patterned scales or spines, often of extraordinary beauty. Many of these scales become reinforced with $CaCO_3$ or silica. Even the most ardent Darwinian is hard-pressed to imagine the selective forces that moulded them. In her illustrated talks, the late Professor Irene Manton, who pioneered these studies at Leeds University, was adept at conjuring up appropriate metaphors to describe these surface adornments ("waste paper baskets from Woolworths", " dressing table mats crocheted by Grandma"). Their massed remains can also be impressive. The White Cliffs of Dover may be a reminder of the wartime songs of Dame Vera Lynn, but they are also, it would appear, monuments to the prodigious GA activity of the coccolithophorid flagellates that abounded in the seas of the Cretaceous era, leaving behind their compressed surface scales to form chalk rock.

Within the Golgi cisternae, the progressive construction of the scale was traced by Manton and her followers. No fewer than seven different types of scale may be synthesized in the GA of some of the prasinophyte green flagellates, at different stages of the cell cycle. The precise segregation and disposition of the different types of scale on the surface of the body and on the flagella are miracles of microbial architecture. How on earth the minute coccolithophorid *Discosphaera tubifera* (Fig. 3) manages to produce and position scales like angels' trumpets from some medieval vision of the last judgement is a real challenge to the imagination, for each is several times the diameter of the cell.

Controversy continues to haunt the Golgi apparatus, however, though these days the debates are more civilized. One of the most fundamental questions concerns the method of transport of secretion along the Golgi stack. One school maintains that such forward transport is effected by shuttling of vesicles of secretion from the periphery of one cisternal sac to that of the next one down: the other maintains that whole cisternae progress along the stack towards the *trans* face. There is much evidence for the former from studies of secretion in mammalian and yeast cells. Indeed in the latter genetic analysis has uncovered many genes whose products are needed for transport at different stages of the secretory pathway. But there can be no doubt that the studies on algal scale production provide compelling visual evidence for the cisternal progression school. Michael Melkonian and his colleagues in Cologne University have calculated that in the prasinophyte algae complete turnover of the cisternal stack may take place in 4–5 min.

At least one Golgi controversy, however, appears to be nearing resolution, and that is whether or not absence of the GA reflects the primitive eukaryote state. Some of the earliest branchers on the eukaryote tree of life based on small subunit rRNA gene sequences – diplomonads such as *Giardia* and amoeboflagellates such as *Naegleria* – appear to lack the GA, whereas in those other early branchers, the parabasalians such as *Trichomonas*, the exquisite development of the organelle, the so-called parabasal body, gives the name to the group. The position of the diplomonads as relicts

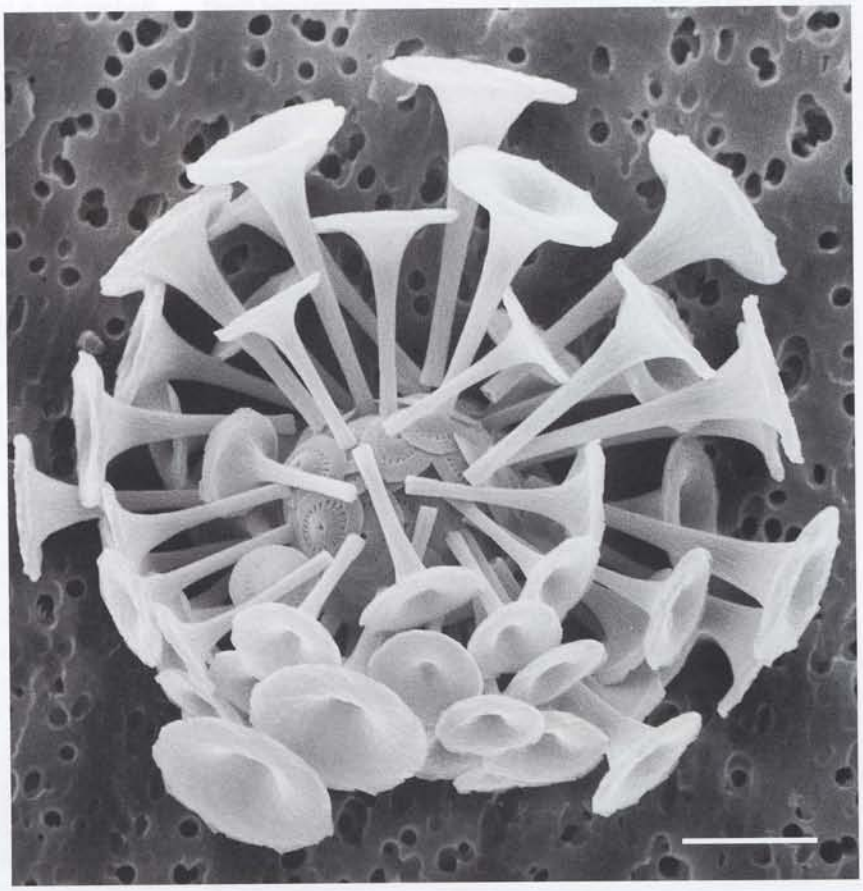


Fig. 3. Scanning electron micrograph of the North Atlantic coccolithophorid haptophyte *Discosphera tubifera* showing two types of scale. The central perforated scales define the body size. The radiating 'angel's trumpet' scales greatly exceed its diameter in length. Bar, 2 μm. *Micrograph courtesy of Dr Jeremy Young, NHM.*

of a pre-Golgi stage in evolution of the eukaryotic cell is beginning to look suspect, however. Closer scrutiny of the life cycle of *Giardia lamblia* has shown that it develops a temporary Golgi apparatus when it has a secretion to package, namely the material comprising the protective wall of the encysted transmission stage. Moreover, among the crown groups on the tree, a GA is absent from ciliates but not from dinoflagellates and apicomplexans (sporozoans) which share a clade with them. Among the apicomplexans, the structure may come and go during the course of the life cycle: intracellular bloodstream stages of the malaria parasite *Plasmodium* lack a Golgi apparatus but developmental stages in the mosquito vector do not.

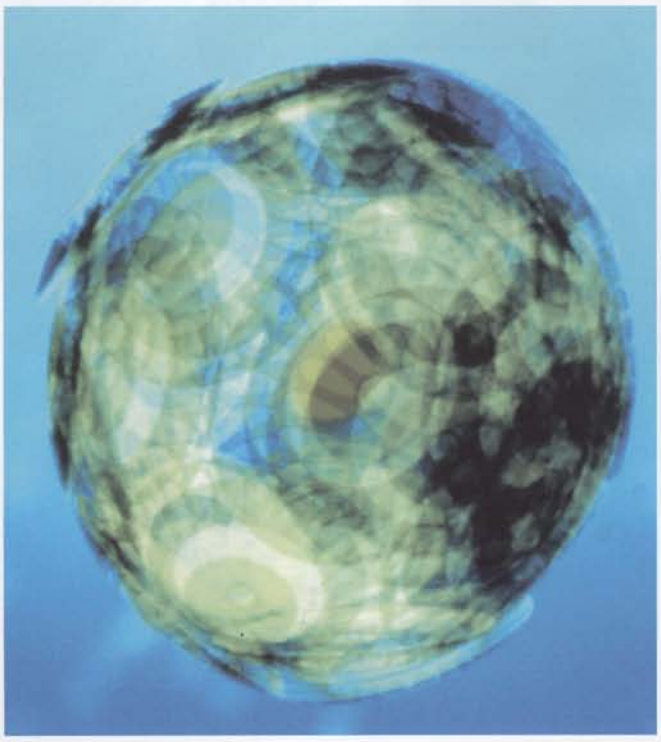
Mention of *Plasmodium* brings me to Golgi's microbiological claim to fame. Biologists who know Golgi's name from his association with the Golgi apparatus and Golgi staining may be surprised to learn that he has another and perhaps more solid claim to recognition for his pioneer work on what is still the most important infectious disease in the world – malaria. Golgi was quick to follow up the discovery of the malaria parasite by Laveran in 1880 and studied the disease in peasants from the rice fields in the Po Valley. He showed that the paroxysms of the disease are related to the developmental cycle of the parasite in the red blood cells, the fever starting when the infected red cells burst, simultaneously releasing their cargoes of infective merozoites. He distinguished morphologically the parasites that cause the tertian and quartan fevers, but being no taxonomist he left it to fellow Italians Grassi and Feletti to name them *Plasmodium vivax* and *P. malariae*, respectively. He showed how superposition of one brood of parasites upon another could result in daily fevers. These phenomena were known for a time as Golgi's cycles. But, unlike the Golgi apparatus, Golgi's cycles have never been controversial and were long ago taken for granted as a fact the whole world knows. Today, only the most erudite of scholars (a dying breed!) would refer to them as such. No, nowadays, the pathologist from Pavia is far better known for his trouble-ridden apparatus than for his gospel-truth cycles. Odd, isn't it?

Keith Vickerman FRS is Regius Professor of Zoology in the University of Glasgow. He warmly thanks Drs Barry Leadbeater and Jeremy Young for comment and providing illustrations. Address for correspondence: Division of Environmental & Evolutionary Biology, University of Glasgow, Glasgow G12 8QQ (Tel. 0141 330 4433; Fax 0141 330 5973; Email k.vickerman@bio.gla.ac.uk).

Beyond the Naked Eye

Roger Jones

Recently a TV documentary on microbes was shown on BBC2 in the Natural World series. Visually stunning, the programme showed the range of organisms that are essential to our lives and yet are invisible. Several SGM members contributed material to the project and Roger Jones, the producer, is to be congratulated on the successful outcome. The film is an excellent promotional vehicle for microbiology. In this short article Roger Jones tells us what inspired him to carry out the project.



Computer-generated colour image of a coccolithophore. These are indigestible to shrimps and they sink to the ocean floor, in time becoming chalk. *Photo courtesy of BBC Natural History Picture Publicity.*

Does the BBC decide what programmes you make? It's a question I'm often asked. It's as if 'the BBC' is perceived as some shady presence that from afar decides who does what. The answer is yes and no. But at least as far as programmes are concerned the initiative still lies with the producer who has to come up with the ideas; he or she proposes, others dispose. So in a sense the producers are 'the BBC'; no producers – no programmes. And as producers we all carry around ideas that we keep on mental hooks, thinking that someday they will come in handy. It's a bit like the magpie mentality of those of us who (sometimes to the desperation of those around us) simply cannot bear to throw anything away.

Beyond the Naked Eye had such roots. It was an attempt to take the lid off the world of 'bugs' and to show how widespread they are and how vital they are to the living world. Its origins arose from a variety of experiences I've had in thirty-odd years of biology watching. Let me explain how and why.

Before the biochemical revolutions of DNA, base pairs, the genetic code and all that followed, we all became acquainted with the simple 'what' and 'where' of living creatures; 'how' and 'why' came a little later. To help, some of us may remember first getting to grips with invertebrate biology by reading Ralph Buchsbaum's *Animals Without Backbones*. That was our bible. Two volumes in paperback, with the then distinctive blue-bordered livery of a Pelican. I still have my copies somewhere. In its journey from single cells to the 'higher' invertebrates one chapter dwelt briefly on nematode worms and how they get everywhere. One description of their ubiquity went something like this. Imagine if everything in the world, living or inanimate, were to be rendered transparent, apart from these worms, what would you see? The answer was that you'd still see the world, but sketched out in ghostly outline by the bodies of these tiny worms. That's how numerous and widespread they are!

I've always been struck by that ghostly image, and thought it a visually powerful way to make the point that single-celled creatures are similarly common, and so very small. It also allowed me to show that we are surrounded by these little guys, particularly if a scanning electron microscope can be used to tunnel down in scale from a human hair to the miniature zoo of bacteria that populate our skin and all the other nooks in Granny!

It also allowed the introduction of impressive facts such as that there are more bacterial cells coating us inside and out than there are cells in the human body itself.

Another stimulus for the programme was garnered from the biology-watching of another biologist, Lewis Thomas. In his *Lives of a Cell*, he drew attention to the likelihood that way back in the mists of time, the nucleated cells from which we are made arose from a small committee of bacterial cells that got together for their common good. I have always had a spooky, uneasy feeling about this. I feel comfortable about being made up of individual cells that are like rooms in the building that is me, but I feel very uncomfortable with the thought that my rooms (my cells) have a load of squatters installed in them, even though they do provide me with energy, or if I were a plant, trap light for me by the magic of photosynthesis.

Now consider what seems to be the compulsion of living things to get together, to co-operate. It's a togetherness that allows lichens to conquer polar deserts, and corals to grow into massive reefs. Add to that the close relationships between other little guys and big guys; the plants with their root fungi, peas and beans with bacteria in their nitrogen-fixing root nodules, and the cows and termites with their little single-celled helpers that digest otherwise indigestible cellulose. Here is a challenging and very interesting set of ideas. And that's only a start. I bet the average 'man in the street', who we imagine to be the target for our programmes, has not come across much of this because the bugs are literally out of sight. They make the headlines all right but you can't see them, only their sometimes distressing effects. Who would have thought that the 'mouthful' of a name, *Escherichia coli*, could ever become headline news?

Perhaps when 'bugs' upset us it is only because we have not yet adjusted to their attempts to get to know us. Perhaps diseases are a failed attempt at co-operation, at getting together? Another interesting thought.

And one other thought has always intrigued me, and it's this. Not only do we share with single-celled creatures a common origin of life, but single-celled life is itself something we as humans all go through, as egg and sperm. We were all once 'bugs', 'germs', microbes, as the sperm that sought out the egg.

The single-celled life is like a gateway through which we all have to pass, however briefly. It's a thought that literally cuts our apparently all powerful human presence down to size. And it's that idea of a 'gateway' that suggested the image of a human embryo at the very end of the programme. It seemed to me to echo the universality of life, perhaps throughout the universe itself, and recall for many the powerful emotional image that arose at the end of *2001: A Space Odyssey*, when Dave Bowman found himself and the starchild as one. I like to pull a few emotional strings in my programmes, as well as provide new insights.

SEM of ventral surface of *Kerona pediculus*, a ciliate protozoan which lives as an epibiont on the surface of *Hydra* spp. (×700). *Photo courtesy of A. Warren.*

Now add to these musings what we now know about the social lives of bacteria. They behave like us. They 'talk' to each other in chemical languages, they 'network', they know where they are and how the rest of their crowd are faring, they fight over resources, slug it out with chemical weapons, and adapt to changes and inherit those adaptations. They are very 'smart' creatures, and do it all with a single cell. Perhaps the cell is a living microchip? Perhaps in our technology we are converging towards solutions that life invented aeons ago. It also indicates that just as *Animals Without Backbones* provided its revelations in its own time, we can look forward to many more as we look further beyond the naked eye.

Roger Jones, BBC Natural History Unit, Whiteladies Road, Bristol BS8 2LR (Tel. 01179 732211; Fax 01179 744114).

Branching pattern produced by millions of bacteria as they seek food by chemotaxis. *Photo courtesy of BBC Natural History Picture Publicity.*

Science in the Sticks

Julie Ingram and Nina Morgan

A Community Science Weekend held in an Oxfordshire village showed that science events held outside of city centres can certainly pull in the punters. But there are pitfalls too. The organizers describe their experiences. This could be a model for other scientists to follow as the 1998 SETweek looms.

On a rainy weekend in November 1997 hundreds of people converged on the West Oxfordshire village of Chadlington, near Chipping Norton, to be entertained, educated and challenged during The Chadlington Community Science Weekend. The event, funded by a COPUS (Committee for the Public Understanding of Science) Seed Grant,[1] was the first of its kind in the local area. As organizers, we found the weekend exhilarating, exhausting and very stressful. But judging by the numbers who turned up and comments we've received, our efforts have been well rewarded. The public response was extremely positive.

COMMON QUESTIONS

The most common questions both before and throughout the weekend were 'Who are you?'; 'What prompted you to organize it?' and 'Will there be another Science Weekend next year?'

To answer the first question: we are merely two individuals with an interest in promoting science (one of us a geologist turned science writer and the other a soil scientist). It seemed hard for people to understand that we did not represent an organization or institution.

Why did we decide to do it? This question ran repeatedly through our own minds in the weeks running up to the event! The idea grew out of our desire to promote science in the local primary school (in our respective roles as parent and governor). This rural school with only 60 children and 3 permanent staff members finds it a challenge to meet the requirements of the Science National Curriculum. It was while looking out for low-cost science resources for schools that we became aware of the COPUS Seed Grants.

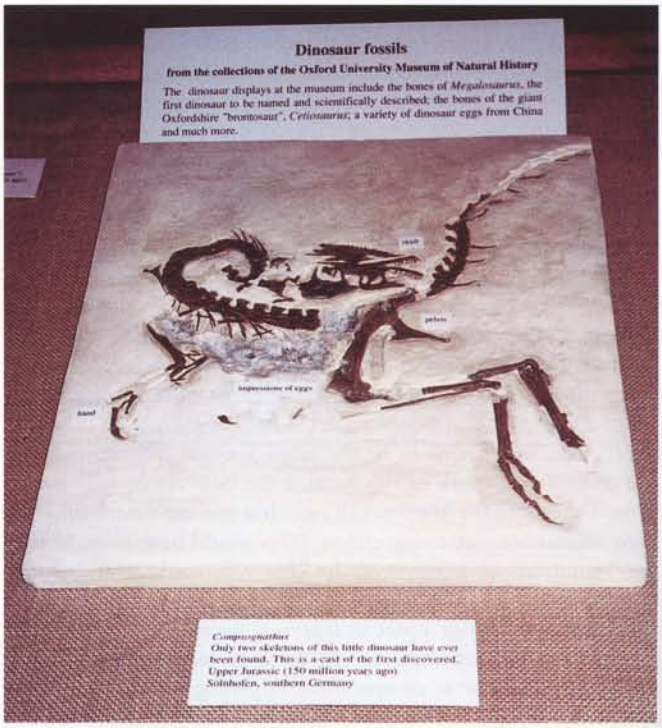
Will we do it again? Our answer has to be a definite 'We have no plans!' For a start, the weekend was funded entirely by a COPUS Grant and we believe a repeat award is unlikely. Adding fund raising to the task of organizing the event would, we feel, be more than we could cope with. As it was, we both put in hundreds of unpaid hours setting up, publicizing and running the event – a time and energy commitment we are not sure we could justify for a second time.

GETTING THE GRANT

Our COPUS grant application requested money to run a Community Science Weekend, a weekend of 'Science Fun for All Ages'. Before submitting the application we spoke to several local museums and education officers to discuss the feasibility of our plans and how best to pitch the grant application.

We believe the success of the application hinged on two points. First, we aimed to target the whole community. Second, we planned to fill a gap in a rural area where access to science events and resources is limited.

Our instinctive response to a frequently asked question!



Part of the Oxford University Museum of Natural History dinosaur collection – on show at the Chadlington Bowls Club.

ORGANIZING EVENTS

We were given the grant in May and began to prepare for a weekend in November. Our plan was to organize a number of timetabled events with a background of hands-on exhibits, book displays and on-going demonstrations available throughout the weekend. All events were to be free, although people were required to book their seats for the programmed events. We used three main venues: the village hall (seating 100), the school hall (seating 80) and the local bowls club (housing on-going exhibits only).

We decided to 'franchise out' other services to local organizations to allow them an opportunity to raise funds for their own causes. Thus, the Village Hall Committee agreed to serve teas, the Bowls Club Committee offered morning coffee and lunches, and the Friends of Chadlington School ran a souvenir shop.

SETTLING ON SPEAKERS

We relied on the British Association Talking Science Database[2] and advice from Curioxity, an Oxford based hands-on science centre, to help us decide on the 'programmed' events.

We knew that popular presenters are often in great demand, so we began booking the main events – The New Kinetic Theatre Company performing *The Bunsen Tower Mystery*; a personal appearance by Captain Cook; a lecture/demonstration about *The Geology of a Meal*; and a science challenge workshop run by Curioxity – in early June. The geology speaker asked only for expenses. All others

required a professional fee. From this point on, therefore, we were forever consulting the bank balance.

We later decided to add extra activities to provide special interest for the youngest and oldest members of the community.

ON-GOING EVENTS

The exhibits and demonstrations were arranged over a period of about 6 weeks prior to the event. For these we relied on the goodwill of local people and personal contacts. Curioxity lent a range of hands-on science displays and the Oxford University Museum of Natural History came up trumps with interactive and 'for display only' exhibits on topics ranging from minerals to dinosaurs, local geology and beautiful bugs. An industrial gases company provided a poster exhibit, along with a popular range of free goodies for people to take away. A local computer training firm demonstrated PC packages and music composition on computer; another computer consultant (of more mature years) ran an 'Internet for Oldies' demonstration in the school office.

The local Chipping Norton Bookshop accepted our invitation to hold a stall focusing on adult science books, while a science publisher agreed to run a display of children's books and CD ROMs.

FURTHER ATTRACTIONS

We also organized a competition on the theme of *The Invention I Would Most Like to See*. Contestants were invited to either write about, draw or build a simple model of their dream idea. Prizes (donated by the science publisher and the Chipping Norton Bookshop) were offered in five age categories (including 60+). A local inventor was persuaded to come along and judge the contributions and to bring his own invention – a mini car that carries its own convertible garage. One other judges was lined up.

PUBLICITY

Publicizing the event proved to be the hardest task. Posters were distributed and press releases issued in good time, resulting in a clutch of brief articles in the local papers. Meanwhile we worked on compiling the detailed programme.

About a month before the weekend we distributed 1000 programmes together with posters and inventions competition entry forms through local schools, museums, shops, libraries, local organizations and clubs. The full programme was also published in such lofty journals as the *Chipping Norton News* and the *Finstock Gazette*. We went along to local meetings of the WI and Local History Society to promote the event. We were greatly helped by people who initially rang to enquire about the weekend, and then offered to publicize it in their local area.

The distribution of programmes resulted in a flurry of enquiries. Tickets for most performances 'sold out' two weeks in advance. To cater for the unsatisfied demand, we arranged for Captain Cook to do an extra performance (80 additional places). Even so, many people expressed disappointment that we weren't able to arrange extra performances of some of the other events.

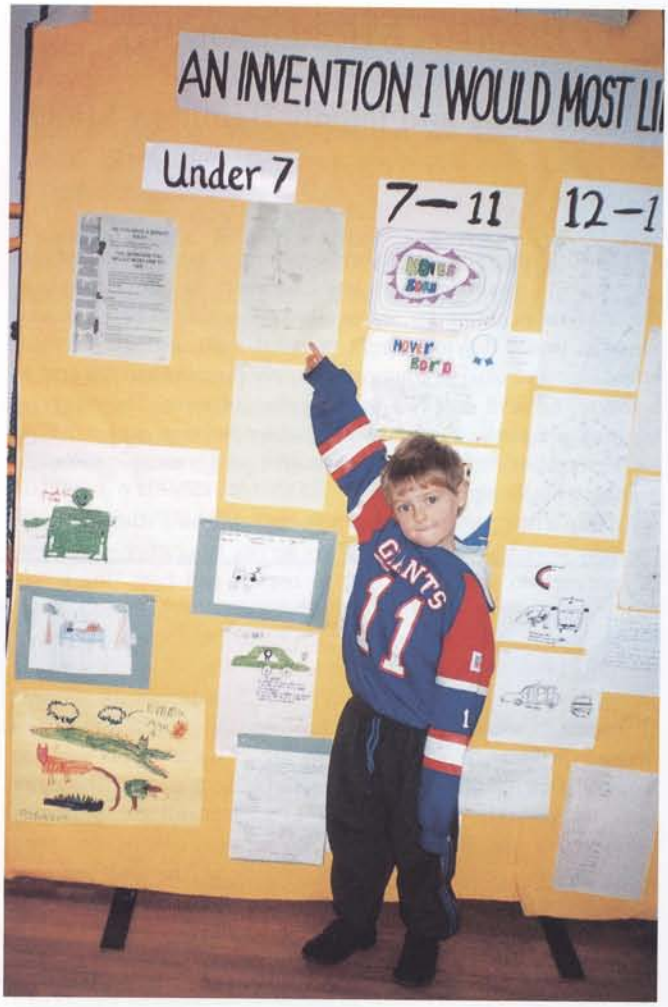
HELP FROM OUR FRIENDS

During the weekend itself we relied heavily on help from volunteers to man the venues. This proved to be essential, not only for ticket collecting, but as moral support for us! It was also a very good way of involving local people who otherwise might not have come along.

WAS IT WORTH IT?

In general, the weekend went extremely well. We attracted capacity audiences for all programmed events and the performances were enthusiastically received.

However, we were disappointed by the relatively few drop-in visitors for the on-going exhibits and demonstrations and the low number of older people who came. Instead, parents with children dominated. Sadly only 15 entries were received for the inventions competition.



Display for the inventions competition – entries were sparse!

We were also surprised that most ticket requests came from outside Chadlington. Whether this reflects a general apathy or the assumption that tickets would be held back for Chadlington residents we are not sure. Attracting people living on your doorstep clearly requires more than the offer of free tickets and is no doubt a challenge for all events organizers.

THE PAY OFF

In spite of the setbacks, we are generally pleased with the way the weekend went. It was gratifying to receive so many messages of thanks and requests for a repeat next year – a tribute to the drawing power of science events. And as a bonus, by exploiting personal communications, key players in the village and the good old-fashioned village network, the event did much to bring together different parts of the community.

Julie Ingram is a soil scientist based at The Manse, Chapel Row, Chadlington, Oxon OX7 3NA.

Nina Morgan is a freelance science writer based at Rose Cottage, East End, Chadlington, Oxon OX7 3LX (Tel./Fax 01608 676530; Email ninamorgan@compuserve.com).

1. For information on grants for schemes to promote the public understanding of science contact COPUS at The Royal Society, 6 Carlton House Terrace, London SW1Y 5AG (Tel. 0171 451 2580; Email copus@royalsoc.ac.uk; http://www.royalsoc.ac.uk). Grants are awarded according to strict criteria and there are closing dates for applications throughout the year.
2. The *Talking Science* database is run by the British Association for the Advancement of Science, 23 Savile Row, London W1X 2NB (Tel. 0171 973 3500; http://www.britassoc.org.uk).

3-D Plastic Microbiology

Linda Tilling and Jeremy Hamilton-Miller

Under-funding, under-staffing and large student groups are the realities faced by many who teach group practicals. A novel way to reduce the workload involved in practical microbiology class demonstrations is discussed.

The ideal teaching laboratory would be a 'tardis' with infinite access to personnel, funds and laboratory facilities available in the same 'time continuum' – class numbers would not be a problem. Students would develop taught practical skills, increase personal knowledge and emerge equipped to apply their skills at the end of a course. An idyll confined to the realms of myth. The reality of teaching practical groups is one of under-funding, under-staffing and timetabling nightmares: large student groups are split to handle numbers, involving repetition.

An important part of medical training is teaching students about the daily workings of a microbiology service laboratory – the types of specimen to send, what tests to request and how long it will take to get a result. It is easy to integrate two or three extra 'staff' for teaching in the laboratory but a group of 20 becomes disruptive. Learning by direct observation at the bench is no longer possible with a large group and a dedicated practical laboratory for teaching all aspects of microbiology is too expensive to maintain. Practicals devised to illustrate laboratory tests are of questionable value to medical students: they are training to be doctors, not laboratory workers. Arguably, it is sufficient to understand the principles involved in a requested test and the doctor need only be concerned with the end result and its interpretation. The end practical result for evaluation in medical microbiology is usually an agar plate containing mixed microbial flora and pathogens in unusual numbers. We all know that pathogens are subject to strict handling and containment procedures and most trainee doctors are novice laboratory workers. Inexperience, enthusiasm, curiosity and potential infection hazards are difficult to control effectively.

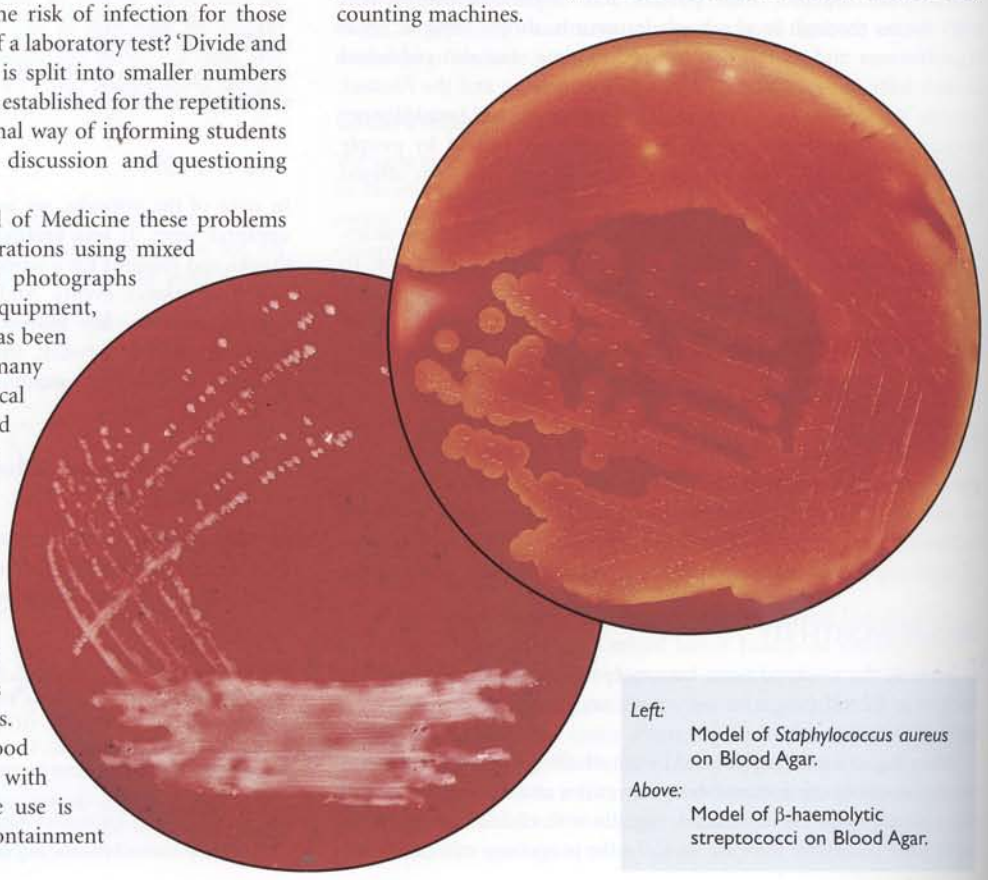
Large student groups also present a major problem. So how do you show 90 students the workings of a routine medical microbiology laboratory when direct access is not an option or selected practical work is of questionable benefit to a future doctor? What can be done to contain, minimize or eliminate the risk of infection for those who only need to observe the result of a laboratory test? 'Divide and conquer' comes to mind: the group is split into smaller numbers and then space, staff and resources are established for the repetitions. Lectures and slides are a simple, formal way of informing students but provide little opportunity for discussion and questioning during the session.

At the Royal Free Hospital School of Medicine these problems have been tackled by class demonstrations using mixed media: text articles, diagrams and photographs augmented with selected laboratory equipment, culture plates and API strips. (This has been a team effort involving input from many members of the Department of Medical Microbiology). Examination of solid exhibits gives the teaching session a tactile element. For fourth year medical students the demonstration material is grouped under various headings: infection control, control of antibiotic chemotherapy, anaerobes, gut infections, wounds, blood cultures, mycology, urinary tract infections ... and student queries can be dealt with during the sessions. Empty specimen pots, swabs and blood culture bottles are easy to display with instructions for use but live culture use is limited as the teaching laboratory is containment level one.

Preparing cultures has practical considerations: ideally one would like to show laboratory material cultured from patients but, apart from obvious safety aspects, the material may not be available when the teaching schedule is running. We have solved this problem by the use of synthetic replicas of agar plates and API strips in our demonstration, taken 'off the shelf' when required for any teaching situation remote from the service laboratory.

Originally the models used were simple to prepare and illustrated topics such as antibiotic susceptibility, media types, mucoid growth, the Nagler reaction, identification of microbes in diagnostic strips and *Mycobacterium tuberculosis* in culture. A method for moulding the surface of the agar plate was developed: silicone rubber is placed on the surface of an agar plate to create an impression mould. The impression mould is then used to make an epoxy resin cast which can be inserted into a Petri dish or other means of display. The models are complex to make but are so life-like that it is very easy to autoclave one by mistake! Accurate colonial form is duplicated for the life of the mould and can be viewed under a low power stereo-microscope (e.g. draughtsman colonies of pneumococci). Although encapsulation and embedding techniques have been used in the past to make 'permanent' microbiological exhibits, we are not aware of any totally synthetic three-dimensional models being used.

Cultures which have been made using the moulding technique for our teaching programme include β-haemolytic streptococci, *Candida albicans*, *Staphylococcus aureus*, *Escherichia coli*, *Proteus mirabilis*, *Bacillus cereus*, *Clostridium perfringens* and *Campylobacter jejuni*. We also have a battery of API strips for fungi, anaerobes, enteric bacteria, staphylococci and streptococci. Antimicrobial chemotherapy is represented by disc, strip and multi-point forms. Other specialized laboratory tests are also represented, such as 'phage' typing and the Elek plate. Beyond our own needs we have produced plates with a guaranteed 'total count' for use with colony counting machines.



Left: Model of *Staphylococcus aureus* on Blood Agar.

Above: Model of β-haemolytic streptococci on Blood Agar.

The production of the models has drastically cut the amount of work required to produce a class demonstration, as the material is always on the shelf (until revisions are needed) ready for use. Material required for examinations can be easily duplicated in the knowledge that each model will be the same and only open to one intended interpretation. Educationally, the models have far-reaching potential as they are not confined to the constraints of Health and Safety issues for display and use. We would, however, advocate that culture handling procedures are observed when plate models are used.

Our collection has proved useful beyond routine needs and models have been used in public exhibitions, video films, at hospital open days and on television. The demonstration could be further developed as an interactive computer package. Demonstration information could be presented by on-screen authoring systems with bullet points, hot spots and levels of access for the pre- and post-training doctors. The computer would be installed as a stand-alone teaching resource for education and training together with relevant three-dimensional models to examine by an on-screen prompt.

Linda Tilling, Multi-User Laboratory – Pathology, Royal Free Hospital School of Medicine, Rowland Hill Street, Hampstead, London NW3 2PF (Tel. 0171 794 0500 extn 4358; Email tilling@rfhsm.ac.uk).

Professor Jeremy Hamilton-Miller, Department of Medical Microbiology, Royal Free Hospital School of Medicine, Rowland Hill Street, Hampstead, London NW3 2PF (Tel. 0171 794 0500 extn 3271; Fax 0171 435 9694).

FURTHER READING

TILLING, L.A. (1993). *Biotechnol Educ* 4(1), 9–13.

TILLING, L. & HAMILTON-MILLER, J.M.T. (1995). In *Abstracts of the 7th European Congress of Clinical Microbiology and Infectious Diseases.*

TILLING, L. & HAMILTON-MILLER, J.M.T. (1996). *J Infect* 32, 89.

TILLING L.A. (1997). MPhil thesis, University of London.

MICROBIOLOGY NEWS

Biological Standardization and Control: the scientific basis of standardization and quality control/safety monitoring of biological substances used in medicine

World Health Organization (1997)

THIS IS THE REPORT of a wide-ranging scientific review of the field commissioned by the UK National Biological Standards Board. It was carried out by an international panel. The report has sections on Definitions and background, New developments in biologicals, Scientific and technical developments in particular areas (covering vaccines, blood products, cytokines, monoclonal and engineered antibodies, cell and tissue transplantation, genetics, spongiform encephalopathies) and Implications of the findings for organizations responsible for control. There is much to interest microbiologists in the report.

Copies available from NIBSC, Blanche Lane, South Mimms, Potters Bar EN6 3QG (Tel. 01707 654753). Price not notified.

Novartis Foundation

SINCE THE MERGER of Ciba and Sandoz to form a new company, Novartis, the Ciba Foundation has become the Novartis Foundation to reflect this change of name. The Foundation is an international scientific and educational charity which promotes co-operation in biological, medical and chemical research.

In addition to organizing scientific meetings, it provides accommodation for visiting scientists and their societies, maintains a library and runs the Media Resource Service to communicate scientific findings and ideas to the media and the public.

Any scientist making a working visit to London can stay at the Foundation's premises in Portland Place (bed and breakfast for a single room costs £42.00). See website (http://www.novartisfound.demon.co.uk) for details or telephone 0171 636 9456.

CTI Centre for Biology

The latest issue of *Life Sciences Educational Computing* contains the usual interesting variety of information, including an article on Quality Assessment of Computer-based Learning (microbiology teaching at University of Reading).

There is also a request for reviewers of various CAL packages that have been received. Items of interest to microbiologists include: *Bacterial Growth 3*, *Hyperclinic* (simulates clinical diagnosis of various diseases) and *Identibacter Interactus* (bacterial classification). Contact the Centre for details: Email CTIBiol@liv.ac.uk; Tel. 0151 794 5118.

News From Student Microbiology Societies

Edinburgh University Medical Microbiology Society (EUMMS)

EUMMS is a student-based society which arranges around 2–3 seminars per term within the Department of Medical Microbiology at Edinburgh University. These seminars are given by invited speakers, and serve to widen the knowledge of students, both by covering extra-curricular topics, and providing a deeper understanding of research principles in taught fields. Seminars also provide a balanced round-up of all fields of microbiology and are therefore useful to staff at the same time. The society is run primarily by postgraduates, along with the help of honours students.

EUMMS also plays a major role in social events within the department, organizing cheese and wines after each seminar. We also arrange many large scale events, which last year included a Christmas Ceilidh, Mulled Wine and Mince Pies evening and a traditional Burns Supper. We encouraged undergraduate students to participate in the latter, and in the past this has included recitals of Burns' poetry, informal public speaking and Scottish singing.

The following 'paper' reports on a recent seminar sponsored by the SGM.

EUMMS Seminar, 4 November 1997

The Biological Properties of the 5' Non-coding Region of Hepatitis C Virus

Professor David Rowlands

Department of Microbiology, University of Leeds

Prof. Rowlands gave a general overview of the clinical interests/manifestations of HCV and the genomic properties of HCV. The talk ended by detailing the properties of the 5′ non-coding region of this virus, including the experiments used to investigate it. Finally, we progressed to a cheese and wine reception.

Introduction

The EUMMS invited Prof. David Rowlands to give a talk on Hepatitis C Virus (HCV).

Materials and Methods

Prof Rowlands was supplied by the University of Leeds, using the Society for General Microbiology (SGM) sponsorship technique. Cheese (4 varieties), crisps (3 flavours), etc., were purchased from Tesco. Wine was provided by departmental funds.

Results

Prof. Rowlands presented the classification of Hepatitis viruses and stated that HCV has an even distribution worldwide. He also commented that HCV has an unusually high chronicity, with immunopathologic mechanisms responsible for liver damage. Chronicity is maintained by gradual mutation of the viral genome, including the HVR I epitope within the E2 region, resulting in evasion of immune responses. Evidence from Japan indicates that the majority of recent hepatocellular carcinoma cases show linkage with HCV infection, unlike the situation in 1980 when they were HBV associated.

There seems to be little hope for vaccination, as the virus can evolve to avoid immune detection. The only current immunotherapy, treatment with γ-EFN, alleviates/clears 50% of infected individuals, but this rebounds upon treatment withdrawal. As patients age, treatment becomes less successful.

The viral genome was discussed, along with difficulties in experimental investigation. The non-structural region was proposed as having target sites for anti-viral drugs, particularly virally encoded cleavage molecules.

Finally, the 5′ non-coding region of the genome was discussed, with the high degree of 20% structure and 90% sequence conservation noted. Three highly conserved domains also suggest a functional role for this region. It was revealed that the site contains an internal ribosome entry site (IRES), allowing translation without normal ribosomal capping at the 5′ end of the genome. Prof. Rowlands told the audience that by 'clipping' the 5′ and 3′ regions, it had been discovered that IRES function was lost before the end of the core region, i.e. after the AUG start codon. Reversing this 'overlapping' area caused loss of function, indicating the area does not operate purely by a spacing mechanism. This was substantiated by reporter construct experiments. A high degree of sequence conservation, even in the third base 'wobble' position, suggests a role for the RNA structure over the amino acid sequence. Mutation of seemingly random AUGs within the 5′ non-coding region caused loss of IRES function, but this could be restored by compensatory mutations to restore the stem–loop structure. In fact, mutation of the active AUG demonstrates a remarkable flexibility, indicating that the IRES controls translation.

Discussion

It was proposed that use of an IRES by HCV may act to protect the virus against host-cell shutdown. Many cellular proteins interact with this area, but those of functional importance are unknown, as is the viral response. It was speculated that a gene product switched on by a cytokine may down-regulate viral expression, and thereby act as a safety measure.

EUMMS would like to thank SGM for their continued support, and Prof. David Rowlands for an informative talk.

Malcolm S. Duthie, EUMMS Treasurer, Virus Research Laboratory, University of Edinburgh Medical School, Teviot Place, Edinburgh EH8 9AG

The UK Young Life Scientist of the Year Award

THE COMPETITION, sponsored by Promega, is being held on **Tuesday 31 March (pm)** in Pope LT C18 of the University of Nottingham.

Participating societies are: Genetical Society, Biochemical Society, SGM and BSI.

There will be 12 speakers. See accompanying programme booklet for details.

Careers 'Я' Us!

Janet Hurst & Jane Westwell

advice

Student Members may not realise that the SGM offers careers advice at graduate level. We can't find you a job or a studentship but we are happy to deal with enquiries from undergraduate students nearing the end of their course, recent graduates, Masters students or those in the throes of their PhD research.

WHAT RESOURCES ARE AVAILABLE?

The External Relations Office has a large careers collection including copies of university prospectuses, research directories, guides to postgraduate courses and training, funding literature and careers leaflets, and booklets from a wide variety of organizations and companies. We have produced our own factsheets on topics such as *Employers of Microbiologists* and *Funding*; further factsheets are in the pipeline on careers in specialist areas of microbiology that are not covered by existing literature.

A broad overview of training and opportunities is to be found in the free booklet *Careers in Microbiology*. This also includes profiles of six young microbiologists, showing how their career has progressed since they entered the world of work, and a useful list of names and addresses of other organizations. Much of the information in this booklet, together with that in the *Funding Factsheet*, is also available on the careers page of the SGM website (http://www.socgenmicrobiol.org.uk). More material is being posted all the time, so visit the site every now and then to see what's new.

WHAT SHOULD I DO IF NEED CAREERS ADVICE?

Before seeking advice from the External Relations Office you should look at the web page as it may well provide the answers to your questions. If you do not have access to the Internet then we will be pleased to send you a copy of the booklet or the factsheets. If you still need information after accessing these sources, please contact us by letter, fax or Email (*NOT* telephone) and we will do our best to help. Don't forget to give your full name and *POSTAL ADDRESS* as most replies will be sent to you by mail. We are not mind-readers and we get really fed up if we have to send you an Email or fax to obtain this information! It also slows up the response.

HOW DO I GET IN TOUCH?

Either of us will deal with your enquiry. Written requests should be sent to: External Relations Office, SGM, Marlborough House, Basingstoke Road, Spencers Wood, Reading RG7 1AE. The fax number is 0118 988 5656. Email enquiries should be addressed to:
careers@socgenmicrobiol.org.uk

conferences

We don't just sit in the office giving advice, we also go out on the road to careers events and meet our customers in the flesh. In recent years we have participated in the careers conferences organized by the Biochemical Society for undergraduate and postgraduate students of the life sciences. These are held at universities around the country on Saturdays in November, when they attract between 250 and 300 students. In 1996 we went to Edinburgh, Birmingham and London; last year we attended events at Bristol, Manchester and again in London. The conferences offer a programme of talks and workshops, an exhibition by employers and training providers, and a personal CV analysis service. Each student fills in a feedback questionnaire, so that the usefulness of the conferences can be evaluated by the organizers. Here are two accounts of careers conferences, one from the viewpoint of a student delegate, the other from behind the desk of the SGM stand!

The Student – *University of Manchester 1997*

The careers conference was organized jointly by the SGM, the Biochemical Society and the British Pharmacological Society. The programme included lectures and an exhibition covering wide areas of graduate opportunities. For those who revel in writing up projects and essays there was publishing and science communication (Portland Press and Gardiner Caldwell Communications). Fledgling scientists considering spending most of their lives with a pipetter were guided around the MSc/MPhil/MRes/PhD/postdoc and funding maze (Universities of Manchester, Glasgow and Bath, Imperial Cancer Research Fund). Alternatively research careers in companies were covered (Xenova, Astra Charnwood, Johnson & Johnson Medical). For exam addicts the 8-year clinical path to MRCPath was recommended (Hope Hospital, Manchester). Memory magicians could follow a career in patenting, where the exam pass rate is only 20%! Those who would like to pass on their knowledge were able to discuss teacher training. To help graduates find that ideal position there was advice on CVs, job hunting and interviews. Overall it was a brilliant chance to survey the wide range of opportunities after university. Full microbiological analysis of the lunch provided was not required*.

Samantha Howorth, Third Year Undergraduate, University of Central Lancashire

**Just be grateful that you did not attend the Bristol event, Samantha – Ed.*

The Weary SGM Member of Staff – *University of Bristol / Queen Mary & Westfield College, London 1997*

Bristol – At 9.30 am on a cold, November Saturday it was hard to see who looked more bleary-eyed, the students or the SGM representatives, one of whom (me) could be seen wandering around looking for a supply of strong coffee. By 10.00 am the coffee had worked its magic and there we were, bright-eyed and bushy-tailed, ready to face the world – or at the very least a barrage of enquiries from aspiring microbiologists.

Students piled into the lecture theatre to hear the talks given on different careers in the life sciences and we sat in the exhibition area waiting for the arrival of individuals who wanted to discuss their CVs. At last, somebody emerged from the lecture theatre, was it my first student? Alas no, it was a rather queasy-looking individual desperate to find the loos!

After the first set of lectures, it started to get really busy. Lots of students were milling around, picking up literature and chatting about careers. The microbiologists seemed to be in a minority that day, but many students were still interested in microbiology and the way it overlaps with the other biosciences. As the day progressed, conference participants relaxed noticeably. Had they found a decent bar where they had been able to supplement the rather meagre lunch and if so, where was it? The day ended with a presentation on finding that elusive job or studentship, after which conference participants departed for destinations as far away as Aberystwyth, laden with information packs from exhibitors.

Queen Mary & Westfield College – Another early start on a cold November Saturday, the same search for coffee but a different set of students. This time, microbiologists were in the majority (hurrah!). The day passed much as before, but this time the food was better! A great deal more time was spent going through CVs at this venue than at Bristol.

Both careers conferences were enjoyable and worthwhile from my point of view. It was good to see that students were interested in subjects across the microbiology spectrum at undergraduate and postgraduate level. It was useful to find out what information students need and also to get some feedback. One thing was clear, there is a need for consistent and clear careers advice; not an easy task since personal preferences about, for example, CV presentation can differ widely. Many students do not seem to receive (or perhaps take advantage of) careers guidance from their host institutions. The careers conferences are certainly a worthwhile venture.

Jane Westwell, External Relations & Grants Office

CVs – Make or Break

Six months on from graduating with a 2(1) and you're still stacking supermarket shelves. The PhD certificate is framed and hanging on the wall, but all you can get is bar work. Where did you go wrong? What should you do to get that first job or studentship? It's tough getting a foothold on the career ladder for today's graduate scientist. A good CV can make all the difference to your chances of getting on to the interview shortlist. Here is some practical advice on how best to present yourself and your achievements based on our experiences both as interviewer and interviewee.

First, make your CV attractive and easy to read so that it receives more than a cursory skim during the initial selection process. Use a clear font and use the available space wisely, don't leave huge gaps or squash the text together so that it requires a magnifying glass to read. Bad presentation can result in a good candidate's CV or application form being consigned to the reject pile because it was too difficult to find the relevant information. Bullet points are a good way to present information concisely without using complete sentences.

Once you have got the reader's attention, make sure that you present yourself and your achievements in the best possible light. Use action words to convey a sense of dynamism and positive thinking. Examples of suitable words include: 'developed', 'accomplished', 'organized', 'maintained', 'liaised', 'communicated'. Employers tend to look for a range of accomplishments including (in no particular order) communication skills, organizing experience, team-working, interpersonal skills, adaptability, leadership, problem solving ability, technical knowledge and achievement.

When referring to previous experiences try not to be too descriptive; base your information around the skills developed in that particular job/project. For example:

Sept. 96–Sept. 97
Events Secretary of student microbiology society

Responsibilities
Organized sales of tickets for society events
Worked with other society members to promote events
Liaised with guest speakers

The person scrutinizing a CV or application form will not read between the lines to find hidden information. If you have a particular skill say so and back up your statement with evidence.

CVs should be tailored to each job application. A general CV will miss out important information and place too much stress on less important items. If you are going for a job in scientific administration, a list of the laboratory techniques that you learnt during your PhD project is completely irrelevant, for example. The potential employer will think that you are not serious about wanting the post.

Finally, all job applications, whether by CV or form should be accompanied by a letter which shows that you are genuinely enthusiastic about the job and identifies (briefly) what skills you can offer the employer. Now it's up to you. Good Luck!

CVs

set98*

The National Week of Science, Engineering and Technology starts on 13 March 1998. Many organizations will be promoting their particular area of science to the public by means of demonstrations, lectures, exhibitions and displays. The SGM will be taking an active part this year through two events at the University of Reading.

Food Microbiology – The Good, The Bad & The Ugly

Food microbiology is the theme of the SGM's own events during setWEEK, which will aim to put food scares into a wider perspective. The approach will be to explore the 'Good' micro-organisms which are used to produce foods, the 'Bad' organisms which cause food-borne illness and the 'Ugly' ones which are responsible for food spoilage.

Public Symposium (admission free)

7.30 pm Wednesday 11 March 1998
LT27 Faculty of Letters, University of Reading

Dr Bob Rastall (Food Science Department, University of Reading)
Making a meal of microbes
Dr Carol Phillips (Nene College, Northampton)
Microbes – the hidden enemy in our food
Dr Zofia Lawrence (International Mycological Institute, Egham)
Food spoilage – stopping the rot
Chaired by Dr Lyndon Davies (Assistant Director, Institute of Food Research, Reading)

Free packs of food biotechnology products will be distributed after the talks!

Science is Fun Weekend

21–22 March 1998
Physics Building
University of Reading

copus

An interactive display on the 'Good, Bad & Ugly' aspects of food microbiology, including a computer quiz on food safety to increase knowledge of how to store, prepare and serve food safely. Contributors include: Food Science Department, University of Reading; Yakult, Institute of Food Research, Reading; International Mycological Institute; Weston Research Laboratories.

For further information (or if you would like to help man the displays) contact Jane Westwell, SGM External Relations & Grants Office (Tel. 0118 988 1821; Email j.westwell@socgenmicrobiol.org.uk).

Careers Fairs

The *Life Science at Work* stand will be at two careers events this year, both of which are aimed at school students:

Careers Live
Birmingham NEC
8–10 March 1998

UCAS NextStep Network
Business Design Centre, Islington
6–7 May 1998

Why not come along and see how the Society promotes careers in microbiology? Other organizations on the stand include National Centre for Biotechnology Education, Institute of Biology, Biochemical Society and British Society for Immunology.

Contact Janet Hurst at SGM HQ for details (Tel. 0118 988 1809; Email j.hurst@socgenmicrobiol.org.uk)

Edinburgh International Science Festival

Public Symposium
(jointly sponsored by SGM and SfAM)

Fed Up: The Secrets of the Ploughman's Supper

5.00 pm Tuesday 14 April 1998
Senate Room, Old College, University of Edinburgh

Admission free by ticket only
(on the door or from the Festival Box Office)

The Ploughman's Supper – beer, bread and cheese – a delicious combination of some traditional items of food and drink. But these are now all the products of modern biotechnology and microbes of many different kinds are used in their manufacture. In this session a top brewing expert will describe what goes into a good pint of beer, a bread microbiologist will reveal the secrets of dough and a dairy technologist will show how milk can be turned into so many tasty varieties of cheese. Chaired by Dr Bernard Dixon. Free tasting after the talks.

Details from: EISF Office, 149 Rose Street, Edinburgh EH2 4LS (Tel. 0131 220 3977; Web http://www.go-edinburgh.co.uk).

Microbiology News: Genes in Search of a Function

Milton Saier and Jonathan Reizer

Much of the genome sequence for the bacterium *Bacillus subtilis* (Moszer *et al.*, 1996; Kunst *et al.*, 1997) has recently appeared in *Microbiology*. Hundreds of newly sequenced genomes are expected to become available for analysis within the first decade of the 21st century. The volume of sequence data that will soon be available is likely to revolutionize our approach to scientific investigation. The recent genome-wide monitoring of gene expression in *Saccharomyces cerevisiae* using DNA chip technology (DeRisi *et al.*, 1997; Wodicka *et al.*, 1997) provides a prime example of efforts directed toward systematic investigation of gene function using novel technologies and conceptual tools.

While a vast majority of the genes identified in newly sequenced genomes are currently without known function, there is not even a general clue as to the functions of between 15 and 30% of these genes (Koonin *et al.*, 1997). Methodologies are currently being developed for large-scale generation of gene knockouts for identification of physiological functions as well as reporter gene fusions and DNA probes for the analysis of absolute and differential rates of gene expression for entire genomes. There is currently no systematic effort aimed at identifying the biochemical functions of gene products. Such efforts will require the development of micro methods for the overexpression of functionally uncharacterized genes, and for the purification and characterization of their products. Such studies are likely to depend upon collaborative efforts transcending national borders and organizational structures. Thus, biomedical and other pharmaceutical companies as well as academic laboratories are likely to co-operatively participate in these endeavours to an ever-increasing degree. Three examples will be cited that illustrate the use of different reverse genetic approaches to the identification of key enzymes, metabolic pathways and regulatory responses in *B. subtilis*.

Schmid *et al.* (1997) and Bernhardt *et al.* (1997) have recently constructed a two-dimensional protein index for the identification of physiologically related constituents of the *B. subtilis* proteome. These investigators used high-resolution two-dimensional protein gel electrophoresis of [^{35}S]methionine-labelled protein extracts. They analysed the gels using a sophisticated computer program, and micro sequencing of the protein spots was used to identify the complement of proteins synthesized under a specific set of physiological conditions. Constituents of the *B. subtilis* proteome were thereby categorized with respect to specific conditions for induced synthesis (Schmid *et al.*, 1997; Bernhardt *et al.*, 1997). The Sub2D protein index of *B. subtilis* can be accessed via the Web (http://pc13mi.biologie.uni-greifswald.de/sub2d/sub2d.htm). Similar mining approaches applied to a variety of sequenced bacterial genomes can be expected to verify the identification of genomic ORFs, provide information regarding the conditions and the levels of gene expression and provide information about the cellular locations of the gene products. Potential co- and post-translational modification events can readily be identified using this technology in conjunction with N-terminal microsequencing and mass spectrometry (http://arep.med.harvard.edu/labgc/proteom.html).

For several years, various laboratories had attempted classical genetic approaches to the molecular characterization of a protein kinase that was postulated to control catabolite repression and carbon utilization in Gram-positive bacteria such as *B. subtilis* (Saier *et al.*, 1996). Thanks to the *B. subtilis* genome sequencing effort, a concerted reverse genetic approach undertaken co-operatively by three laboratories has resulted in the identification of this kinase (Reizer *et al.*, 1998). The N-terminal sequence of the purified kinase allowed identification of the kinase-encoding gene (*ptsK*). Both a *ptsK* gene knockout mutant and a *ptsK–lacZ* fusion were immediately available as a result of the efforts of the international *B. subtilis* genome sequencing consortium. Sequencing of the *B. subtilis* genome and the availability of these mutants greatly accelerated the identification and characterization of the *ptsK* gene and its product. They allowed resolution of a long standing problem related to one important control mechanism for catabolite repression and inducer control in Gram-positive bacteria.

The identification of novel enzymes sometimes leads to the identification of previously unrecognized pathways. Recently, genome sequencing projects have led to the identification of hexulose-6-phosphate synthetase, a key enzyme in the ribulose monophosphate (RuMP) pathway, in several organisms, including *B. subtilis* (Reizer *et al.*, 1997). Although this pathway had previously been identified in methylotrophic bacteria, it had not been shown to occur in other organisms. The *in silico* analyses reported by Reizer *et al.* (1997) served as a prelude to physiological and metabolic analyses in *B. subtilis* that confirmed the presence of the RuMP pathway in this organism (De Wulf, 1998). Thus, an initial functional prediction for a sequenced gene product led to the identification of an entire metabolic pathway.

The drastic switch in experimental approach made possible by genome sequencing is likely to lead to changes in publication approaches. Already, many investigators are finding it preferable to publish the details of their studies on the Internet and to only summarize their findings in hard-copy journals. Virtually all of the major genome sequencing efforts and many additional genome analysis efforts have utilized this approach. Hard-copy journals thus may come to provide summary articles and guides to detailed electronic manuscripts. The latter will be of interest primarily to investigators interested in pursuing detailed studies in a specific field.

Milton H. Saier Jr and Jonathan Reizer, Department of Biology, University of California at San Diego, La Jolla, CA 92093-0116, USA.

REFERENCES

BERNHARDT, J. *et al.* (1997). *Microbiology* **143**, 999–1017.

DERISI, J.L., IYER, V.R. & BROWN, P.O. (1997). *Science* **278**, 680–686.

DE WULF, P. (1998). *Microbiology* (in press).

KOONIN, E.V. *et al.* (1997). *Mol Microbiol* **25**, 619–637.

KUNST, F. *et al.* (1997). *Nature* **390**, 249–272.

MOSZER, I., KUNST, F. & DANCHIN, A. (1996). *Microbiology* **142**, 2987–2991.

REIZER, J., REIZER, A. & SAIER, M.H., JR (1997). *Microbiology* **143**, 2519–2520.

REIZER, J. *et al.* (1998). *Mol Microbiol* (in press).

SAIER, M.H., JR *et al.* (1996). *Microbiology* **142**, 217–230.

SCHMID, R. *et al.* (1997). *Microbiology* **143**, 991–998.

WODICKA, L. *et al.* (1997). *Nature Biotechnol* **15**, 1359–1367.

The *International Journal of Systematic Bacteriology* Explores New Shores

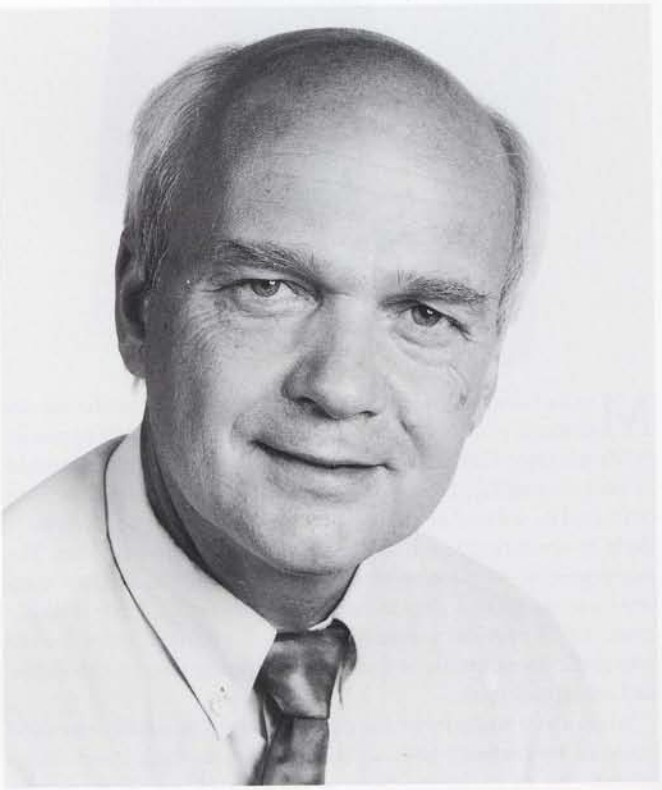
Erko Stackebrandt

Guided by the *International Code of Nomenclature of Bacteria* and educated by experience, microbial taxonomists are considered conservative scientists; they need to be to develop a long-lasting, stable and reliable classification scheme and user-friendly identification systems. Any radical external input into their research field, no matter how stimulating and fruitful this input may turn out to be, will initially stir up the community of microbial systematists; this was witnessed when molecular sequencing was introduced in the classification of prokaryotes some 20 years ago, and, just recently, when after more than 25 years of successful service to science, the publisher of the *International Journal of Systematic Bacteriology* (IJSB) changed from the American Society for Microbiology (ASM) to the Society for General Microbiology. The concerns of taxonomists about these changes expressed to the Editors of the IJSB were honest and reflected their hope that the departure from the ASM would not be accompanied by the loss of its standard and high reputation.

As the Editor of this journal, speaking on behalf of the Associate Editors, Monique Gillis, David L. Labeda, Hans G. Trüper, Jan B. Ursing and William B. Whitman, and the members of the International Committee on Systematic Bacteriology (ICSB), I must stress that this change in publisher was not initiated because of any discord with the previous publisher. The ASM has developed the publication of the previous *International Bulletin of Bacteriological Nomenclature and Taxonomy* (Iowa State University Press) into a prestigious organ for new taxa and for innovative taxonomic and phylogenetic methods. The IJSB now has a very high impact factor (3.929) that should make all previous and recent authors, reviewers and the publisher proud of their work. The journal has broadened its international character, thus fulfilling the objective given to the journal by the International Union of Microbiological Societies (IUMS).

The question is then 'why change publisher in times of extreme success?' Indeed, the IJSB was too successful in terms of numbers of accepted manuscripts and printed pages per annum, which reflects the increasing interest in prokaryotic systematics and phylogeny and the renewed focus on the isolation of novel strains. It has always been the mission of Editors of the IJSB to guide the less experienced authors along the Rules of the *Code* to maintain a high standard in the formal description of taxa. That is why the rejection rate of about 20% is rather low when compared to that of other scientific journals. For the publisher, however, this poses a problem. In times of stagnating subscription numbers and moderate increases in subscription rates, the increase in page numbers from the anticipated 1200 to more than 1600 pages over the past 2 years let the journal run steadily deeper into deficit. As the journal was not owned by the ASM, but only published by the ASM for the IUMS, this deficit could neither be absorbed by page charges nor levelled by subsidy. Both ICSB and IUMS strongly opposed the implementation of page charges for the IJSB, wishing to maintain it as an international journal encouraging microbiologists in laboratories worldwide to increase their activities in studies of microbial diversity. As a consequence, much to the concern of the Editors and taxonomists, the ASM could not but terminate its publishing agreement with the IUMS.

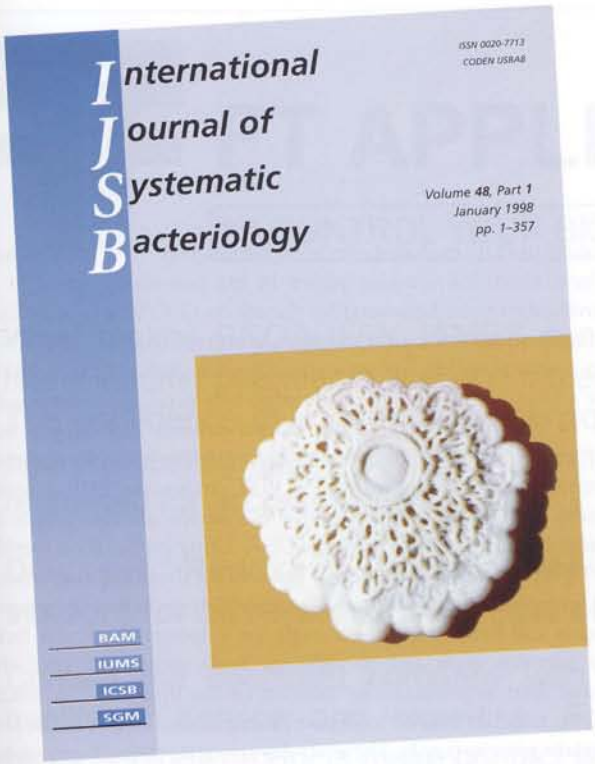
Now, for the first time in the 48-year history of the IJSB, the journal has crossed the Atlantic. After a few months of negotiation between Tim Gray, representing the IUMS, and Ron Fraser, Executive Secretary of the SGM, the IUMS has signed a publishing agreement with the SGM, a society with a long-standing successful record of publishing one of the most internationally well-known journals in general microbiology, *Microbiology*. For many years, the majority of submitted and accepted IJSB manuscripts have originated from



Erko Stackebrandt, Editor of the IJSB.

Europe/UK, so the move seems appropriate. The first experience of the Editors of the IJSB with the Managing Editor Aidan Parte has reinforced my impression that the transition period will be short and painless. The delay in the publication of the first issue of the 1998 volume by only 2 months is a distinct sign of the efficiency of the SGM and its ability to handle the new journal. The smooth transition is also due to Barbara Iglewski, Linda Illig and John Bell from the ASM who gave their full co-operation to the move and offered all their help in the transfer of files, documents and pending manuscripts.

The benefits of the move can already be noticed: authors will receive 25 offprints of their article free of charge and, as part of the redesign, each issue of the IJSB will have a different cover picture. Bacteriologists will be surprised to see a eukaryotic micro-organism on the cover of the first issue published by SGM in March 1998. The IJSB has a long tradition in publishing the taxonomy of yeasts and yeast-like organisms, although the number of novel yeast taxa has been small in the past. However, the recognition of the chimaeric structure of the eukaryotic cell at the genetic and organelle level, harbouring elements from *Bacteria* and *Archaea*, as well as the strong relationships of eukaryotic hosts with prokaryotic symbionts and parasites at various levels of interactions, makes it necessary to place the microbial cell in a broader context than traditionally dealt with by the IJSB. To better address these evolutionary, phylogenetic, systematic and ecological interactions between all micro-organisms, the vast majority of Editors of the IJSB and the ICSB, in agreement with members of the IUMS, decided to change the title of the IJSB to the *International Journal of Systematic and Evolutionary Microbiology* (IJSEM) at the last IUMS congress in Jerusalem, August 1996. The change of title and scope of the journal will take place within the next couple of years, when SGM has settled into publishing



A new look for the IJSB in 1998.

the IJSB. Despite this expansion, the journal will keep on serving the community with its prime goal, the description of taxa according to the rules outlined in the *Code of Nomenclature*. Whether or not this journal will develop into a forum for the original description of taxa of eukaryotic micro-organisms remains to be seen, and will very much depend on the selection of appropriate Editors and signals given by taxonomists that specialize in eukaryotic micro-organisms. Besides the purely taxonomic facet of the journal, publication of data on nucleic acid sequences and their importance in the elucidation of phylogenetic and evolutionary relationships will be strengthened. This is especially true for the comparative analysis of gene sequences that are going to be released from the genome sequencing efforts. The journal will remain a prime source for the description of phylogenetic relationships amongst archaeal and bacterial taxa, and serves the community of microbiologists by providing information on recent methodological approaches and their application for improving taxonomic conclusions. The regular publication of Validation and Notification Lists, which are presently compiled by Dr Norbert Weiss at the DSMZ, Braunschweig, Germany, provides recent updates of new taxa and changes in nomenclature according to the rules of the *Code of Nomenclature*. Authors who publish taxa governed by the *Code* in journals other than the IJSB are reminded to send copies of these descriptions to Dr Weiss for inclusion in a Validation List.

The last year has been stormy for the IJSB. Changing the crew in these conditions is usually judged risky and unwise but we have learnt better. The ASM and the SGM must be congratulated for their harmonic collaboration, never losing sight of the mission of the IJSB to serve the community of microbiologists. The Editors, authors and SGM are thanked for their trust in the future of the journal.

Erko Stackebrandt, Editor of the IJSB, DSMZ, Braunschweig, Germany.

From the New Managing Editor...
Aidan Parte

As Erko says above, things have gone fairly smoothly since the SGM took on the IJSB. As soon as Ron Fraser appointed me as Managing Editor (well before the publishing contracts had actually been signed), I started working on the new Guidelines for Authors for the Website; since the first issue is not due until March, having a Web presence has proved invaluable for the Guidelines and also for publicizing the fact that SGM is the new publisher. After a visit to Erko in Braunschweig, where we discussed the new format, editorial procedures and future development of the journal, the hard work began.

One day, 50 papers arrived from the ASM. The major difference in journal production between the SGM and the ASM is that we edit as many of our papers as possible on-screen and have them typeset from disk, whereas the ASM typeset from the hard copy. This necessitated requesting disks from the authors of all accepted papers (where would we be without e-mail and fax technology!) and some changes to the reference list; the response from authors has been excellent.

In the meantime we needed to promote and sell our new journal, largely by mailshots to existing subscribers; the orders are coming in thick and fast, so our Finance Manager, Richard Noble, is happy!

The next job was setting up a manuscript-tracking database so that we know exactly where a manuscript is at any given time, be it with the Editors or authors, in the office or at the printers. To avoid re-entering all the data (a virtually impossible task), we obtained an electronic version of the ASM database and, after much sweating (and swearing!), ran the data into a version of the existing *Microbiology* database.

Back to those papers. We have sent 37 papers to press for the first issue. Thanks are due to Ian Atherton, Susan Westgate and Anne Gurr for their help in editing them, and to Kendra Waite for her administrative skills. A recent development is the posting of advance journal contents lists on the Web site; these have proved popular and, being a quarterly journal, it will be particularly useful to let the world know what is coming up in the IJSB well in advance of publication.

I am looking forward to the first year of the new IJSB and its expansion into related areas. It will be a challenge for everyone involved.

JGV News: *Ménage à Trois*

Stuart Siddell

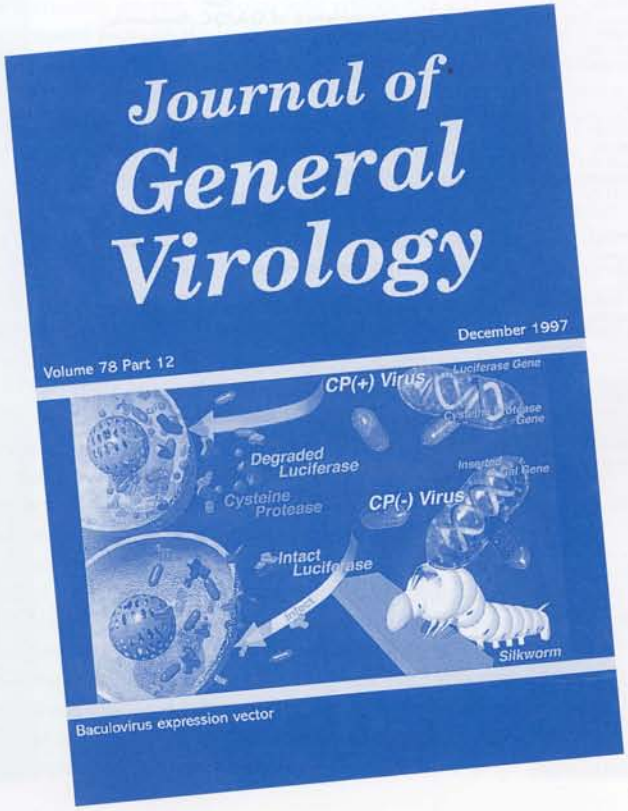
For many of us, the term 'insect virus' means little more than the use of baculovirus vectors for the over-expression of foreign proteins in *Spodoptera frugiperda* cells. However, two recent papers in the *Journal of General Virology* highlight another group of insect viruses, the polydnaviruses (PDVs), that have got themselves mixed up in a complex, but fascinating, tripartite relationship with endo-parasitic wasps and their lepidopteran hosts.

Basically, the parasitic wasp lays its eggs in the caterpillar, ensuring an optimal environment for larval development. However, even caterpillars have been equipped with an immune system and, without any further intervention, the host would most likely be able to thwart the wasp's parasitic ploy. And this is where the virus steps in. PDVs, which are replicated in the wasp ovary and co-injected with the eggs during oviposition, apparently play an important role in modulating the developmental and immune programmes of the caterpillar host. The intervention of the virus tips the scales in favour of the wasp and, as we shall see later, they appear to be rewarded with the gift of Mendelian inheritance.

Asgari and colleagues (JGV **78**, 3061–3070) have investigated the immune modulatory-related properties of CrV1, a PDV-encoded, 45 kDa glycoprotein that is expressed in, and secreted from, the haemocytes of caterpillars parasitized by the wasp *Cotesia rubecula*. Although the precise details of cellular immunity in insects are not well understood, immune activation of haemocytes is thought to involve alterations at the cell surface, including a rearrangement of lectin-binding sites and microparticle formation. The inhibition of these processes would preclude encapsidation of foreign bodies and severely compromise the effectiveness of the immune system. Using recombinant protein, produced from either baculovirus or plasmid expression vectors, Asgari *et al.* show that CrV1 alone is able to inhibit both cell surface changes (as measured by exposure of HPL-binding protein) and microparticle formation (as measured by the exposure of phosphatidylserine) in a way that is virtually identical to PDV-mediated effects on haemocytes. Thus, they appear to have identified a major player in the subversion game. It is interesting to note, however, that the effects of CrV1 are reversible, so there are obviously more surprises in store.

In a second article, Savary and colleagues (JGV **78**, 3125–3134) have addressed the genetic relationship between *Cotesia congregata* and its polydnavirus (CcPDV). Earlier studies had shown that PDV sequences can be transmitted as Mendelian traits via the wasp germline and sequences present in PDV circles (the PDV genome consists of multiple, double-strand DNA circles) are also present in a linear form in the wasp genomic DNA. Using probes for a specific CcPDV gene (the early protein 1 gene, EP1), these authors showed that both circular and integrated forms of EP1 sequences are present in male and female wasps, although the amounts of circular form vary between sexes and in different body parts. Moreover, the circular form is produced by excision of the integrated sequences and this reaction may be mediated by an enzyme related to the Hin invertase protein family. These results are quite thought-provoking as, to put it mildly, they seem to blur our conventional view of the viral genome.

JGV takes pride in publishing papers relating to all categories of viruses. The viruses of vertebrates and agricultural crops may sometimes seem to overwhelm but a great deal of interesting reading can be found elsewhere, if only we can find the time to browse for it.



Professor Stuart G. Siddell, JGV Editor-in-Chief, Institute of Virology and Immunology, University of Würzburg, Versbacher Str. 7, 97078 Würzburg, Germany [Tel. +49 931 201 3966 (lab) or 3896 (office); Fax +49 931 201 3934; Email siddell@vim.uni-wuerzburg.de].

ROYAL SOCIETY – ESSO SCIENCE – EDUCATION PARTNERSHIP GRANTS

The Partnership Grants have been designed to encourage ideas for activities from teachers, scientists and engineers that enable primary and secondary school children to experience something of the nature, processes and excitement of science and the benefits it brings to society. Grants in the range £250–£1500 are available to support activities and initiatives aimed at promoting scientific research in schools. These can be one-off events or continuing projects. The deadline for the receipt of applications is **30 April 1998.**

Further details and application forms are available from: The Royal Society, 6 Carlton House Terrace, London SW1Y 5AG (Tel. 0171 451 2570; Email sep.grants@royalsoc.ac.uk).

ROYAL SOCIETY & BRITISH ASSOCIATION MILLENIUM AWARDS

Scientists with a good idea for involving their local community in promoting awareness and understanding of science and technology can apply for grants ranging from £1000–£10,000. The money, which is provided by the Millenium Commission from National Lottery funds, can be used to develop skills or acquire the resources or equipment needed to convert ideas into action. **Closing dates in 1998 are 30 June and 31 December.**

For further details and proposal forms contact: Millenium Awards Administrator, BA, 23 Savile Row, London W1X (Tel. 0171 973 3069).

SocietyNews

November Council Meeting

New Members of Council

OUR NEW PRESIDENT, Professor Howard Dalton of the University of Warwick, opened the first meeting of his period of office by welcoming newly elected members, George Salmond (University of Cambridge) and Chris Thomas (University of Birmingham), as well as re-elected member Ulrich Desselberger (Public Health Laboratories, Oxford and Cambridge).

New Treasurer

COUNCIL MEMBERS enthusiastically approved the appointment of Peter Stanbury (University of Hertfordshire) as Treasurer, to succeed Allan Hamilton on his retirement from office later this year. It is gratifying to note that despite the demands on time and energy of employment today in the universities and elsewhere, individuals of ability are still prepared to help look after the affairs of the Society.

Finance Reporting

AN INNOVATION with which the new Treasurer will soon be familiar was revealed to Council by Allan Hamilton. The newly appointed Financial Manager Richard Noble has developed, and already implemented, new reporting processes. These include monthly reports on key financial statistics and quarterly management accounts. These give up-to-date details of cash flow and balances, and are in a format which allows for the fact that the Society's income is mainly gathered at the year-end, while expenditure is spread throughout the year. Council members were appreciative of the changes and with practice, will no doubt learn to interpret the finer details revealed by the figures!

The Dearing Report

COUNCIL IS NOW giving detailed consideration to its response to the Dearing Report. Jeffrey Almond pointed out that the report had neglected to examine some important aspects of University business which were highly relevant to the activities of many Society members, such as the quality of PhD training. Council agreed to formulate a response to Dearing on this and other matters, which will be fed back to the Committee in the near future.

Charles Penn, General Secretary

Nominations for Members of Council

Three members of Council, ***Professor J.C. Fry***, ***Dr L.A. Glover*** and ***Dr N.D. Stow***, retire from Council in September 1998.

Nominations are invited from Ordinary Members to fill these three vacancies. All nominations must include the written consent of the nominee and the names of the proposer and seconder, both of whom must be Ordinary Members.

Members submitting nominations should indicate the main area of microbiological interest of their nominee, who must have been a member of the Society for at least two years.

Nominations should be sent to the SGM General Secretary, Dr C.W. Penn, School of Biological Sciences, Biology West Building, University of Birmingham, Birmingham B15 2TT, to arrive ***no later than 24 April 1998***.

SGM MEMBERSHIP SUBSCRIPTIONS 1998

All members receive the *SGM Quarterly*; in addition they may take any of the Society's journals.

ORDINARY MEMBER		
Membership Subscription (inc. *SGM Quarterly*)	£35.00	(US$60.00)
Additional subscriptions for publications:		
Microbiology	£56.00	(US$100.00)
JGV	£56.00	(US$100.00)
International Journal of Systematic Bacteriology	£45.00	(US$70.00)
STUDENT OR RETIRED MEMBER		
Membership Subscription (inc. *SGM Quarterly*)	£15.00	(US$25.00)
Additional subscriptions for publications:		
Microbiology	£28.00	(US$55.00)
JGV	£28.00	(US$55.00)

Notices

Microscene Noticeboard

At the Spring meeting of the Society to be held at Nottingham University, a board will be set up with advertisements of jobs, post-doctoral positions, studentships, courses, conferences etc. The notices should be in a standard format: 6"x 4" card with details of the post or meeting and name, address and telephone number of the advertiser. A4 size posters are also acceptable. There will be a small charge for commercial organizations. Contributions for the board may either be brought to the meeting or sent beforehand to Janet Hurst at SGM HQ.

News of Members

New Year Honours

Professor John P. Arbuthnott, Principal, University of Strathclyde, Glasgow, has been made a Knight Bachelor for services to higher education.

Professor John R. Pattison, Dean, University College London Medical School and Chair, Spongiform Encephalopathy Advisory Committee, has been made a Knight Bachelor for services to medicine.

Dr Grace Alderson, currently Dean of the Faculty of Health and Environmental Sciences, University of Bradford, has been awarded a Personal Chair within the Department of Biomedical Sciences. Her new title is Professor of Medical Microbiology.

Dr L.A. Casselton, Department of Plant Sciences, University of Oxford, has been appointed to a visiting professorship at the School of Biological Sciences, Queen Mary and Westfield College.

Dr A.G. Papavassiliou, Associate Professor of Biochemistry, University of Patras School of Medicine, Patras, Greece, has been appointed to the distinguished Board of Contributing Editors of *Molecular Medicine*, the official journal of the Molecular Medicine Society, USA, of which he was elected a Fellow in May 1996.

The Society notes with regret the deaths of ***Dr D.W. Fletcher*** (member since 1956) and ***Dr John Treharne*** (member since 1964).

SocietyNews

Grants & Awards

GRANTS ON THE WEB!

Information on all of the Society's grant schemes is now available on the SGM website at http://www.socgenmicrobiol.org.uk

You can also download the application forms for some schemes. Click on the External Relations & Grants button for details.

President's Fund

YOUNGER MEMBERS of the Society are reminded that the President is prepared to consider applications for limited financial support for one of the following:

1. Travelling to present a paper or a poster on a microbiological topic at a scientific meeting.
2. Making a short research visit.
3. Attending a short course (up to two weeks).

Grants are usually limited to £100 for attendance at meetings or institutions in the UK and Republic of Ireland, £155 for travel to Europe and £220 for travel to North America, Japan and the rest of the world.

Applicants must be resident and registered for a PhD in a country in the European Union. Grants are restricted to applicants who have not received an award from the President's Fund to attend a meeting, visit or course in the calendar year prior to the application. The full rules of the scheme were published in the November 1997 issue of the *Quarterly*.

The Watanabe Book Fund

A GENEROUS DONATION to the Society by Professor T. Watanabe of Japan has enabled us to set up a fund to make annual awards for the benefit of members in developing countries. This is distinct from our own International Development Fund.

Members of the Society who are permanently resident in a developing country may apply. The purpose of the fund is to enable members involved in higher education and/or research to acquire for their libraries books or possibly journals relating to microbiology.

Applications should include:

1. A list of the publications required together with an estimate of their cost (the total cost for any one application should not exceed £350 sterling).
2. A letter from the Head Librarian of the organization certifying the need for the books and the address to which the books should be sent, a statement on where the books will be kept and an outline of the loan arrangements for members of the organization.
3. A description of the member's organization and its involvement in microbiology, the number of staff and students and details of the nature of any courses in microbiology provided by the organization, i.e. BSc Microbiology, technical training, etc.
4. A curriculum vitae of the principal applicant.

None of these items (1–4) inclusive should exceed one side of A4 paper each.

The closing date for applications is **3 October 1998.** Applications (single copies) should be sent to the Grants Office at SGM Headquarters.

Awards 1997

Three applications to the Fund were received in 1997. Awards of publications to the value of £300 each were made to Dr T.K. Adiku, Department of Microbiology, University of Ghana Medical School, Accra, Ghana and Professor R.F. Schwan, Department of Biology, Federal University of Lavras, Brazil.

Postgraduate Student Meetings Grants

POSTGRADUATE STUDENT Members of the Society currently resident in the UK or another European Union country are eligible for a grant to cover the costs of accommodation and travel in attending one of the following SGM meetings: Nottingham University, March 1998; University of East Anglia, September 1998; Warwick, January 1999 and any other Society Group or Branch meeting in 1998. An application form giving full details of the scheme was sent to each Student Member with their subscription invoice in October 1997. Student members should submit their applications well in advance of a meeting if they wish to ensure that the grant is received before making their booking.

Vacation Studentships 1998

A LIMITED NUMBER of awards are available to enable undergraduates to work on microbiological research projects during the summer vacation. The purpose of the awards is to provide undergraduates with research experience and to encourage them to consider a career in scientific research. The studentships provide support at the rate of £120 per week for a period of up to 8 weeks. An additional sum of up to £400 for specific research costs may also be awarded. Applications on behalf of named students are invited from SGM members in higher education institutions and research institutes. The full rules of the scheme were published in the November 1997 *Quarterly* (p.130). The closing date for applications, which must be made on a form supplied by the Grants Office, is **20 March 1998.**

International Development Fund Awards 1997

THE FOLLOWING AWARDS HAVE BEEN MADE FROM THE SOCIETY'S INTERNATIONAL DEVELOPMENT FUND. THE FUND EXISTS TO PROVIDE TRAINING COURSES, PUBLICATIONS AND OTHER ASSISTANCE TO MICROBIOLOGISTS IN DEVELOPING COUNTRIES. THE RULES FOR THE 1998 FUND WILL BE ADVERTISED IN THE MAY ISSUE OF THE *QUARTERLY*.

Mr L. Baillie, CBD Porton Down – £4,000 to finance the attendance of microbiologists from developing countries at the 3rd International Conference on Anthrax, University of Plymouth, September 1998.

Dr B. Liu, Department of Molecular Microbiology, University of Southampton – £2,232 to run a short lecture course on enteric viruses and practical training in the detection of viral antigens from faecal specimens at the Chinese Academy of Preventative Medicine.

Dr G.B. Nair, National Institute of Cholera and Enteric Diseases, Calcutta – $4,000 to provide a UNESCO-IUMS-MIRCEN short-term fellowship to enable a young microbiologist from a developing country to use the research facilities in a laboratory in a developed country.

Mrs M.A. Sokmen, Ondokuz Mayis University, Turkey – £4,834 to fund the development of techniques to detect and identify virus pathogens of solanaceous plants in the Black Sea Region of Turkey.

Professor J.M. Thresh, National Resources Institute, Greenwich – £1,260 to run seminars and training programmes on cassava mosaic virus in Kenya and Tanzania.

For application forms and details of any schemes contact the Grants Office, SGM, Marlborough House, Basingstoke Road, Spencers Wood, Reading RG7 1AE (Tel. 0118 988 1821; Fax 0118 988 5656; Email grants@socgenmicrobiol.org.uk).

SocietyNews

Fellowship Announcement – *UNESCO-IUMS-SGM-MIRCENS 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 especially to developing countries. The SGM, a member society of the IUMS, is making a separate contribution to this programme from its International Development Fund. The UNESCO-IUMS-SGM-MIRCENS short-term fellowship is a co-operative scheme between the listed organizations to provide an opportunity for young microbiologists from any developing country to pursue, or to complete, 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-SGM-MIRCENS 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 inter-regional scientific co-operation.

The applicant from a developing country must be a permanent employee in the country of residence, must have adequate work experience, must have completed at least 5 years of post-doctoral 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, six fellowships are available every year, of which two should be served in laboratories in the UK.

The award will be up to US$4000 for travel and subsistence (room & 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 are 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 the applicant's achievements. Applications must be submitted to Dr G. Balakrish Nair, National Institute of Cholera and Enteric Diseases, P-33, CIT Road, Scheme XM, Beliaghata, Calcutta 700010, India (Fax +91 33 3505066; Email krishgb@giascl01.vsnl.net.in).

Colworth Prize Lecture

The Colworth Prize Lecture is sponsored by the Colworth Laboratory of Unilever Research and is awarded biennially by the Society in recognition of an outstanding contribution in an area of applied microbiology. The award is £1000. Previous recipients of the award were:

Dr Geoffrey T. Yarranton (Department of Molecular Genetics, Celltech Ltd, Slough) for his work in the development of stable, controlled expression systems in bacterial, yeast and mammalian cells for commercial production purposes

Dr Philip D. Minor (Head of the Division of Virology, National Institute of Biological Standards and Control) for his outstanding scientific contribution to the production of polio virus vaccines

Professor Gordon Dougan (Imperial College, London) for his work on vaccine development and his contribution to the WHO on the production of experimental leprosy vaccines

Dr Mervyn J. Bibb (Department of Genetics, John Innes Institute, Norwich) for his contribution to the genetic regulation of antibiotic production by Streptomyces

Professor Gordon S.A.B. Stewart (Department of Applied Biochemistry and Food Science, University of Nottingham) for his contribution to the application of molecular biology in practical bacteriology

Nominations are now invited by the Council Award Panel for the sixth Colworth Prize Lecturer who will be expected to present his lecture at the Society Spring meeting in 1999.

Rules

1. The Colworth Prize Lecture shall be awarded biennially for an outstanding contribution in an area of applied microbiology.
2. Nominations 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 applied 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 applied microbiology.

   The General Secretary will be pleased to advise members preparing nominations about the information to be supplied.
3. There will be no restriction by reason of age or nationality of those eligible for nomination for the Colworth Prize Lecture. Recipients of the Lectureship may not be nominated on a subsequent occasion.
4. The recipient of the Colworth 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, and to repeat the lecture at the Colworth Laboratory. 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 two journals.
5. Nominations should be sent to the General Secretary, Dr C.W. Penn, School of Biological Sciences, Biology West Building, University of Birmingham, Birmingham B15 2TT no later than **30 April 1998**.

1998 Marjory Stephenson Prize Lecture

Professor Rudolf Thauer

The 1998 Marjory Stephenson lecturer is Professor Rudolf Thauer, Max-Planck-Institut für terrestrische Mikrobiologie, Marburg, Germany.

Title of talk:
Biochemistry of methanogenesis

Rudolf Thauer was born 1939 in Frankfurt/Main. He studied medicine and biochemistry at the universities of Frankfurt, Tübingen and Freiburg. His researches into the energy metabolism of *Clostridium kluyveri* at the University of Freiburg led to a PhD in 1968, and he was appointed an Assistant Professor in the same institution in 1971. He spent a period in the States in 1972 as Guest Scientist in Cleveland, Ohio, working with H.G. Wood, before becoming Associate Professor at the Ruhr-Universität Bochum later that year. Since 1976 he has worked in Marburg, firstly as Professor in the Department of Microbiology, Philipps-Universität and more recently at the Max-Planck-Institut für terrestrische Mikrobiologie where he was appointed Director in 1991.

Professor Thauer's researches have focused on the biochemistry of anaerobic bacteria, especially of methanogenic archaea and sulphate-reducing bacteria, and he has published over 300 papers in peer-reviewed journals. His distinguished contribution to our knowledge of this field has been recognized by numerous honours and awards.

SocietyNews

New Group Conveners

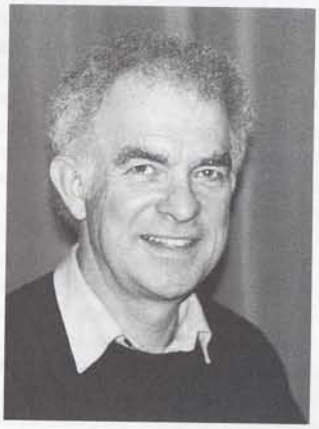
Geoffrey L. Smith *Virus*

A YORKSHIREMAN, who lived his first 3 years within earshot of Headingley cricket ground, and was educated at Bootham School, York and the University of Leeds (BSc Microbiology/ Biochemistry, 1977). He studied the replication of the influenza virus genome for his PhD at the National Institute for Medical Research, Mill Hill in Alan Hay's laboratory. This was followed by a postdoctoral fellowship at the National Institutes of Health, Bethesda, USA in Bernard Moss's laboratory (1981–4). Here, together with Michael Mackett, he developed vaccinia virus as an expression vector, which became a popular tool for virologists, molecular and cellular biologists, immunologists and for vaccine development. On 1.1.85 he returned to England to a lectureship in virology in the Department of Pathology, University of Cambridge and established a research group studying vaccinia virus. In 1988 he was awarded the Jenner Fellowship of the Lister Institute of Preventive Medicine and, freed from university teaching duties, devoted more time to research. By sequencing part of the virus genome, many vaccinia genes were identified with similarity to human genes and that contribute to virus virulence. In 1989 he accepted a Readership in Bacteriology and moved to the Sir William Dunn School of Pathology, University of Oxford. Here the research group expanded and studied how vaccinia virus enters and exits the cell and how it evades the host response to infection. A notable feature was the discovery of several virus-encoded soluble proteins that bind and inhibit cytokines, chemokines or interferons. In 1992 he received the Fleming Award from the Society for General Microbiology.

Geoffrey is a keen sportsman, having played county and divisional hockey and school county cricket. He is married and has four children. He has served the Society as a Member of the *Journal of General Virology* Editorial Board (1988–92), the Virus Group committee (1989–91 and 1996–), and his term as Convener of the Virus Group runs until 2002.

Peter Wyn-Jones *Education*

MY INTEREST IN MICROBIOLOGY followed our school Biology master shaking out some woodwool packing over an agar plate and growing *Bacillus subtilis*, apparently from nowhere. Reading Hawker's *Introduction to the Biology of Micro-organisms* and Collins' practical books got me interested in medical microbiology and into the degree course at Surrey University under the sometimes acerbic eye of John Smith, who introduced us all to the wider world of veterinary microbiology and me to the ways in which research and teaching in microbiology can go hand-in-hand, given the chance. We were learning computer taxonomy as far back as 1969, through his studies on the enteric bacteria.



Virology was my real interest, however, and a studentship at the Wellcome Research Laboratories on Marek's disease provided ample opportunity to learn the craft under some good teachers: the need to maintain a clear picture of the problem was brought home by June Almeida who seemed to get wonderful EM pictures of viruses with apparently little effort, but knowing just what a particular method would or would not do.

Veterinary virology was not really an option at Sunderland and I developed an interest in water and environmental virology. We have excellent collaboration with the PHLS and the common interest in techniques for detection of low levels of micro-organisms in environmental materials has been very fruitful in many ways.

Microbiology is an intensely practical subject and the reduction in the unit of resource in teaching has brought problems in maintaining the quality (in the true sense) of practical teaching. Sir Fred Dainton, when Chairman of UGC said that the principal job of a university lecturer is to communicate his enthusiasm for his subject to his students – this remains as true now as in the 1970s, and a task for all of us is to keep that enthusiasm going even in the face of strictures and sometimes blind ignorance.

Relaxation – what's that? My photographic collection of trees and their microscopic structures grows slowly, and I have great fun walking my Border collie over the moors of North Yorkshire, except he never knows when to stop. Perhaps he needs some educating too!

Howard Jenkinson *Cells & Cell Surfaces*

HOWARD OBTAINED HIS BSc in Microbiology and Virology at the University of Warwick (1975) and a PhD in Applied Biochemistry at the University of Nottingham School of Agriculture (1978). He worked for 5 years as a postdoctoral research assistant with Joel Mandelstam in the Microbiology Unit, Oxford on the biochemistry and genetics of *Bacillus subtilis* sporulation and was appointed lecturer in Oral Biology at the University of Otago (Oral Biology and Oral Pathology), New Zealand in 1983. He was promoted to senior lecturer in 1987 and awarded a personal chair in 1996. During this period he was a Commonwealth Visiting Fellow at Cambridge (1989–90) and Oxford (1995–6). He was appointed to the Chair of Oral Microbiology at the University of Bristol in July 1997. Howard was Secretary, then President, of the New Zealand Section of the International Association for Dental Research (1987–94), Secretary of the New Zealand Microbiological Society (1991–4), and has been a member of the C&CS committee since 1996.

Howard's primary research interests are concerned with the molecular characterization of microbial cell surfaces, particularly the adhesion and colonization determinants of bacteria. Current projects include the role of cell-surface-anchored polypeptides in colonization of oral mucosal and hard surfaces by bacteria and genetics and biochemistry of ATP-binding cassette transport systems in solute uptake and drug resistance in human microbial commensals and pathogens.

SocietyNews

New Editor-in-Chief of the Journal of General Virology

Stuart Siddell

ALTHOUGH I HAVE BEEN INVOLVED in the study of animal viruses for over 20 years, I have to admit to being trained as a plant biochemist with an interest in chloroplast biogenesis. However, after obtaining a PhD in Biological Sciences at the University of Warwick in 1976, I decided to devote myself full-time to the study of viruses and my first professional appointment was as a postdoctoral fellow in the laboratory of Alan Smith at ICRF. I can still remember the excitement of the first DNA restriction enzyme digest using *Pst*I that I had purified myself from a large slab of dark-brown, frozen bacteria. In 1980, I moved to the Institute of Virology and Immunology at the University of Würzburg and, ever since, my research has focused on a group of positive strand RNA viruses, the coronaviruses. My main areas of interest are the study of coronavirus gene expression, the structure–function relationships of coronavirus proteins (in particular those involved in RNA transcription and replication) and, more recently, the molecular mechanisms of (measles and corona-) virus-induced immunosuppression.

I joined the SGM in 1977 and served my apprenticeship as a JGV Editor from 1991 to 1997. As the first Editor-in-Chief of JGV based in continental Europe, I feel it is my particular duty to increase the representation and influence of European scientists on the journal. It will also be a major challenge to steer JGV even deeper into the age of 'electronic publishing' and, at the same time, maintain the remarkably high standards of scientific quality and presentation achieved by my predecessors. I am confident these challenges will be met and the journal will continue to prosper.

New Honorary Members

AT THE MEETING IN NOVEMBER 1997 COUNCIL WAS PLEASED TO INVITE THE FOLLOWING DISTINGUISHED MICROBIOLOGISTS TO BECOME HONORARY MEMBERS OF THE SOCIETY.

Professor J. G. Morris

PROFESSOR GARETH MORRIS, who retired recently from the founding Chair of Microbiology in the University of Wales Aberystwyth, was born in South Wales in 1932. He graduated in Biochemistry in the University of Leeds and then moved to the Microbiology Unit of the Department of Biochemistry in Oxford where his DPhil studies, on the route of vitamin B6 biosynthesis in *Escherichia coli*, were supervised by D.D. Woods. He remained in Oxford (Trinity College) as a Guinness Research Fellow until in 1959, funded by a Rockefeller Fellowship, he spent a year in the University of California, Berkeley working with R.Y. Stanier on acetate metabolism by photosynthetic bacteria. In the same building on the Berkeley campus Melvin Calvin's group was studying the route of carbon dioxide fixation by photosynthetic algae and Daniel Arnon's group was investigating the mechanism of photophosphorylation. It was a thrilling experience to attend the joint seminar sessions held by these three pre-eminent research teams, but his year in California concluded even more memorably by his participation in the famed summer school given by C.B. van Niel at the Hopkins Marine Station in Pacific Grove. Though initially he returned to his research fellowship in Oxford and a Tutorship at Balliol College, in 1961 he accompanied H.L. Kornberg when he moved to the University of Leicester to establish a Department of Biochemistry there. Apart from a sabbatical with H.E. Umbarger in Purdue University, Indiana, he remained in Leicester for 10 of the most enjoyable years of his career. Though initially studying the routes of utilization of C2-compounds (including glycollate) by a variety of aerobic and anaerobic bacteria, during this period he developed the particular interest in anaerobic fermentations and biotransformations that he brought with him to Aberystwyth in 1971. Here bacteriology, mycology and phycology were already well established, but when later joined by Douglas Kell and Michael Young he was able to develop an expert group in anaerobic microbial physiology and genetics (with especial emphasis on non-pathogenic species of *Clostridium*). Studies undertaken by this group included investigations of methods of defence against oxygen toxicity employed by anaerobes, mechanisms/pathways of fermentative substrate utilization, regulation of sporulation and solvent production by clostridia, on-line methods of monitoring fermentations, and the exploitation of clostridia and lactic acid bacteria as agents of chiral bioreductions of a variety of synthons. In the early 1970s under the tutelage of John Postgate he served as a member of the Editorial Board of the *Journal of General Microbiology* and, from 1978 to 1983, with the late Tony Rose, he jointly edited *Advances in Microbial Physiology*. He also authored the well received textbook *A Biologist's Physical Chemistry* (1968 & 1974).

Over the years he has served in membership of a variety of advisory bodies. He was a member of the Science Board of the SERC, and from 1978 to 1981 he served as Chairman of its Biological Sciences Committee. As a member of the University Grants Committee (1981–1986) he chaired both its Biological

SocietyNews

Sciences Sub-Committee and its Agricultural and Veterinary Sciences Sub-Committee. In 1988 he was appointed the first Chairman of the UK Forum for Microbiology and he currently serves as a member of the Governing Body of the Institute for Grassland and Environmental Research and as a member of the Royal Commission on Environmental Pollution. He was elected FRS in 1988 and was appointed CBE in 1994.

Looking back over the 40 years of his University career he says that he was especially fortunate in three respects. "First, in having been exposed in the formative years to the influence of so many first-rate teachers and inspirational senior colleagues. Second, having latterly been able to enjoy the rare privilege of being able to work in the company of like-minded friends in an exceptionally beautiful (if rather remote) location with only a small familial research group and tolerable funding and policy constraints. Third, and most importantly, having been so well served by a succession of quite exceptionally gifted and genial graduate students and postdoctoral fellows; it has been most rewarding to maintain contact with them and to observe how their remarkably diverse skills have elevated so many to international prominence in their subsequently chosen specialisms."

Looking forward, he hopes to enjoy three years of part-time teaching in the Institute of Biological Sciences in Aberystwyth and the greater liberty that this will give him to read more widely (The National Library of Wales is conveniently close). The *SGM Quarterly* and *Microbiology* will, he trusts, help him to continue to derive pleasure and excitement from a discipline that has been the source to him of so much enduring enjoyment.

Professor C. R. Pringle

THE DECISION OF THE COUNCIL of the Society for General Microbiology to confer on me the status of Honorary Membership was an unexpected and deeply appreciated distinction. I regard this award as a tribute to the many colleagues, collaborators and students with whom I have been associated during my career as a virologist, as well as a personal honour.

Born in Glasgow in 1930, I received my initial scientific education at the University of Glasgow in the Departments of Zoology and Genetics (then headed by C.M. Yonge and G. Pontecorvo, respectively). Subsequently, I moved to Edinburgh to undertake 3 years postgraduate research with G.H. Beale, on the genetic determination of the surface antigens of *Paramecium*. Then followed a 30-month interlude of military service, mostly at the Joint Services School for Linguists and the Department of Slavonic Studies, Cambridge University, aspiring to master the Russian language. In 1958 I became a civilian again and for 4 years was an Assistant, a minor position now extinct, in the Natural History Department of Aberdeen University, where I was able to rehabilitate my scientific career.

In 1962 I was appointed Geneticist at the Research Institute, Pirbright (later to become the Animal Virus Research Institute), in succession to John Subak-Sharpe. In 14 hectic days he turned me into a virologist and taught me all that was then worth knowing about classical virology. The era of monolayer cell culture was dawning and virology was blossoming into an exact science. My earliest contribution as a virologist was the demonstration of genetic recombination in foot-and-mouth disease virus (a positive strand RNA virus), although recombination in viruses with RNA genomes was a phenomenon not widely accepted until some years later.

In 1968 after 6 years at Pirbright, interrupted by a short spell in Bacteriology in Aberdeen, I was invited by John Subak-Sharpe to become a founder member of the reconstituted MRC Virology Unit in Glasgow, where I remained until 1983 when I was appointed to a Chair in the Department of Biological Sciences at Warwick University. In Glasgow I worked on the genetic properties of both monopartite negative strand RNA viruses (rhabdoviruses and pneumoviruses) and segmented genome negative strand RNA viruses (bunyaviruses). The development of a candidate live attenuated respiratory syncytial virus (RSV) vaccine was initiated in Glasgow and continued at Warwick. Although never brought to clinical use, sequencing of the genome of this virus and its virulent progenitor has identified key mutations in the process of attenuation of RSV, a respiratory virus which afflicts mainly the new-born and the elderly. It is hoped that this information, in conjunction with the recent development of methods of reverse genetics for respiratory syncytial virus, will contribute to the development of a safe paediatric vaccine.

During the winter of 1996/7 I worked with Gail Wertz and Andrew Ball in Birmingham, Alabama, assisting both in the re-engineering of the genome of the rhabdovirus, vesicular stomatitis virus (VSV) and in the study of the phenotypic properties of VSV in which the sub-terminal genes had been rearranged in all possible combinations. Unexpectedly, this research has revealed new ways of controlling the virulence of RNA viruses. The intellectual stimulus of this experience has served to counteract the onset of mental stagnation in retirement and has re-awakened a curiosity about virus phylogeny which is giving more purpose to my continuing commitments as Secretary of the International Committee on Taxonomy of Viruses and Editor of *Virology Division News* for the Virology Division of the RMS.

During my career I have been privileged to serve as a member of a variety of national and international committees, including the MRC Cell Board A, MRC Physiological Medicine and Infections B, MRC Respiratory Syncytial Virus Vaccine Sub-committee, the NERC Wildlife Diseases Initiative and the UK Advisory Committee on Dangerous Pathogens. Perhaps the most demanding and rewarding, however, were the 6 years from 1983 to 1989 when I served as Chairman of the WHO Steering Committee on the Acute Respiratory Diseases of Childhood.

My association with the SGM dates back to 1961. I have served as a member of the Virus Group Committee and have been first an Editor and then from 1982 to 1987 Editor-in Chief of the *Journal of General Virology*, all instructive and satisfying experiences. I am delighted to continue my association with the Society with the enhanced status of Honorary Membership and to have this opportunity to acknowledge the help and friendship over the years of very many members of the Society.

Cells & Cell Surfaces

Nottingham, 30 March–2 April 1998

The Group will be holding a one-day symposium on *Intracellular Pathogens: Entry and Survival in the Host* organized by Iain Sutcliffe (Sunderland) and Andrew Johnston (UEA). Full details are given in the accompanying Programme Booklet.

Warwick, 5–7 January 1999

There will be a one-day symposium on *Microbial–Host Interactions at Mucosal Surfaces* organized by Howard Jenkinson (Bristol) and Iain Sutcliffe (Sunderland). The symposium will relate closely to the *Respiratory Pathogens* symposium which is being organized by other groups at this meeting. Participants are encouraged to contact the Convener about opportunities to present either an offered paper or a poster.

Committee Membership

Howard Jenkinson is now the new Group Convener. Alan Wheals (Bath), the retiring Convener, thanks Society members who have contributed to and supported CCS Group activities.

Convener:

Professor 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 (DD)
0117 928 4304/5 (Office)
Fax 0117 928 4428
Email
howard.jenkinson@bristol.ac.uk

Clinical Virology

Nottingham, 30 March–2 April 1998

The Group is planning a two-day meeting: a one-day symposium on *Viruses and Neurological Disease* and one day of offered papers. The organizer is Dr W. Irving (will.irving@nottingham.ac.uk). Full details are given in the accompanying Programme Booklet. Send proposals for offered papers now.

Warwick, 5–7 January 1999

The Group will combine with the Microbial Infection and Systematics & Evolution Groups to present a symposium on *Respiratory Pathogens*. Dr E. Boxall is representing the Group on the organizing committee. Speakers will include: Dr P. Cane, The evolution of respiratory syncytial virus; Dr G. Taylor, Novel treatments for respiratory infections; Prof. J. Oxford, Novel treatments for influenza. Prof. Robert Webster (St Jude's Children's Research Hospital, Memphis, USA) will give a keynote talk on Evolution of influenza viruses relative to the appearance of pandemics. Also, Prof. Mike Ward will speak on *Chlamydia pneumoniae*. There will be a debate, 'Should UK introduce universal antenatal screening for HIV?', and a day of offered papers.

Future Meetings

Looking forward to the future, the Group may join other European societies in a millenial meeting in Glasgow in September 2000. Suggestions for topics for other future symposia and speakers are always welcome.

Convener:

Dr Philip P. Mortimer
PHLS Virus Reference Division
Central Public Health Laboratory
61 Colindale Avenue
London NW9 5HT
Tel. 0181 200 4400
Fax 0181 200 1569

Education

Nottingham, 30 March–2 April 1998

Peter Wyn-Jones (Sunderland) is organizing a symposium on *Sandwich Training in Microbiology*. Full details are given in the accompanying Programme Booklet. Feedback from ex-students will be an important feature of the symposium and a round-table discussion is planned to follow the main talks to give all concerned an opportunity to exchange ideas on this important area of microbiology education.

East Anglia, 8–10 September 1998

Alan Jacob (Manchester) is organizing a symposium on *Innovations in the Teaching of Molecular Biology*. It is anticipated that this will be a joint symposium with the Genetical Society. Teaching at school, undergraduate and postgraduate levels will be addressed. Topics will include school practical molecular biology, the design and value of 'virtual' practicals and 'dry' undergraduate research projects, affordable practicals, the use of CAL programmes for lecture and practical teaching, and teaching videos.

Future Meetings

Further meetings are planned on *A National Curriculum for Microbiology*, *Undergraduate Research Projects* and *Microbiology for the Non-microbiologist*.

Following the Dearing Report there will be lots of interest in developments in science education over the next few years from students, teachers and members of the public. The Education Group aims to keep you abreast of these changes in microbiology and how we can match our students' learning with their needs for the future.

Convener:

Dr Peter Wyn-Jones
School of Health Sciences
Darwin Building
University of Sunderland
Wharncliffe Street
Sunderland SR1 3SD
Tel. 0191 515 2520
Email
peter.wyn-jones@sunderland.ac.uk

Environmental Microbiology

Nottingham, 30 March–2 April 1998

Details of the Group's two-day symposium, *Ecophysiology of Microbial Pigments*, including a half-day workshop entitled *Microbial Responses to UV-B Radiation and Effects of the Ozone Hole*, have now been finalized and can be found in the accompanying Programme Booklet. Please contact David Wynn-Williams (ddww@pcmail.nerc-bas.ac.uk) if you require further information about this meeting. Postgraduate students and young scientists are encouraged to offer papers.

East Anglia, 8–10 September 1998

The programme for this one-day meeting on *Biosensors* is nearing completion. The topics to be covered include: Theory and history of biosensors; Bioluminescence, applications and utility; *In situ* biosensors – applications; GFP for monitoring microbes in sludge; Sensor design, signal detection and data interpretation; Current and future prospectives, antibody/*in situ*; Using biosensors for monitoring community structure. Mark Bailey (mbj@pcmail.nerc-oxford.ac.uk) is the convener for this meeting and would like to hear from anyone who wishes to present a paper or poster. Postgraduate students are especially encouraged to participate.

Future Meetings

Further meetings are being planned for 1999 when the topics will be *Detection of Bacteria in Natural Environments* and a Main Symposium on *Survival of Pathogens in the Natural Environment*. Further details of these two exciting topics will appear in the next issue of the *Quarterly*. The Committee would like to hear from any member who has suggestions for future meetings.

Convener:
Dr Hilary M. Lappin-Scott
Department of Biological Sciences
Exeter University
Hatherly Laboratories
Prince of Wales Road
Exeter EX4 4PS
Tel. 01392 263263
Fax 01392 263700
Email
H.M.Lappin-Scott@exeter.ac.uk

Irish Branch

Royal Irish Academy, Dublin, 30 April 1998

A symposium on *Microbial Responses to Stress* has been organized jointly with The Royal Irish Academy, National Commission for Microbiology. Speakers include: Prof. G. Stewart (Nottingham), Bacterial stress, inimical processes and the suicide response – new opportunities for industrial microbiology; Dr C. Hill (Cork), The inducible stress response in *Listeria monocytogenes* plays a role both in survival of acid foods and during infection; Dr U. Bond (Trinity College Dublin), Molecular analysis of the heat-shock response in laboratory and brewery strains of *Saccharomyces cerevisiae*; Dr P. Coote (Unilever), The role of intracellular pH (pH_i) homeostasis in growth and resistance of *Saccharomyces cerevisiae* during exposure to antifungal compounds; Dr B. Dowds (Maynooth), Phase variation as a stress adaptation in populations of bacteria; Dr P. Rainey (Oxford), Persisting on a plant – finding the genes that count; Dr D. Coleman (Trinity College Dublin), The 1997 National Commission for Microbiology Award Lecture – Stress response in *Candida dubliniensis*, an emerging pathogen in AIDS patients.

For further information and registration please contact Margaret Critchley, Royal Irish Academy, 19 Dawson Street, Dublin 2 (Tel. +353 1 6762570; Fax +353 1 6762346; Email m.critchley@ria.ie) **before 17 April 1998.**

NB – Registration for non-society members is £20 (£5 for students). Lunches, if required, will be available in Molesworth Hall for £10 but must be pre-booked.

University College, Cork, 25–27 June 1998

2nd International Symposium on Propionibacteria. For details contact Prof. Seamus Condon, Department of Microbiology, University College, Cork, Ireland (Tel. +353 21 902396; Fax +353 21903101) or Dr Tim Cogan, Dairy Products Research Centre, Fermoy, Ireland (Tel. +353 25 42222; Fax +353 25 42340; Email tcogan@dpc.teagasc.ie).

Queen's University Belfast, 1–3 September 1998

A joint Symposium on *Microbial Neuropathogenesis* is being organized with the Virus Group. For details please see the Virus Group News on p. 40. For further information contact Dr Louise Cosby, School of Biology & Biochemistry, Medical Biology Centre, Queen's University of Belfast, 97 Lisburn Road, Belfast BT9 7BL (Tel 01232 272127; Fax 01232 236505; Email L.Cosby@qub.ac.uk).

Convener:
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. 01232 255314
Fax 01232 668376
Email m.collins@qub.ac.uk

Fermentation & Bioprocessing

Nottingham, 30 March–2 April 1998

The Group's symposium at this meeting is entitled *Towards the Ideal E. coli Expression System: Meeting the needs of Fermentation and Downstream Processing*. Full details are given in the accompanying Programme Booklet.

East Anglia, 8–10 September 1998

The Group will be holding a one-day meeting on *Mycelial Fermentations* organized by Dave Langley (Glaxo-Wellcome) on behalf of the Group. Invited speakers include: G. Robson (Manchester), Production of recombinant proteins; P. Butler (UMIST), Growth rate control of mycelial morphology in *Streptomyces coelicolor*; M. Bushell (Surrey), Enhancing bioreactor performance of antibiotic-producing cultures; J. Smith (Strathclyde), Solid state fermentations; N. Connors (Merck, USA), Production of pneumocandins; K. Falkner (Stuttgart), Quantitative morphological characterization of actinomycetes with on-line digital image analysis.

If you are interested in offering a short paper/poster (postgraduate students are particularly encouraged) then please contact the Convener in the first instance **before the end of May 1998**.

Future Meetings

The committee is planning a two-day meeting on *Archaea* in 1999. The symposium will be organized by Rod Herbert (Dundee) on behalf of the Group. More details will appear in a future issue of the *Quarterly*. The committee would welcome suggestions from any SGM member for topics for symposia within the area of Fermentation and Bioprocessing. Please contact the Convener or any committee member.

Committee Membership

We welcome Rob Cummings (Teesside) and Mike Dempsey (Manchester Metropolitan) to the committee.

Convener:
Dr Reg R. England
Department of Applied Biology
University of Central Lancashire
Corporation Street
Preston PR1 2HE
Tel. 01772 893513
Fax 01772 892929
Email r.england@uclan.ac.uk

Microbial Infection

Nottingham, 30 March–2 April 1998

A two-day symposium on *Iron and Infection* organized by Paul Williams (Nottingham) and Julian Ketley (Leicester), will be held at this meeting. The Group's nominee for the Promega Prize competition will be chosen from the offered papers and posters presented at this meeting. Full details of the invited speakers and the offered papers are given in the accompanying Programme Booklet.

Leicester, 1–2 July 1998

The first of a series of meetings jointly arranged by the Microbial Infection Group and the Microbiology Section of The Pathological Society will be held at the Pathological Society meeting at the University of Leicester. Registration forms can be obtained from the SGM Meetings Office or from The Pathological Society, 2 Carlton House Terrace, London SW1Y 5AF. The meeting will take the form of a one-day symposium on *Prospects for Non-microbial Antimicrobials* followed by a day of offered posters. Speakers will include: R. Lehrer (Los Angeles), The Role of antimicrobial peptides in phagocytes; C. Shaw (Belfast), Antimicrobial peptides from amphibians; D. Mirelman (Israel), Garlic and protozoa – the therapeutic link; P. Houghton (London), Medicinal plants as antimicrobial agents; J. Hamilton-Miller (London), Antimicrobial properties of tea. There will also be presentations on the antimicrobial peptides from insects and on an industrial view of the prospects of antimicrobial peptides in therapy. Our co-organizer is Peter Andrew (Leicester) (pwa@le.ac.uk), to whom titles and abstracts of offered posters should be sent **by 1 April 1998**.

Warwick, 5–7 January 1999

A two-day meeting on *Respiratory Pathogens* will be held. This meeting will be held jointly with the Systematics & Evolution and Clinical Virology Groups. The Microbial Infection Group organizer is Tim Mitchell (Glasgow) (t.mitchell@bio.gla.ac.uk). Please contact him if you have any suggestions for topics or speakers. Please send titles and abstracts of offered papers and posters to the organizer **by 30 September 1998**.

Convener:
Professor Peter Andrew
Department of Microbiology and Immunology
University of Leicester
Medical Sciences Building
PO Box 138
University Road
Leicester LE1 9HN
Tel. 0116 252 2941
Fax 0116 252 5030
Email pwa@le.ac.uk

Edinburgh, 13–16 April 1999

A two-day meeting on *Evasion of the Immune Response* is being organized by Petra Oyston (CBD, Porton Down) (100432.3200@compuserve.com) and Brian Henderson (Eastman Dental Institute) (b.henderson@eastman.ucl.ac.uk). Please contact one of them if you have any suggestions for invited speakers and titles.

Future Meetings

Food-spoilage and Food-borne Diseases will be the topic for the next joint meeting with The Pathological Society in Autumn 1999. Our organizer is Ian Poxton (Edinburgh) (i.r.poxton@ed.ac.uk). He will be happy to receive suggestions for invited speakers and titles.

Ideas for symposium topics and speakers for future meetings are always welcome. Please contact the Convener or any committee member.

Physiology, Biochemistry & Molecular Genetics

Nottingham, 30 March–2 April 1998

The Group will hold a symposium on *Morphogenesis in Filamentous Fungi* on Wednesday 1 April. The organizer is Sue Assinder (Bangor). Full details are given in the accompanying Programme Booklet.*

East Anglia, 8–10 September 1998

The Group will hold a symposium on *Versatile Pseudomonads* on Tuesday/Wednesday 8/9 September. The organizer is Dieter Haas (Lausanne). The speakers are John Govan (Edinburgh), Mike Vasil (Denver, Colorado, USA), Wim Quax (Delft, Netherlands), Mark Bailey (Oxford), Huw Williams (London), Peter Williams (Bangor), Paul Williams (Nottingham), Rob Drew (London), Christoph Keel (Lausanne, Switzerland) and Carol Bender (Stillwater, Oklahoma, USA). Offered contributions are requested for inclusion in the symposium and as posters. Please send titles and abstracts to the Convener. Abstract forms can be requested from the Convener or Marlborough House.

Edinburgh, 13–16 April 1999

The Group will hold a symposium on *Regulation of Complex Processes in Bacteria* at this meeting. The organizer is George Salmond (Cambridge).*

Leeds, 7–9 September 1999

The Group will hold a symposium on *Molecular Machines: Mobile Protein Complexes in Micro-organisms* at this meeting. The organizer is Liz Sockett (Nottingham). There will also be a joint symposium with the Microbial Infection and the Pathological Society on *Food-spoilage and Food-borne Diseases*. The PB&MG co-organizer is Simon Foster (Sheffield) and the MI organizer is Ian Poxton (Edinburgh).

Future Meetings

The Group Committee is always receptive to suggestions for topics for symposia, workshops, etc., within its remit from any SGM member. Please contact the Convener or any member of the Group Committee.

**The Group will be assessing posters for inclusion in the Promega Prize at these meetings. Qualifying candidates please identify which posters are to be assessed by our judging panel when the abstract is submitted to Marlborough House. Posters do not have to be directly relevant to any of the Group's symposia to be included in the assessment.*

Convener:
Dr David A. Hodgson
Department of Biological Sciences
University of Warwick
Coventry CV4 7AL
Tel. 01203 523559
Fax 01203 523701
Email dm@dna.bio.warwick.ac.uk

Systematics & Evolution

Nottingham, 30 March–2 April 1998

The Group is holding a two-day collaborative symposium with the British Mycological Society entitled *Impact of Molecular Methods on Fungal Systematics* (organizers: Drs Grace Alderson and Gerry Saddler for the SGM and Prof. Michael Dick for the BMS). Full details are given in the accompanying Programme Booklet.*

Warwick, 5–7 January 1999

At this venue the Group is holding a two-day collaborative meeting with the Microbial Infection and Clinical Virology Groups on the subject of *Respiratory Pathogens*. Please forward any proposals for

Convener:
Professor Grace Alderson
Department of Biomedical Sciences
University of Bradford
Bradford BD7 1DP
Tel. 01274 383564
Fax 01274 386210
Email g.alderson@bradford.ac.uk

short oral contributions or posters on this theme (title and draft abstract) to the Convener as soon as possible, but **before 2 October 1998**. The deadline for finalized abstracts will be mid-November.

Edinburgh, 13–16 April 1999

The Group is working with the Environmental Microbiology Group on a two-day joint symposium on the subject of *Detection of Bacteria in the Natural Environment* to be held during this meeting. Developments will appear in future issues of the *Quarterly*.*

Leeds, 7–9 September 1999

The Group is in the very early stages of planning a two-day joint symposium with the Microbial Infection Group and the Pathological Society on *Food-spoilage and Food-borne Diseases*. Developments will appear in future issues of the *Quarterly*.

Future Meetings

The Group is already planning symposia into 2000 and hopes to hold a Group symposium on *Molecular Epidemiology: Infrasubspecific Classification and Identification* during the Easter 2000 Society meeting. However, we are always happy to accept ideas from members so do please send any suggestions for symposia, workshops or relevant activities to the Convener over the next few months, or contact any committee member and we will discuss your ideas at our next committee meeting.

**The Group will be assessing posters for inclusion in the Promega Prize at these meetings. Qualifying candidates please identify which posters are to be assessed by our judging panel when the abstract is submitted to Marlborough House. Posters do not have to be directly relevant to any of the Group's symposia to be included in the assessment.*

Virus

Nottingham, 30 March–2 April 1998

The Virus Group has organized a symposium entitled *The Use of Virus Vectors for the Delivery and Expression of Genes*. The symposium will run from 31 March to 2 April with plenary sessions each morning and open paper sessions on the first two afternoons. Full details are given in the accompanying Programme Booklet. In addition there will be four evening workshops: *Adenoviruses* (organized by E. Blair, Department of Biochemistry, Leeds) and *Influenza Virus* (organized by W. Barclay, Department of Microbiology, Reading) on Monday 30 March, and *Herpesviruses* (organized by J. Stewart, Department of Veterinary Pathology, Royal Dick Veterinary School, Edinburgh) and *Hepatitis C Virus* (organized by D. Rowlands, Department of Microbiology, Leeds) on Wednesday 1 April. Those interested in participating at these workshops should contact the organizers.

Queen's University Belfast, 1–3 September 1998

A joint symposium with the Irish Branch entitled *Microbial Neuropathogenesis*, separate from the main Society meeting, has been organized. The meeting will run over three days with plenary sessions each morning and open paper sessions on the first two afternoons. Speakers include I.V. Allen (R&D Office, Northern Ireland), V. ter Meulen (Institute of Virology, Würzburg, Germany), M. Vandevelde (Institute of Comparative Neurology, Berne, Switzerland), L. Enquist (Princeton, USA), Dr T. Hill (Department of Pathology & Microbiology, Bristol), P. Talbot (Virus Research Center, Institut Armand-Frappier, Laval, Canada), H. Ludwig (Institute of Virology, Berlin, Germany), L. Bode (Department of Virology, Robert Koch Institute, Berlin, Germany), G. Atkins (Trinity College Dublin), C. Bangham (Department of Immunology, Imperial College School of Medicine, St Mary's Hospital, London), C. Bostock (Institute of Animal Health, Compton), S. Kroll (Department of Paediatrics, Imperial College School of Medicine, St. Mary's Hospital, London) and M. Virji (School of Microbial Sciences, Reading). Those wishing to present an open paper should send a title and 150 word abstract to the Convener by 31 May 1998.

Edinburgh, 13–16 April 1999

The Virus Group will be organizing a symposium, open paper sessions and evening workshops at this meeting. Details will be announced in future issues of the *Quarterly*.

Convener:
Professor Geoffrey L. Smith
Sir William Dunn School of Pathology
University of Oxford
South Parks Road
Oxford OX1 3RE
Tel. 01865 275521 (direct)
01865 275524 (secretary)
Fax 01865 275501
Email glsmith@molbiol.ox.ac.uk

Elections to Group Committees 1998

A number of members of Group Committees retire in September 1998 at the end of their terms of office. Nominations are now required to fill the vacancies arising. Where the number of nominations to a Group Committee exceeds the number of vacancies, there will be an election by postal ballot.

The current members of each Group Committee and number of vacancies are listed below. In making nominations, members are particularly asked to bear in mind the desirability of a breadth of scientific interest on each committee.

Nominations, including the general area of interest of the nominee, should be sent to reach the appropriate Group Convener **no later than 20 April 1998.**

Cells & Cell Surfaces (Four Vacancies)

H.F. Jenkinson (C)	Univ. Bristol	Cell adhesion, yeast/bacterial transporters
J.K. Broome-Smith*	Univ. Sussex	Bacterial membrane transport
A. M. Carr	Univ. Sussex	DNA repair, yeast checkpoints
M. Egerton*	Zeneca Pharmaceuticals	Antifungals
V. Koronakis	Univ. Cambridge	Expression and secretion of haemolysin
K.A. Smart*	Oxford Brookes Univ.	Physiology of brewing yeasts
C.J. Stirling	Univ. Manchester	Membrane translocation, heat shock proteins
I.C. Sutcliffe	Univ. Sunderland	Bacterial cell wall composition
M. Wilson	Eastman Dental Inst. London	Oral biofilms, antimicrobials and cytokine induction
M.J. Woodward	MAFF Central Veterinary Laboratory	Food-borne zoonoses
Vacancy		
U. Desselberger (CR)	Addenbrooke's, Cambridge	

Clinical Virology (Two Vacancies)

P.P. Mortimer (C)	CPHL, London	Hepatitis/HIV
E.H. Boxall	Regional Virus Laboratory, Birmingham	Perinatal transmission, vaccination, hepatitis B
D.W.G. Brown	CPHL, London	Exotic viruses, immunization
R.P. Eglin	PHL, Leeds	Molecular diagnostics
W.L. Irving*	University Hospital, Nottingham	Hepatitis, viral immunology
E.A.B. McCruden	Western Infirmary, Glasgow	Diagnostic virology, hepatitis C
H.J. O'Neill	Regional Virus Laboratory, Belfast	Diagnostic and molecular virology
T.G. Wreghitt*	Addenbrooke's Hospital, Cambridge	Transplantation
G.B. Clements (CR)	Regional Virus Laboratory Glasgow	

Education (Two Vacancies)

P. Wyn-Jones (C)	Univ. Sunderland	Health-related water virology
R.H. Bishop	Univ. Ulster	General and industrial microbiology
J.C. Bunker	Open University	Adult education, IT, women in science
T.G. Cartledge	Nottingham Trent Univ.	Microbial physiology and molecular biology
A.E. Jacob*	Univ. Manchester	Bacterial molecular genetics
H.M. O'Sullivan	Liverpool Hope Univ. College	Innovations in teaching, work-based learning
R.E. Sockett	Univ. Nottingham	Skills teaching for graduates, large class teaching
E. Williams*	Univ. Newcastle	Biodiversity, microbiology in schools
J.C. Fry (CR)	Univ. Wales, Cardiff	

Environmental Microbiology (Two Vacancies)

H.M. Lappin-Scott (C)	Univ. Exeter	Biofilms and starvation survival
M. Bailey*	IVEM, Oxford	Plant/soil/microbial interactions
C.D. Clegg	Scottish Crops Research Institute, Invergowrie	Soil microbial ecology
K. Jones	Univ. Lancaster	Survival of pathogens and biofilms
T. Kearney	BNFL, Preston	Biodegradation of xenobiotics
L.A. Lawton	Robert Gordon Univ. Aberdeen	Toxic cyanobacteria
R.J. Parkes	Univ. Bristol	Sediment and subsurface microbiology
D. Wynn-Williams*	BAS, Cambridge	Bacterial survival at low temperatures
L.A. Glover (CR)	Univ. Aberdeen	

Fermentation and Bioprocessing (Three Vacancies)

R.R. England (C)	Univ. Central Lancashire	Bacterial physiology and signalling
R.H. Cumming	Univ. Teesside	Bioprocessing
M.J. Dempsey	Manchester Metropolitan Univ.	Biochemical engineering
C.J.L. Gershater*	SmithKline Beecham	Applied microbial physiology, computer control
R.A. Herbert	Univ. Dundee	Extremophiles, fungal fermentations, fatty acids
G. Hobbs*	Liverpool John Moores Univ.	Fungal and actinomycete physiology and biochemistry
B. Kara	Zeneca Pharmaceuticals	Microbial physiology of yeasts and *E. coli*
D. Langley*	Glaxo Wellcome	Microbial secondary metabolism
G.P.C. Salmond (CR)	Univ. Cambridge	

Irish Branch (Three Vacancies)

M.A. Collins (C)	Queen's Univ. Belfast	Food microbiology
C.C. Adley*	Univ. Limerick	Antibiotic resistance, bioremediation
T.G. Barry	Univ. College, Galway	Molecular microbiology
L. Cosby*	Queen's Univ. Belfast	Morbiliviruses
A.D.W. Dobson	Univ. College Cork	Degradation of aromatics
K.A. Kavanagh	St. Patrick's, Maynooth	Fungal infections of man
G. McMullan*	Univ. Ulster, Coleraine	Bioremediation
D. Todd	DANI Veterinary Sci. Div. Belfast	Veterinary virology/molecular virology
C.W. Penn (CR)	Univ. Birmingham	

Microbial Infection (Two Vacancies)

P.W. Andrew (C)	Univ. Leicester	Pathogenicity: *Listeria, Mycobacterium, Strep. pneumoniae*
B. Henderson	Eastman Dental Institute, London	Cytokines, host-bacteria interactions
W.L. McPheat	Zeneca Macclesfield	Immunology of infection
T.J. Mitchell	Univ. Leicester	Bacterial pathogenicity, virulence, transgenes, *Streptococcus*
P.C.F. Oyston	CBDE, Porton Down	Bacterial pathogenicity, *Yersinia*, vaccines
I.R. Poxton	Univ. Edinburgh	Bacterial pathogenesis, lipopolysaccharide, anaerobes, *Clostridium*
P. Williams*	Univ. Nottingham	Iron transport, Quorum sensing, membrane proteins, cell envelopes
B.W. Wren*	St Bartholomew's Hospital, London	Regulation of virulence determinants, bacterial toxins
C.E. Hormaeche (CR)	Univ. Newcastle	

Physiology, Biochemistry & Molecular Genetics (Three Vacancies)

D.A. Hodgson (C)	Univ. Warwick	Molecular genetics and physiology
S.J. Assinder*	Univ. Wales, Bangor	Xenobiotic degradation, plant pathogenic fungi
A.J.P. Brown	Univ. Aberdeen	*Candida*, gene regulation
S.J. Foster	Univ. Sheffield	Cell walls, starvation survival
D. Haas	Univ. Lausanne	Soil bacteria-plant interactions
M.J. Larkin	Queen's Univ., Belfast	Biodegradation, survival
G.P.C. Salmond	Univ. Cambridge	Density dependent gene expression, autoinducers
S. Spiro	Univ. East Anglia	Gene regulation, (de)nitrification
R.E. Sockett	Univ. Nottingham	Bacterial mobility, *Rhodobacter*
F.B. Ward*	Univ. Edinburgh	Biochemistry/genetics of cytochromes, esp. *Pseudomonas*
A.P. Wood*	King's College, London	Microbial physiology, biochemistry and ecology, esp. chemolithoautotrophs
E.M.H. Wellington (CR)	Univ. Warwick	

Systematics & Evolution (Two Vacancies)

G. Alderson (C)	Univ. Bradford	Numerical, molecular & chemosystematics of medical/industrial bacteria
D.E. Buckley	SmithKline Beecham, Epsom	Microbial metabolites, pathogenicity, systematics
J.G. Burgess	Heriot-Watt, Edinburgh	Marine microbiology
M. Goodfellow	Univ. Newcastle	Systematics and biotechnology, actinomycetes
W.D. Grant*	Univ. Leicester	Microbes from hypersaline and alkaline environments
N.A. Logan	Glasgow Caledonian Univ.	*Bacillus* systematics, polyphasic taxonomy, identification
J. Stanley*	CPHL, London	Evolutionary genetics and molecular epidemiology
W. Wade	Guy's & St. Thomas', London	Oral bacteria, unculturables
D.McL. Roberts (CR)	Natural History Museum	

Virus (Four Vacancies)

G.L. Smith (C)	Sir William Dunn School of Pathology, Oxford	Poxviruses
G.E. Blair	Univ. Leeds	Adenovirus
J.C. Bridger	Royal Veterinary College, London	Rotaviruses
L. Cosby*	Queen's Univ. Belfast	Paramyxoviruses
R.D. Everett	Inst. of Virology, Glasgow	Herpesvirus
A.M.L. Lever	Addenbrooke's, Cambridge	Retrovirus
G.P. Lomonossoff	John Innes Centre, Norwich	Plant viruses
J. McCauley*	IAH, Compton	Influenza virus
C. Sweet*	Univ. Birmingham	Viral pathogenesis
T. Wileman	IAH, Pirbright	African swine fever virus
Vacancy		
N.D. Stow (CR)	Inst. of Virology, Glasgow	

(C) Convener (CR) Council Representative *Retiring 1998

Book Reviews

Manual on Membrane Lipids

Edited by R. Prasad.
Published by Springer-Verlag GmbH & Co. KG (1996).
DM98.00/öS715.40/sFr86.50
pp. 253 *ISBN: 3-540-59448-5*

This laboratory manual has a sensible ring-bound construction, making it easy to lay open on the bench. However, a successful laboratory manual must be comprehensive in its coverage of methodology and this book is not. Commendably, it has attempted to bridge the gap between a book on lipid analysis and one on membranes, to emphasize the provenance of the lipid molecules. Inevitably, however, the broad coverage is at the expense of detail, often being quite introductory or focussed on one organism. There are important omissions and the inconsistency of coverage extends to both the referencing and the diagrams. A plus point is the inclusion of useful 'tips and tricks'.

This book would benefit newcomers to membrane lipid analysis, but they would quickly find the need for more detailed treatises, several of which are available, and at a price of DM98 they might think it is not good value.

Nick Russell, Wye College, University of London

Ribozyme Protocols. Methods in Molecular Biology, Vol. 74

Edited by P.C. Turner.
Published by Humana Press (1997).
US$74.50 *pp. 512* *ISBN: 0-89603-389-9*

'The Ribozyme Cookbook'

RNA catalysis simultaneously provides a fascinating challenge in structural, chemical and mechanistic terms, and an opportunity to exploit the potential selectivity of ribozymes for intervention in cellular events. This has led to an explosion of interest in both academic and commercial sectors, and *Ribozyme Protocols* aims to provide a resource for all parts of that community. This is a recipe book, written at the level of 'add *x* ml of A to *y* ml of B' throughout, with full experimental details, including suppliers of agents. The 49 short, focussed chapters are written by active researchers, both academic and commercial, a number of whom are leading experts in their areas. My main disappointment in this regard (aside from the jarring inaccuracies in the cover picture) was the lack of any chapters from the Boulder groups, where so much of the world's ribozyme expertise resides. Nevertheless, I am sure that this collection of methods will provide a valuable source of reference for many laboratories, including my own.

David M.J. Lilley, Biochemistry Department University of Dundee

AIDS, Drugs of Abuse, and the Neuroimmune Axis. Advances in Experimental Medicine and Biology, Vol. 402

Edited by H. Friedman, T.K. Eisenstein, J. Madden & B.M. Sharp.
Published by Plenum Publishing Corporation (1996).
US$79.50 *pp. 234* *ISBN: 0-306-45375-4*

The interaction between drugs of abuse, infection and the central nervous system is a fascinating if scantily studied subject. This book contains the proceedings of the 1995 San Diego Symposium on *AIDS, Drugs of Abuse and the Neuroimmune Axis*. Critical research is presented which begins to define, at the cellular level, the process of this interaction between the nervous and immune systems and the effects of drugs of abuse. A better understanding of this process may influence our interpretation of these pathologies in our patient.

This book, as with other published 'proceedings', is not one to read from cover to cover, but access to the volume in a library is to be recommended. While pathologists and physicians working with patients with AIDS, particularly drug-injection-associated, will find this a useful text. It also has useful science for clinicians in oncology managing patients with chronic pain.

Sheila M. Burns, Royal Infirmary of Edinburgh

Toxoplasma gondii. Current Topics in Microbiology and Immunology, Vol. 219

Edited by U. Gross.
Published by Springer-Verlag GmbH & Co. KG (1996).
DM174.00/öS1270.20/sFr152.00
pp. 274 *ISBN: 3-540-61300-5*

Toxoplasma gondii is one of the most promiscuous and successful parasites able to infect all warm-blooded animals. Recent advances through the application of novel techniques in immunology and, in particular, molecular biology have greatly increased our understanding of the host/parasite relationship and may lead to the development of new therapeutic strategies.

This book provides the reader with a compilation of 'state-of-the-art' reviews of recent developments in research into *T. gondii* written by experts in the field. Each article is carefully presented to give the reader a succinct, comprehensive and up-to-date overview of the particular research area.

This book will appeal to a wide-ranging audience; from research scientists, clinicians and teachers to both undergraduate and post-graduate students. I wholeheartedly recommend it as invaluable to individuals with an interest in *T. gondii* and as an important addition to educational institutions.

Elisabeth A. Innes, Moredun Research Institute Edinburgh

Progress in Nitrogen Cycling Studies. Developments in Plant and Soil Sciences, Vol. 68

Edited by O. Van Cleemput, G. Hofman & A. Vermoesen.
Published by Kluwer Academic Publishers Group (1996).
Dfl650/US$422.50/£286.00
pp. 715 *ISBN: 0-7923-3962-2*

This book is the proceedings of the *8th Nitrogen Workshop* held in Ghent in September 1994, a usually comprehensive and up-to-date conference series. However, this is simply a collection of the invited and offered papers and there has been no attempt to summarize or synthesize them. Given that there were 115 papers this is somewhat understandable. Twenty of the papers are reprinted from *Plant and Soil* (Vol. 181) and confusingly have different pagination from the other papers. In many cases the remaining, un-refereed, papers are short and several contain preliminary findings which, although new in 1994, may have also now been published in other journals. Taking this into account I would seriously question its value at this asking price.

The book is, however, comprehensive in its overall topic coverage. If you are new to this field it is an excellent one-stop compendium of European research on nitrogen cycling in soil-plant-animal and waste treatment systems. Most papers deal with either nitrification/denitrification, organic matter cycling or fertilizer use with surprisingly few on nitrogen fixation.

Colin Campbell, Macaulay Land Use Research Institute Aberdeen

Book Reviews

Poo You and the Potoroo's Loo. Making Sense of Science Children's Books

By David Bellamy (Illustrated by Mic Rolph).
Series Editor: Fran Balkwill.
Published by Portland Press (1997).

£6.99 *pp. 32* *ISBN: 1-85578-095-X*

I think that *Poo You and the Potoroo's Loo* explains nature very well. It tells you also where the food goes in your body before it gets to your bottom. It explains that the poo fertilizes the soil which helps the trees to grow and lets us grow more crops. Some of the words are a bit hard, but they tell you how to say them and explain what they mean. There was not much about bacteria in here which surprised my dad.

It teaches you lots of things that are very interesting, if a bit yucky. It has lots of nice, funny things in the speech bubbles as well. I like the ending bit where it says "now wash your hands".

Karl Roberts, aged 10

David Bellamy (author), Mic Rolph (illustrator) and Fran Balkwill (Series Editor) at the launch of *Poo You and the Potoroo's Loo* on 5 November 1997. *Richard Keil Photography.*

Brainbox. Making Sense of Science Children's Books

By Steven Rose & Alexander Lichtenfels (Illustrated by Mic Rolph).
Series Editor: Fran Balkwill.
Published by Portland Press (1997).

£6.99 *pp. 32* *ISBN: 1-85578-096-8*

I think this book is funny and educational. It is about the brain, cells and how you think. I liked the comment when the cells say "we're with you all the way", meaning that you have your brain cells for your whole life. It has lots of interesting facts. It also has great pictures that tell you a lot. There is a good memory game to try, and then it has a test to see who in your family has the best results.

I would recommend this book to all ages.

Karl Roberts, aged 10

Helicobacter pylori Protocols

Edited by C.L. Clayton & H.L.T. Mobley.
Published by Humana Press (1997).

US$89.50 *pp. 288* *ISBN: 0-89603-381-3*

Given the recent release of the entire *Helicobacter pylori* genome sequence and the intense research interest in this fascinating organism, this comprehensive and well-referenced practical guide is very timely. The 24 chapters have concise introductions followed by easy-to-follow step-by-step protocols that should be suitable for beginners and experts alike. Detailed methods for the isolation, growth, detection and metabolism of the organism are described. There are exemplary chapters on the application of molecular methods, including mapping, transformation and mutagenesis procedures. The final two chapters on animal models of *H. pylori* infection are particularly useful and contain much unpublished information. Inevitably, in a book containing a compilation of protocols, some are dated. Nevertheless, this book is an essential laboratory guide for scientists engaged in *H. pylori* research and should also prove useful for researchers studying related organisms.

Brendan Wren, St Bartholomew's and the London Schools of Medicine and Dentistry

Nematode Vectors of Plant Viruses

By C.E. Taylor & D.J.F. Brown.
Published by CAB International (1997).

£45.00/US$80.00 *pp. 296* *ISBN: 0-85199-159-9*

Plant viruses in two genera, *Tobravirus* and *Nepovirus*, are transmitted by plant parasitic nematodes. This book is about these vector nematodes and is an authoritative account of what is known of their morphology, taxonomy and biology. In the sections dealing with the viruses, the treatment is adequate but there are some minor errors. However, the authors have the humility to advise the reader, in the context of virus identification, "to consult a plant virologist". The approach is largely an historical one, which makes the book quite readable, although some sections, like that on the arcana of nematode taxonomy, require concentration. Some of the illustrations would have been better in colour, but that would have increased the price. Every laboratory seriously involved in work with plant viruses will want to have access to this book and those of us who work on nematode-transmitted viruses will need our own copies.

David J. Robinson, Scottish Crop Research Institute.

Antiviral Chemotherapy. Biochemical & Medicinal Chemistry Series

By R. Challand & R.J. Young. Series Editor: J. Mann.
Published by Spektrum GmbH (1997).

£8.99 *pp. 128* *ISBN: 1-901217-03-5*

This is a well-written and enjoyable paperback. All sections are extremely well illustrated with clear and accurate diagrams, and although the virology/biology axis is over-simplified, this book is a real gem because of the very strong, but again simple, chemistry content. It is well worth the cover price precisely because it contains the correct chemical names and structures of many leading antiviral agents; not only are these illustrated in the context of individual chapters, but they are also gathered together in the invaluable Appendix 2. This is an ideal reference text for new or experienced virologists with an interest in antivirals. However, buy at your peril; acquisition of this book "irreversibly inhibits" all excuses for dropping a double bond or misconstruing chirality!

Eddie Blair, GlaxoWellcome, Stevenage

Book Reviews

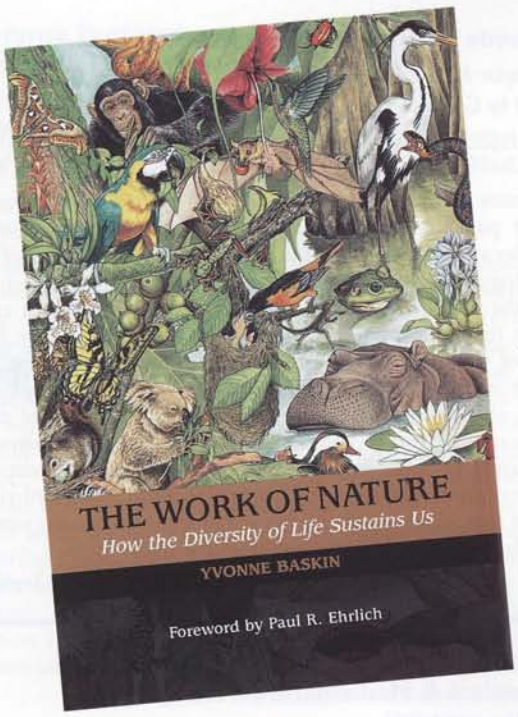
The Work Of Nature. How the Diversity of Life Sustains Us

By Yvonne Baskin.
Published by Island Press (1997).
£19.95 *pp. 263 + xix* *ISBN: 1-55963-519-3*

The Scientific Committee on Problems of the Environment (SCOPE) and, later, the United Nations Environment Program's (UNEP's) Global Biodiversity Assessment sponsored several workshops and studies on the impact of the current loss of biodiversity on ecosystem functioning. They then commissioned Ms Baskin, a professional science writer, to convert the mountain of scientific and technical reports into a digest accessible to a broad audience, and she succeeded admirably. Eschew doubts about what exactly 'biodiversity' means and about when a given environment is (or ever was) truly 'natural': her highly informative account of largely US-centred research on, and US attitudes to, the impact of Mankind on the biosphere and its biota is awe-inspiring.

Not a microbiology book – microbial ecologists could justly feel their speciality is somewhat marginalized – but microbiologists who have the well-being of their planet at heart will find it thought-provoking and reasonably free of simplistic eco-babble.

John Postgate, c/o University of Sussex



Chromosomal Translocations and Oncogenic Transcription Factors. Current Topics in Microbiology and Immunology, Vol. 220

By F.J. Rauscher III & P.K. Vogt.
Published by Springer-Verlag Gmbh & Co. KG (1997).
Dm168.00/öS1226.40/sFr147.00
pp. 166 *ISBN: 3-540-61402-8*

Transcription factors are fundamentally important for cellular control processes, and there are many examples of chromosomal translocations which alter the properties of a transcription factor to produce an oncogene. This book presents reviews which summarize the clinical, biochemical and molecular aspects of several oncogenic transcription factors. The reviews are as up-to-date as one can expect with this sort of publication, citing references up to 1995 or 1996.

The contents of each article follows a similar format, with a brief description of the disease, the identification and cloning of the chromosomal translocation responsible, a summary of the properties of the original and parent proteins and a discussion of how the resulting fusion protein behaves as an oncogene. This strategy means that the book is of value to researchers of differing backgrounds, from the postgraduate level upwards. It would certainly be a good buy for the departmental library.

Roger Everett, MRC Virology Unit, Glasgow

Animal Mycoplasmoses and Control. *Scientific and Technical Review*, Vol. 15(4)

By OIÉ: Co-ordinated by J. Nicolet.
Published by Office International des Épizooties (OIÉ) (1997).
FrF270.00/US$54 *pp. 472* *ISBN: 92-9044-433-9*

The new outbreaks of contagious bovine pleuropneumonia (CBPP) in southern Europe and Africa in the early 1990s led to a major research effort in European laboratories into all aspects of animal mycoplasmology. This special issue of the journal attempts to encompass many of these developments especially in the area of diagnostics, control and epidemiology. It updates but does not fully replace a previous special issue published by the OIÉ in 1987. Much attention is given to CBPP, contagious caprine pleuro-pneumonia and contagious agalactia. The chapter on the epidemiology of CBPP in Europe is unique. However, potential readers should be aware that three important chapters covering diagnosis and control of CBPP and contagious agalactia are written in French. Also more than 70 pages are devoted to indices, which cover three other issues of the journal. Nevertheless, the publication will be of value to veterinary research workers, epidemiologists and national control authorities.

Robin Nicholas, Central Veterinary Laboratory, Addlestone and Roger Miles, King's College London

Clinical Applications of the Interferons

Edited by R. Stuart-Harris & R.D. Penny.
Published by Chapman & Hall Medical (1997).
£79.00 *pp. 420* *ISBN: 0-412-60250-4*

Although it is now some 10 years since interferons entered routine medical use, surprisingly there is no recent book covering their clinical applications. This multi-author book, intended as a comprehensive account, predominantly for post-graduates, is therefore welcome.

Some of the 27 chapters are rather disappointing. Others are excellent, notably those dealing with chronic hepatitis, carcinoid tumours and haematological malignancies, though inevitably even these omit important recent developments. A firmer editorial hand would have been beneficial, e.g. the same interferon preparation may be termed differently in various chapters. Also, more information about currently available interferon preparations would have been more useful than, for example, the account, however fascinating, of the politics behind interferon development in the 1970s.

Though expensive and inevitably already somewhat dated, medical libraries will want this book. For clinicians unfamiliar with the interferons, it is a useful source of background information which should be supplemented from current medical journals.

Norman Finter, Sevenoaks

Book Reviews

Ciliates: Cells as Organisms

Edited by K. Hausmann & P.C. Bradbury.
Published by Gustav Fischer Verlag (1996).
DM248.00/öS1835.00/Sfr238.50
pp. 485 *ISBN: 3-437-25036-1*

What a wonderful book on ciliates. It is not only nicely illustrated with numerous micrographs (optical microscopy, SEMs, TEMs) and drawings, but consists of numerous highly informative chapters on all aspects of ciliate life from molecular biology to ecology. This allows for the presentation of a truly integrated view of ciliate biology, illustrating the importance of interactions between 'distant' fields of biology such as systematics, genetics and cell biology for the understanding of the eukaryotic cell. It is also well cross-referenced and indexed. In a period of comparative genomics, an integrated approach to biology will become more and more important to allow the 'digestion' of all this molecular data – ciliates shall play an interesting role in this. To my mind this book represents a stimulating example of what comparative and integrated biology is about. Get a copy or beg the library to get one – it is expensive!

Robert Hirt, Natural History Museum, London

Bioremediation Protocols. Methods in Biotechnology, Vol. 2

Edited by David Sheehan.
Published by Humana Press (1997).
US$99.50 *pp. 352* *ISBN: 0-89603-437-2*

This book comprises three major sections: Overview, Protocols and Case Studies which contain a series of 'clearly written laboratory protocols' and, in the main, are written in the form of research papers. These papers encompass a broad range of contaminants as well as a number of techniques, including molecular biology, bioreactors, cell immobilization and preparation and analysis of environmental samples. The book is well referenced and, at the end of each protocol, there is a 'Notes' section containing useful information which would normally be omitted from a research paper. This book makes a reasonable attempt at summarizing some of the major issues in bioremediation research, although it is in no way comprehensive. The only drawback is that some of the information presented, particularly in the Overview section, lacks detail. However, I think that the book succeeds in its objective of providing protocols which may be used and/or adapted by other researchers in their own particular investigations.

Kirk T. Semple, Lancaster University.

Campylobacters, Helicobacters, and Related Organisms

Edited by D.G. Newell, J.M. Ketley & R.A. Feldman.
Published by Plenum Press (1996).
US$175.00 *pp. 767* *ISBN: 0-306-45312-6*

This book is the proceedings of the *Eighth International Workshop* concentrating mainly on *Campylobacter* with a smattering of papers on *Helicobacter*. The Editors have made the information easily accessible by providing a comprehensive table of contents, and excellent subject and author indices, the latter containing all publications cited in the extended abstracts. Although not recommended for the general reader, the book would be of interest to researchers presently working in or intending to enter the *Campylobacter*, and possibly *Helicobacter*, fields, who wish to know the 'state-of-the-art' as of 1995. Not all information is yet published so readers can get a 'sneak preview' of work in progress, but unlike published papers, the information has not been subjected to rigorous peer review. The book is recommended for purchase by research laboratories or libraries.

Diane E. Taylor, University of Alberta, Edmonton, Canada

Biotechnology and Safety Assessment

Edited by J.A. Thomas & L.A. Myers.
Published by Raven Press (Taylor & Francis) (1993).
£100.00 *pp. 270* *ISBN: 0-7817-0080-9*

Recombinant DNA technology is employed in a wide variety of areas and the issue of safety regarding these applications is complex and frequently debated. This book aims to be an introduction to safety across the whole field of biotechnology but omits large areas of the subject entirely. Seven out of the 11 chapters cover issues related to novel pharmaceuticals produced by rDNA technology. Model examples of toxicological studies are presented in detail requiring knowledge of specialist terms, whilst a description of the relevant regulations mentions only those in place in the US and is of limited value to UK readers. The remainder of the field of biotechnology is summarized in the final four chapters in which many issues are not discussed and information is often dated. In summary, the price of £100 is prohibitive to individual purchasers and it is likely to be of use only as a very limited introduction to the field of biosafety. It will not be of use to those developers, regulators or licensing authorities already involved in the field but may be of interest to newcomers.

Rebecca Bowden, London.

Buffer Solutions: The Basics

By R.J. Beynon & J.S. Easterby.
Published by IRL Press at Oxford University Press (1996).
£12.99 *pp. 96* *ISBN: 0-19-963442-4*

Attractively laid out, this slim, readable paperback is targeted at life-scientists. A casual dip into any chapter suggests the authors have worked hard to dispel the mystique that can surround the theory and use of pH buffers. They have even included details of how to access free software to ease the calculation of buffer compositions. Regrettably, the authors' intentions to provide support and guidance for buffer duffers fail because of numerous errors, both serious and trivial. In Chapter 1, for example, their attempts to clarify numerical nomenclature transpose the English and American definitions of one billion and record $\log_{10}(0{\cdot}0000001)$ as -6! Elsewhere, figures are incorrectly plotted (Fig. 3.2), missing (Fig. 4.2) and the text is sprinkled with irritating mistakes. Health and safety is accorded a cursory nod and the Web software, though readily accessed, failed to deliver as promised. My advice – wait for a revised edition before buying!

Vic Din, Natural History Museum, London

Probiotics 2. Applications and Practical Aspects

Edited by R. Fuller.
Published by Chapman & Hall (1997).
£65.00 *pp. 212* *ISBN: 0-412-73610-1*

Although the concept of Probiotics was documented more than a century ago, little is still known about their mode of action. Indeed, as the book makes clear, many of the trials to determine their efficacy have given negative results. The book covers a wide variety of topics ranging from their effect on immunity and use for anti-tumour therapy to their application for the treatment and prevention of enteric disease in man and farm animals. A useful and balanced review is provided, but on the whole I found the chapters relating to their actual use to be of more value than those dealing with studies in experimental animals. Given the increasing concerns about anti-microbial resistance, the book will provide a useful, but expensive, source of information on alternative strategies.

Clifford Wray, Central Veterinary Laboratory, Addlestone

Book Reviews

Advances in Insect Control: The Role of Transgenic Plants

Edited by N. Carozzi & M. Koziel.
Published by Taylor and Francis (1997).

£70.00 *pp. 300* *ISBN: 0-7484-0417-1*

This interesting book, which highlights insect resistance as one of the success stories of plant genetic engineering, provides valuable support for the use of transgenic plants in agriculture. It is primarily aimed at researchers at postgraduate level and above, but will be of value to the wider scientific community interested in molecular biology, entomology and plant breeding. The volume not only provides a comprehensive review of the use of *Bacillus thuringiensis* toxins for insect control in transgenic plants, but also covers the use of genes encoding foreign protease and amylase inhibitors, lectins, cholesterol oxidase and chitinases; less well developed areas such as manipulation of secondary metabolism are also covered. Developing good practice for deployment of transgenic crops in the field is also considered. The majority of contributions are by authors from the USA, giving the book an American bias, although several chapters attempt to redress this imbalance.

John Gatehouse, Crop Protection Group, University of Durham

Bacteria in Oligotrophic Environments

By R.Y. Morita.
Published by Chapman & Hall (1997).

£69.00 *pp. 529* *ISBN: 0-412-10661-2*

Richard Morita is to be congratulated on writing a really excellent monograph. It is largely about starvation-survival, but includes valuable chapters on the availability of nutrients in several environments. I especially enjoyed reading the first chapter, which is rather philosophical, outlining Professor Morita's personal views on the concept of oligotrophy in bacteria. The book is very comprehensive indeed, covering almost all the work of the scientists who have contributed to this broad and important field of study. About 120 pages of the book are taken up by approximately 2000 references; this makes the book a valuable source for tracking relevant literature. It will be most useful for researchers and PhD students but is probably too detailed for final year undergraduates. The book will be an important addition to libraries serving microbiologists and should find its way into the personal collections of many microbial ecologists.

John Fry, Cardiff

Energy and Life

By J.M. Wrigglesworth.
Published by Taylor & Francis (1997).

£13.95 *pp. 188* *ISBN: 0-7484-0433-3*

Energy and Life provides a valuable insight into many aspects of bioenergetics with a minimum of the detailed thermodynamics that often 'turns off' biological scientists. The book is particularly helpful in explaining the roles of redox reactions in metabolism and in making chemiosmotic coupling between electron transport and ATP synthesis in mitochondria understandable in terms of the way in which proton movements are believed to drive rotation of a transmembrane part of the ATP synthetic apparatus. The coupling of reactions to bypass energetically unfavourable parts in metabolic pathways is also dealt with and the need for a mechanism for this coupling is stressed. The mechanism of hexokinase is interesting in this context, but is arguably overemphasized relative to the underlying thermodynamics. However, this book can be warmly recommended to students needing a guide to bioenergetics.

Allan Lowe, University of Manchester

Fungal Infection – Diagnosis and Management. Second Edition

By M.D. Richardson & D.W. Warnock.
Published by Blackwell Science (1997).

£19.95 *pp. 249* *ISBN: 0-86542-724-0*

This is a handbook of practical information about clinically important fungi, their diagnosis, treatment with antifungals and management in the clinic or hospital. The book has the feel of a dictionary or encyclopaedia – broken into short paragraphs covering well defined topics which make it easy to find specific information in a hurry. The coverage is broad and the style is dry, focused, brief and to the point. This is not a book for those wanting a general introduction to the biology of medically important fungi or the mode of action of antifungals. There are no illustrations and only a few selected references for further reading. It is however an extremely useful, well organized, practical and affordable guide for clinicians and for those working in diagnostic services.

Neil Gow, University of Aberdeen

Books Received

Topley & Wilson's Microbiology and Microbial Infections, Ninth Edition

Edited by L. Collier, A. Balows & M. Sussman.
Published by Arnold (1997).

CD-ROM:	*£995.00*	*ISBN: 0-340-70015-7*
Printed Set:	*£995.00*	*ISBN: 0-340-61470-6*
Printed Set and CD-ROM package:	*£1295.00*	*ISBN: 0-340-70069-6*

A demo disk is available from the publisher at 338 Euston Road, London NW1 3BH.

DIARY

Diary

SGM MEETINGS

Microbial Responses to Light and Time
University of Nottingham
30 March–2 April 1998

Joint meeting of the SGM Microbial Infection Group and the Microbiology Section of the Pathological Society:
Prospects for Non-microbial Antimicrobials
University of Leicester
1–2 July 1998

Joint meeting with The Genetical Society – a symposium to mark the retirement of Professor Sir David Hopwood FRCS:
Portrait of an Organism: The Genetic Analysis of *Streptomyces coelicolor* A3(2) Biology
University of East Anglia
8–10 September 1998

Behaviour of Pathogens in the Environment
University of Warwick
5–7 January 1999

Contact: Meetings Administrator, SGM, Marlborough House, Basingstoke Road, Spencers Wood, Reading RG7 1AE (Tel. 0118 988 1805; Fax 0118 988 5656; Email meetings@socgenmicrobiol.org.uk; Web http://www.socgenmicrobiol.org.uk/meetings.htm)

See pp. 36–40.

MARCH 1998

Tenth RNA Polymerase Workshop: RNA Polymerase and Transcriptional Control
Breadsall Priory Hotel, Morley, nr Derby
9–10 March 1998
Contact: Robert E. Glass, Division of Genetics, School of Clinical Laboratory Sciences, Queens Medical Centre, Nottingham University, Clifton Boulevard, Nottingham NG7 2UH (Tel. 0115 970 9226; Fax 0115 9709 906; Email Robert.Glass@nottingham.ac.uk)

APRIL 1998

Colicins and other Bacteriocins
University of East Anglia, Norwich
1–3 April 1998
Contact: Dr Richard James, School of Biological Sciences, University of East Anglia, Norwich NR4 7TJ (Fax 01603 592197; Email colicins@uea.ac.uk; http://www.bio.uea.ac.uk/Workshop.html)

Molecular Biology Update – Four-day laboratory course
University of Hertfordshire
6–9 April 1998
Contact: Prof. J.M. Walker, Department of Biosciences, University of Hertfordshire, Hatfield, Herts AL10 9AB (Tel. 01707 284546; Fax 01707 284510; Email J.M.Walker@Herts.ac.uk)

MAY 1998

Professional Development for Biotechnologists
Belgrave Square, London
13 May 1998
Organizing body: Biotechnology Committee of Society of Chemical Industry.
Contacts: Dr Nick Major, Genzyme Biochemicals, 50 Gibson Drive, West Malling, Kent, ME19 6HG (Tel. 01732 878349; Fax 01732 220024; Email nmajor@genzyme.co.uk) and Dr Ellen George, University of Westminster, Department of Biosciences, 115 New Cavendish Street, London, W1M 8JS (Tel. 0171 911 5000 extn 3717; Fax 0171 911 5087; Email georgee@westminster.ac.uk)

JUNE 1998

FEMS Symposium: Recent Advances in the Diagnosis of Sexually Transmitted Diseases (STDs)
The Marmara Hotel, Istanbul
10–13 June 1998
Contact: Ali Ağaçfidan PhD, Department of Microbiology, Istanbul Faculty of Medicine Çapa, 34390-Istanbul, Turkey (Tel. +90 212 635 2582; Fax +90 212 635 1186)

Algal Virus Workshop
Bergen, Norway, 15–18 June 1998
Contact: AVW, Department of Microbiology, University of Bergen, Jahnebakken 5, N-5020 Bergen, Norway (Tel. +47 55 58 26 62; Fax +47 55 58 96 71; Email Gunnar.Bratbak@im.uib.no; http://imp.imp.uib.no/virus/index.htm)

Molecular Approach toward Vaccine Development Against Viral Infections
Yogyakarta, Indonesia
17–30 June 1998
Contact: Dr Joedoro Soedarsono, Gadjah Mada University, Interuniversity Center for Biotechnology, Jl. Ternika Utara, Barek, Yogyakarta, Indonesia 56281 (Fax 0274 63974)

2nd International Symposium on Propionibacteria
University College, Cork, Ireland
25–27 June 1998
Contact: Prof. Seamus Condon, Department of Microbiology, University College, Cork, Republic of Ireland (Tel. +353 21 902396; Fax +353 21903101) or Dr Tim Cogan, Dairy Products Research Centre, Fermoy, Ireland (Tel. +353 25 42222; Fax +353 25 42340; Email tcogan@dpc.teagasc.ie)

JULY 1998

Epitope Mapping – Five-day laboratory course
University of Hertfordshire
20–24 July 1998
Contact: Prof. J.M. Walker, Department of Biosciences, University of Hertfordshire, Hatfield, Herts AL10 9AB (Tel. 01707 284546; Fax 01707 284510; Email J.M.Walker@Herts.ac.uk)

AUGUST–SEPTEMBER 1998

International Course on the Identification of Fungi of Agricultural & Environmental Significance
IMI, Egham
10 August–18 September 1998
Contact: Mrs Stephanie Groundwater, IMI, Bakeham Lane, Egham, Surrey TW20 9TY (Tel. 01784 470111; Fax 01784 470909; Email s.groundwater@cabi.org)

SEPTEMBER 1998

3rd International Conference on Anthrax. Organized by the Chemical and Biological Defence Sector, Porton Down, and the Society for Applied Microbiology
University of Plymouth
7–10 September 1998
Contact: The Society for Applied Microbiology, The Blore Tower, The Harpur Centre, Bedford MK40 1TQ (Tel. 01234 326661; Fax 01234 326678; Email sfam@btinternet.com)

Biomembranes and Molecular Medicine
Cluj-Napoca, Romania
14–26 September 1998
Contact: Prof. Gheorghe Benga, 'Iuliu Hatieganu' University of Medicine and Pharmacy, Department of Cell & Molecular Biology, 6 Pasteur Street, 3400 Cluj-Napoca, Romania (Fax +40 64 194373/197257)

Molecular Probes in Diagnostics – One-day conference
University of Hertfordshire
15 September 1998
Contact: Dr Ralph Rapley, Department of Biosciences, University of Hertfordshire, Hatfield, Herts AL10 9AB (Email r.rapley@herts.ac.uk)

SEPT.–OCTOBER 1998

The Australian Society for Microbiology Inc., 1998 Annual Scientific Meeting & Exhibition: 'Microbes To The Max'
Wrest Point Hotel Casino
Hobart, TAS 7000
27 September–2 October 1998
Contact: ASM Secretariat, Unit 23, 20 Commercial Road, Melbourne VIC 3004, Australia (Tel. +61 3 9867 8699; Fax +61 3 9867 8722; Email ASMConference@clari.net.au; http://www.vicnet.net.au/~asm)

OCTOBER 1998

5th IUBMB Conference on The Biochemistry of Health and Diseases
Jerusalem, Israel
18–22 October 1998
Contact: Kenes Ltd, Sharon Barnett, PO Box 50006, Tel Aviv 61500, Israel (Tel. +972 3 514 0000; Fax +972 3 517 5674; Email IUBMB@kenes.com)

Modern Techniques in the Identification of Bacteria and Filamentous Fungi (Course)
IMI, Egham
19–30 October 1998
Contact: Mrs Stephanie Groundwater, IMI, Bakeham Lane, Egham, Surrey TW20 9TY (Tel. 01784 470111; Fax 01784 470909; Email s.groundwater@cabi.org)

Current Trends in Microbial Technology for a Sustainable Environment
Kuala Lumpur, Malaysia
October 1998
Contact: Dr Sabaratnam Vikineswary, Institute of Postgraduate Studies & Research (IPSP), University Malaya, 50603 Kuala Lumpur, Malaysia (Fax 60 3 756 8940)

NOVEMBER 1998

Isolation & Identification of Fungi from Natural Habitats (Course)
IMI, Egham, 26–30 November 1998
Contact: Mrs Stephanie Groundwater, IMI, Bakeham Lane, Egham, Surrey TW20 9TY (Tel. 01784 470111; Fax 01784 470909; Email s.groundwater@cabi.org)

SEPTEMBER 1999

EURECO '99 – 8th European Ecological Congress. The European Dimension in Ecology: Perspectives & Challenges for the 21st Century
Halkidiki, Greece
18–23 September 1999
Contact: Secretariat EURECO '99, UPB 119, Department of Ecology, School of Biology, Aristotle University, GR-540 06 Thessaloniki, Greece (Tel. +30 31 998316/998254; Fax +30 31 998379; Email registration@eureco99.auth.gr)

SEPTEMBER 2000

BIOTECHNOLOGY 2000: 11th International Biotechnology Symposium and Exhibition
International Congress Centre (ICC), Berlin, Germany
3–8 September 2000
Contact: DECHEMA e.V., c/o 11th IBS, Theodor-Heuss-Alee 25, D-60486 Frankfurt am Main, Germany (Tel. +49 69 7564 241; Fax +49 69 7564 201; Email info@dechema.de; Web http://www.dechema.de)

Officers:

President Prof. Howard Dalton	*Department of Biological Sciences,* The University of Warwick, Coventry CV4 7AL	Tel. 01203 523552 Fax 01203 523568/523701 Email HD@dna.bio.warwick.ac.uk
Treasurer Prof. W. Allan Hamilton	*Department of Molecular and Cell Biology,* Institute of Medical Sciences, University of Aberdeen, Foresterhill, Aberdeen AB25 2ZD	Tel. 01224 273143 Fax 01224 273144 Email w.a.hamilton@abdn.ac.uk
General Secretary Dr Charles W. Penn	*School of Biological Sciences,* Biology West Building, University of Birmingham, Birmingham B15 2TT	Tel. 0121 414 6562 Fax 0121 414 6557 Email c.w.penn@bham.ac.uk
Scientific Meetings Officer Dr Pat M. Goodwin	*The Wellcome Trust,* 183 Euston Road, London NW1 2BE	Tel. 0171 611 8435 Fax 0171 611 8352 Email p.goodwin@wellcome.ac.uk
International Secretary Prof. Jeff W. Almond	*School of Animal and Microbial Sciences,* University of Reading, PO Box 228, Whiteknights, Reading RG6 6AJ	Tel. 0118 931 8901 Fax 0118 931 6671 Email j.w.almond@reading.ac.uk
Professional Affairs Officer Prof. Chris F. Thurston	*Microbiology Group,* Division of Life Sciences, King's College London, Kensington Campus, Campden Hill Road, London W8 7AH	Tel. 0171 333 4276 Fax 0171 333 4500 Email chris.thurston@kcl.ac.uk
Publications Officer Dr Dave McL. Roberts	*Department of Zoology,* The Natural History Museum, Cromwell Road, London SW7 5BD	Tel. 0171 938 8790 Fax 0171 938 8754 Email d.roberts@nhm.ac.uk
Editor-in-Chief, *Microbiology* Prof. Jon R. Saunders	*Department of Genetics and Microbiology,* School of Life Sciences, University of Liverpool, PO Box 147, Liverpool L69 3BX	Tel. 0151 794 4416 Fax 0151 794 4401 Email jrs@liverpool.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 3934 Email siddell@vim.uni-wuerzburg.de

Members:

Dr Geoff B. Clements	*Regional Virus Laboratory,* Ruchill Hospital, Bilsland Drive, Glasgow G20 9NB	Tel. 0141 946 7120 Fax 0141 946 2200
Dr Ulrich Desselberger	*Regional Public Health Laboratory,* Level 6, Addenbrooke's Hospital, Hills Road, Cambridge CB2 2QW	Tel. 01223 216816 Fax 01223 242775
Prof. John C. Fry	*School of Pure & Applied Biology,* University of Wales College of Cardiff, P.O. Box 915, Cardiff, CF1 3TL	Tel. 01222 874190 Fax 01222 874305 Email fry@cardiff.ac.uk
Dr L. Anne Glover	*Department of Molecular and Cell Biology,* Institute of Medical Sciences, University of Aberdeen, Foresterhill, Aberdeen AB25 2ZD	Tel. 01224 273099 Fax 01224 273144 Email l.a.glover@abdn.ac.uk
Prof. Ron T. Hay	*School of Biological & Medical Sciences,* Irvine Building, University of St Andrews, St Andrews, Fife KY16 9AL	Tel. 01334 463396 Fax 01334 463400 Email rth@st-and.ac.uk
Dr David A. Hodgson	*Department of Biological Sciences,* University of Warwick, Coventry CV4 7AL	Tel. 01203 523559 Fax 01203 523701 Email dm@dna.bio.warwick.ac.uk
Prof. Carlos E. Hormaeche	*Department of Microbiology,* University of Newcastle Medical School, Framlington Place, Newcastle upon Tyne NE2 4HH	Tel. 0191 222 7704 Fax 0191 222 7736
Prof. Dave J. Rowlands	*Department of Microbiology,* University of Leeds, Leeds LS2 9JT	Tel. 0113 233 5641 Fax 0113 233 5638 Email d.j.rowlands@leeds.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
Dr Nigel D. Stow	*MRC Virology Unit,* Institute of Virology, Church Street, Glasgow G11 5JR	Tel. 0141 330 4017 Fax 0141 337 2236
Prof. Chris M. Thomas	*School of Biological Sciences,* University of Birmingham, Edgbaston, Birmingham B15 2TT	Tel. 0121 414 5903 Fax 0121 414 5925 Email C.M.Thomas@bham.ac.uk
Dr Liz (E.M.H.) Wellington	*Department of Biological Sciences,* University of Warwick, Gibbet Hill Road, Coventry CV4 7AL	Tel. 01203 523184 Fax 01203 523701 Email eg@dna.bio.warwick.ac.uk