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- Silicon microbiology
- Macro- vs micro-ecology
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- Computer-assisted learning

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Front cover: Examples of photographs used in the University of Nottingham Microbe CAL package. Top left: Escherichia coli on MacConkey No. 3 agar. Bottom left: Escherichia coli on XLD agar. Right: Salmonella enteritidis on XLD agar. See report on p. 93. Photos courtesy of Christine Dodd and Catherine Rees.

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EDITORIAL

So What Is Microbiology?

In the last *Quarterly* we published a call for things that should be covered in a review of *The Best of British Microbiology*. However, this raises the immediate question of what, exactly, is microbiology? In his splendid review of the Society's history (*Society for General Microbiology – Fifty Years On*) John Postgate observed that microbiology defined itself by the techniques it used. This is a fair starting point, in that techniques dictate the way one thinks about a problem and constrain the kind of data that can be collected. It is probably easiest to separate microbiology from within biology generally in terms of the size of the organisms we study. The issue of size does far more than demand the use of a microscope to visualize the organism at work; it also means that we have traditionally ignored spatial heterogeneity because it is exceedingly difficult to measure processes over the scale of microns and at the same time gather enough information to contribute to a general understanding of what is going on. This situation is beginning to change, with a variety of modern techniques able to study the dynamics of process on these very small size scales. As John Postgate pointed out, this means that, generally, macroscopic biology focuses on the activity of individual organisms while microbiology tends to focus on the activity of populations.

The calls to 'understand soil' that have become rather fashionable of late illustrate the disparate viewpoints. Microbiologists more-or-less gave up on soil leaving it to the chemists to sterilize the stuff and to begin to measure processes at a chemical level, then to re-introduce the microbes in a controlled fashion to examine their effects. The language of soil science is derived from this chemical basis. Despite the huge quantity of data that have been collected since then, we cannot reasonably describe soil as a well understood environment. At a recent workshop in Imperial College's Silwood Park Research Station, home to the parallel series of controlled-environment soil plots collectively called the Ecotron, it was clear that the macroscopic biologists expected microbiologists to be able to gather the same type of data, albeit at a smaller size scale, that they traditionally use to distinguish between terrestrial habitats of varying type. That the microbiologists present could not come close to being able to offer suitable data was a surprise and that realization the most positive outcome of the workshop. The nature of the discipline of microbiology was clearly not understood by the broader biological community.

So, how should we separate microbiology from within the more general subject of the life sciences? This question might appropriately have taxed those who recently decided on the scope of the RAE panels. If you work on the genetics of microbes are you a geneticist or a microbiologist? In many circumstances, this is a truly trivial distinction because clearly you are both and the answer will depend on the context of the question. The same problem exists for other disciplines, like biochemistry or the medical sciences, of course.

It becomes a real question when you want to promote one of these disciplines. The UK National Committee for Microbiology includes representatives of over a dozen learned societies, in which some or all of the members are microbiologists of one persuasion or another. The UKNCM forms a 'cluster' within the Institute of Biology, and as such or independently should become increasingly involved in promoting microbiology. Individual societies such as SGM also have a major part to play.

Taking a pragmatic leaf from John Postgate's booklet, it is also sensible to spell out why we want to promote microbiology. It must surely be easier to recruit good students to places on microbiology courses if they already have an idea of what microbes are, what they can do and the range of activities that microbiologists get up to. The supply of students is vital to the continued good health of any discipline and the doctrine of supply and demand will ensure that if students are asking for it, universities will provide it.

If the discipline is healthy, it can argue strongly for adequate resources. The total funding available to science is finite and not all disciplines can be represented at the level where the cake is first cut. It is to our benefit that microbiology is widely perceived by the great and the good to be an important discipline, especially beyond its obvious biomedical applications.

Please, then, send in your ideas to Marlborough House for *The Best of British Microbiology*. We will collate this information and use it to produce a variety of promotional materials. For members not based in Great Britain, the exercise should still be of benefit, since raising the profile and supplying supporting material will presumably not go unnoticed elsewhere.

Dave Roberts

Apology

In the *Letter to the Editor* on p. 59 of the May issue of the *Quarterly*, the name of the author of the letter was omitted. The last line should have read:

Yours in awe,
Dr Jim S. Robinson (SGM Member)

The production staff apologize to Dr Robinson for this error and for the apparent errors in the setting of the letter caused by the use of a different version of the font by our printers.

In this issue ...

Life on earth is carbon-based, at least that is the conventional wisdom. But is it really like nature to miss the opportunity to use such an abundant resource such as silicon? Explore some of the diverse and controversial issues surrounding silicon microbiology (pp. 83–85).

There has always been a lack of understanding between macro- and microbiologists, but as Harriet Jones explains, nature does not discriminate according to size and there is a growing need for more collaboration between the two camps if the ecological picture is to be completely understood (pp. 86–87).

Are we at risk of infection from microbial agents in transfused blood? The media have made much of the scares of AIDS, Hepatitis C and, recently, CJD. However, a microbiology consultant to the National Blood Authority argues on pp. 88–89 that in contrast to such reports, blood has never been safer.

How can the potential of developments in information technology be used to help alleviate many of the difficulties faced by those teaching microbiology today? The subject is reviewed and examples of SGM-funded projects can be found on pp. 90–93.

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

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

Silicon microbiology is more interesting than is generally recognized. It has even been suggested that silicon-based autotrophy exists. What little is known about how micro-organisms interact with silicon is discussed.

THE NEGLECTED MICROBIOLOGY OF SILICON – FROM THE ORIGIN OF LIFE TO AN EXPLANATION FOR WHAT HENRY CHARLTON BASTIAN SAW

Milton Wainwright

Most microbiologists never come across the element silicon, probably because it is thought to be largely biologically unreactive, and is not transformed by micro-organisms. Although silicon is close to carbon in the Periodic Table, its chemistry is dominated by stable Si–O bonds, so direct replacement of silicon for carbon in normal biochemistry appears impossible. However, there are a number of references scattered about the literature which suggest that silicon might be more interesting to microbiologists than is generally supposed. I aim here to review this neglected literature and in so doing touch upon such diverse subjects as microbiology, physiology and the origin of life. I will also show that the ability of micro-organisms to metabolize silicon may throw light on one of the 19th century's major scientific controversies.

INTERACTIONS BETWEEN SILICON AND MICRO-ORGANISMS

Science fiction writers often suggest that silicon could provide an alternative to carbon as the basis for extra-terrestrial life forms. For example, devotees of the science fiction programme *Star Trek* will probably have heard of Horta of the planet Janus VI. This fictional creature is made of silicon and, because of its ability to secrete concentrated mineral acids, can apparently pass through solid rock! However, despite such fantasies, silicon is not considered sufficiently chemically versatile to replace carbon, at least in life as we know it.

Compounds of silicon are very common, comprising around 28 % of the earth's crust. The element occurs in two forms: silica or the oxides of silicon, which exist in crystalline or amorphous forms as in quartz, flint, sandstone, opal and diatomaceous earths and silicates, of which clay is an example. Silicon, as silicic acid (0.1–0.6 mM) occurs as one of the main constituents of soil solution and it can be regarded as a plant nutrient (Epstein, 1994; Birchall, 1995). Lauwers & Heinen (1974) have also suggested that a silicon cycle operates in the environment, involving microbial transformations between insoluble and soluble forms.

A wide range of bacteria and fungi can solubilize insoluble silicates by producing mineral and organic acids, and chelating agents (Henderson & Duff, 1965). Most of these silicate solubilizers are common soil micro-organisms, although a specialized bacterium, *Bacillus mucilaginosus*, has been described by Russian workers. Silicate-dissolving micro-organisms have been used to remove silicon from low-grade mineral raw materials, like bauxite, and to extract valuable metals from silicate and aluminosilicate ores and minerals (Karavaiko *et al.*, 1988).

It has long been known that silicon compounds can stimulate microbial growth. Reynolds (1909), for example, suggested that silicon takes the place of carbon in some types of microbial metabolism, while Borrell *et al.* (1922) found that the "addition of a small amount of K_2SiO_3 notably augments the yield of cultures of *Bacille tuberculeux*" Price (1932) also showed that the growth rate of *Amoeba proteus* was greatly increased by the addition of sodium silicate. Similarly, Mast & Pace (1937) found that *Chilomonas paramecium* will not grow in inorganic solutions lacking silicon and also that silicon stimulated starch production, growth and respiration in this organism. Bacteria, such as *Bacillus licheniformis*, can also accumulate silicon from growth media (Mohanty *et al.*, 1990).

Much of the early work on the interaction between silicon and bacteria relates to studies on the lung diseases silicosis (a form of pneumoconiosis) and tuberculosis. In the past, silicosis was very common amongst industrial workers (especially coal miners) exposed to dust rich in crystalline silica, but not amorphous silica and silicates. Many silicosis sufferers died from tuberculosis which spread rapidly through the lungs and caused death in a relatively short time. This observation led to studies by the Canadian microbiologist R.M. Price (1932) that showed that sodium silicate and silicic acid can in fact stimulate the growth of *Mycobacterium tuberculosis*, and that even small amounts of silicon compounds, notably the easily soluble forms, produced the stimulatory effect. More recently, Yoshino (1990) found that 100 μg silicon ml^{-1} has "a remarkable stimulatory effect on the growth of *Staphylococcus aureus*". He also showed that a high concentration of silicon present in the mucous membrane acts to enhance the growth of *Pseudomonas aeruginosa*. Sufferers from chronic sinusitis apparently have a high concentration of silicon in their mucous membranes, a fact which led Yoshino to suggest that this stimulatory effect of silicon on bacteria exacerbates the condition.

The stimulatory effect of silicon compounds on microbial growth is not restricted to bacteria and amoebae. We have recently shown that silicic acid stimulates the growth of fungi, including *Penicillium* species, when growing in ultra-pure water as well as nutrient-rich media (Wainwright *et al.*, 1997). It is not clear why silicon compounds should stimulate the growth of micro-organisms in culture medium as well as purified water, which obviously lacks any added nutrients. Bigger & Nelson (1941) made the serendipitous observation that bacterial growth is stimulated by the addition of talc (hydrated magnesium silicate) to distilled water. In a follow-up paper they suggested that coliform bacteria can use CO_2 and ammonia, adsorbed from the atmosphere, a reaction which is in some way promoted by the presence of silicon compounds (Bigger & Nelson, 1943). Das *et al.* (1992) and Chakrabarty *et al.* (1988) also showed that *Mycobacterium* and *Nocardia* spp. can grow in the absence of carbon provided that silicon compounds were present. They suggested that bacteria grow autotrophically under these conditions, fixing CO_2 by using energy gained from silicon metabolism, i.e. by a form of silicon autotrophy. Unfortunately, absolute proof of this was not provided. One problem with attempting to verify silicon autotrophy is that silicon compounds adsorb potential nutrients from the atmosphere. It is possible therefore that, in these studies, bacteria grew oligotrophically, rather than autotrophically, using ammonia and fixed carbon scavenged by the silicon compounds. A similar explanation could also apply when certain fungi were found to grow in ultra-pure water only when silicon compounds were added and on nutrient-free silica gel (Tribe & Mabadje, 1972; Parkinson *et al.*, 1989). However, Mirocha & Devay (1971) have suggested that fungi can grow in the absence of carbon by using energy obtained from the oxidation of ammonium or hydrogen and, under these conditions, silicon might act as a direct energy source or as a catalyst.

Although the ability of micro-organisms to grow autotrophically using silicon as an energy source has been suggested, most microbial physiologists would argue that it is theoretically unlikely that micro-organisms could gain energy from breaking silicon bonds. Allison (1968), however, has suggested that the reaction of Si–Si–Si with O_2 or oxygen compounds might prove to be an energy yielding process.

The stimulatory effect of silicon compounds, including clays (Stozky & Rem, 1966), on microbial growth might help explain how micro-organisms can grow in soil despite the fact that it contains only trace amounts of available carbon. Silicon also plays a role above the ground in protecting plants from predators. The silicon content of plants like cucumber, for example, increases following fungal infection, when it appears to exert a protective effect (Samuels *et al.*, 1991).

As microbiologists we are all aware that micro-organisms never seem to miss a metabolic opportunity, no matter how unlikely such a transformation might appear from a thermodynamic viewpoint. One could therefore take a teleological view and conclude that since silicon is the second most common element on earth, it is likely that micro-organisms would have evolved some means of using it as an energy source.

The ability of silicon compounds to stimulate microbial growth under low nutrient conditions leads us on to the brush with cosmology that was mentioned in the first paragraph.

THE ORIGINS OF LIFE ON EARTH

One view which is gradually gaining some degree of credibility is that life arose not on earth, but somewhere else in the cosmos, from where it seeded the primeval earth. This so-called theory of panspermia was first developed by Arrenius, then Lord Kelvin, and has recently been championed by Sir Fred Hoyle and N.C. Wickramasinghe (1978), who controversially maintain that the earth still continues to be showered with micro-organisms from space. Although this modern version of panspermia has been criticized by some microbiologists, evidence increasingly points to the possibility that panspermia could have operated (or is still operating). The classic alternative to panspermia is the Oparin/Miller–Urey view, i.e. that life arose on earth from chemicals present in a dilute primeval soup. Why not combine the two theories and throw in a bit of silicon? If the early earth was exposed to a cosmic rain of micro-organisms, these would have fallen into this soup which might have been too dilute to support growth. The presence of silicon, including clays, might however, have allowed micro-organisms to grow in the soup, or even in rain water, either because it helped to scavenge airborne nutrients or acted as a source of energy. Francis Crick, in *Life Itself* (1982), his book devoted to the theory of directed panspermia (the view that life was deliberately seeded on earth by a cosmic intelligence) pointed out that no-one seems to have tried growing micro-organisms in the artificial soups produced in typical Miller–Urey experiments. However, such artificial primeval soups contain an abundance of potential microbial nutrients, including urea, and amino and carboxylic acids. Since many micro-organisms can grow in distilled water, there is no doubt that they could also grow in such rich mixtures, even without the addition of silicon.

It is noteworthy that space contains an almost infinite number of grains of silicate material around 0.1 μm in diameter; comets also contain carbon-rich silicates (Heidmann, 1995). As they travel through space these grains accumulate methylamine, methyl alcohol, formaldehyde and hydrogen cyanide; potential building blocks for earth-evolved life, but also potential nutrients for interstellar life. As we have seen, silicon compounds stimulate the growth of micro-organisms added to purified water, so we could even dispense with the pre-biotic soup. Provided that silicon and an organic carbon- and nitrogen-rich atmosphere were present, sufficient nutrients would have been available to support the growth of any earth-bound micro-organisms. Micro-organisms might have evolved the ability to use silicon elsewhere in the universe and used it here on earth. It is interesting that, despite all the attention currently given to the RNA world view of life's origin, Woese believes that an energy-producing metabolic cycle, not RNA, triggered life on earth (Cohen, 1996). Could such a metabolic cycle have been based on silicon metabolism? Cairns-Smith (1985) has also suggested that clays, which are rich in silicon, could have acted as the original replicators, while Coyne (1985) has suggested that the surfaces of minerals, including clays, played an important role in the initial development of life on earth.

WHAT HENRY CHARLTON BASTIAN SAW

The stimulatory effect of silicon on microbial growth might also explain an historical enigma, concerning the controversial work of the British physiologist, Henry Charlton Bastian (1837–1915).

Henry Charlton Bastian, who inadvertently discovered microbial silicon metabolism while trying to demonstrate spontaneous generation.

Towards the latter part of a very productive scientific career he became embroiled in the spontaneous generation controversy. He maintained that Pasteur's famous experiments had merely demonstrated that micro-organisms live in the air; his own experiments, he believed, showed that micro-organisms can arise *de novo* (Bastian, 1914). He was literally the last bastion (excuse the pun) of support for the theory of spontaneous generation. In a previous article in the *Quarterly* I judged that although Bastian's conclusions were erroneous, his experiments were sound and probably produced important observations which have been ignored (Wainwright, 1994). Bastian exposed mixtures of various solutions in sealed, heat-sterilized tubes to diffuse sunlight. When bacterial and fungal life appeared in these tubes he declared that he had demonstrated spontaneous generation. Not surprisingly, Bastian's work came in for considerable criticism, not least from Thomas Huxley and John Tyndall, who were passionate advocates of Pasteur's doctrines. Bastian was no fool however, and his experiments were very well conducted and his arguments well thought out.

In retrospect, his experiments appear to demonstrate the potentially important role that silicon plays in microbial metabolism. In some, Bastian employed solutions containing small quantities of sodium silicate, ammonium phosphate and phosphoric acid in distilled water, while in others he used sodium silicate and ferrous nitrate. Carbon was only present in these experiments in the form of CO_2 and as traces of organic carbon in the liquids and air above. The contents of the tubes were examined following incubation at room temperature for between 5 weeks and 4 months. Bastian found that micro-organisms were always found associated with flakes of silicon floating in the liquid. The liquid above, which Bastian described as being "ostensibly carbon-free", remained clear. Bastian concluded that he had produced life *de novo*. But, perhaps more importantly he stated that "there was good prima facie evidence tending to suggest that silicon was capable of entering into the composition of protoplasm that was wholly or in part

taking the place of carbon". Bastian's use here of the word ostensibly shows that he realized that distilled water was not carbon free and that micro-organisms might scavenge fixed carbon from the atmosphere. While Bastian's conclusions about spontaneous generation seem erroneous we can see that, by careful experimentation, he may have stumbled across the fact that silicon plays an important role in microbial metabolism under oligotrophic conditions, i.e. he suggests the existence of some form of silicon-based autotrophy.

I will end with two more heresies. The first, postulated by Norman Heron, is that silicon-based life could exist using zeolites (compounds that have crystalline open framework structures constructed of SiO_4 and AlO_4 tetrahedra linked through oxygen bridges) as enzyme mimics (Heron, 1989). Even more amazingly, Benveniste's group has shown that homeopathic amounts of SiO_2 can influence the synthesis, by peritoneal macrophages, of PAF (AcGEPC, platelet-activating factor) (Davenas *et al.*, 1987).

Clearly, although largely neglected by microbiologists, silicon is an element whose study might yet throw up new approaches to microbial physiology. After all, as I have already suggested, it is not like nature to miss the opportunity presented by a resource like silicon, vast amounts of which are lying around on our planet.

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Macro- vs Micro-ecology – The Need for Understanding and Collaboration

Harriet Jones

So often it is what we see around us that appears to be of the greatest importance. The immediately visible world is made up of plants, animals and fungi. Why consider anything else? And yet, it is what we cannot see that is proving to be more of a puzzle than what we can see.

Microbiologists often find themselves defending the importance of the microscopic world, trying to get non-microbiologists to appreciate a world they cannot see: the problem appears to be one of scale and concepts relating to scale. Macro- (as opposed to micro-) biologists are beginning to realize the importance of microbial systems to ecology as a whole but often fail to appreciate the problems associated with studying microbial systems. Macro- and microbiologists could benefit a lot from sharing the wealth of knowledge that each has built up over the last few decades. To bridge the gap that lies between the interests of each camp appears at present to be an almost impossible aim.

One of the particular areas of interest developing among macro-ecologists is to understand soil processes, so long considered a 'black box'. This requires at least a basic understanding of the role of all soil micro-organisms, the most neglected group being the protists on which this article will focus. On the whole, protozoologists have steered clear of soil microbiology, the brave few have made some headway, but their message is clear: soil protozoology is an extremely complicated subject, even at the most basic level. Some initial studies on the role of protists in soil processes, while sometimes contradicting each other, show that protists do affect the availability of nutrients and so could affect plant communities. It is vital, therefore, to include work on protist communities in any work on soil processes. It is not, however, a simple task to combine macro- and microbiological studies. When you look at the ecology of, for example, a grassland, it is not too complicated to work out which types of plants and animals live there, their relative abundance, and who is eating what, or who. But for a microbiologist, characterizing a very simple system is full of practical problems before one even considers applying concepts and theories. Relatively well established concepts for macrobiologists remain, on the whole, unexplored by microbiologists. The understanding and application of such basic concepts such as 'spatial heterogeneity', 'diversity' and, in particular, what is meant by 'species', will require a lot more basic research before they can be successfully tackled by microbiologists.

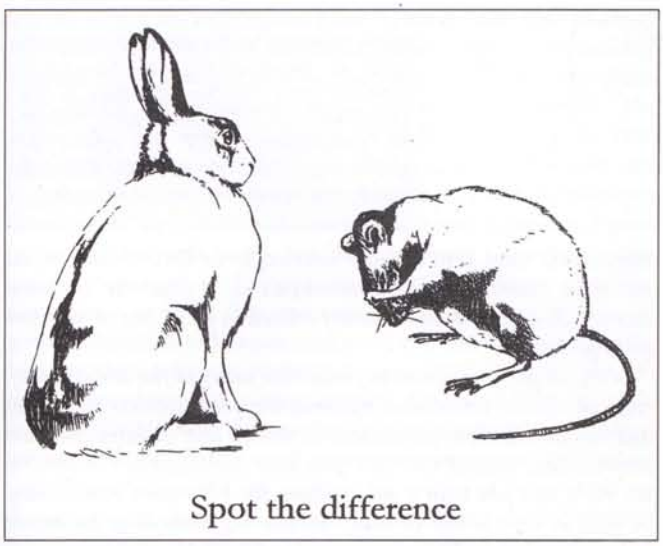
One of the fundamental problems in studying microbial ecology, and this applies to soil in particular, is that of transferring organisms from the field to the laboratory to carry out detailed experiments. More than 90% of soil protozoa cannot be cultured. Of those that can, it is necessary to rely on appearance to judge whether the organism in culture is the same as one you may see in a soil sample on a separate occasion, and so be able to compare laboratory data with sightings in the field. It encompasses one of the most basic questions of all to protist biology – what is a species? And how do you recognize a species once you have defined it, given the elasticity of form and function that is found in some protists? Since such a small percentage of protist strains can be cultured, many laboratory studies concentrate on these particular strains, with little idea of their real importance in the field. Of this small percentage that can be grown in the laboratory, very few can be maintained axenically and so their biochemistry remains a mystery. The biochemistry of protists, therefore, is based on a tiny sample, and perhaps a sample that is unrepresentative since it is derived only from the minority that can be cultured axenically. This inability to obtain laboratory cultures of all but a tiny fraction of species, severely hampers efforts to understand the ecological roles of these micro-organisms in the field.

Identifying the species observed in a field sample is a huge problem to protozoologists, and to soil protozoologists in particular. Identifying to genus can usually be done with high power light microscopy, but identification to species often requires electron microscopy, for which protists need to be isolated and cultured; and so, since we cannot culture most species, we cannot accurately identify them. For a macro-ecologist a quick glance is enough to establish that, for example, a rabbit and a mouse are different species. On a microbial scale such quick observations are, on the whole, impossible. If rabbits and mice were the size of heterotrophic flagellates, a careful inspection down a good microscope would reveal that the ears and tail of the rabbit and mouse were of different sizes and shapes and the legs were slightly differently arranged; there is also a general size difference. But what if ear or tail size depended on environmental conditions, or the size of the organism was dependent on the stage of its life cycle, equivalent to comparing a baby rabbit to a large mouse? Macro-biologists, are usually able to identify individual species, but the inability to do this makes life very difficult for the microbiologist. Microbiologists may, however, learn from recent developments in macrobiology where species are represented by functional groups in diversity studies.

The ecological principles used by macrobiologists are very difficult to explore in terms of microbiology. For example, macro-ecologists have devoted much effort to understanding how spatial heterogeneity affects species abundance. They have demonstrated how it allows the co-existence of species and promotes diversity. Spatial heterogeneity, however, depends on the scale of the organism that senses it. What appears to the macro-ecologist as a homogeneous environment, may for much smaller organisms, appear as a mosaic of different environments. These concepts, although practically difficult to explore, can be applied to studying the effects of spatial heterogeneity on soil protists. A sand grain or a clay particle could provide a very different habitat for heterotrophic flagellates or bacteria, and so influence species diversity. A large ciliate, however, may not be sensitive to individual grains, but may respond to properties of grain aggregates.

This problem is also highlighted when considering ideas surrounding food webs and descriptions of interactions within a whole ecosystem. Macrobiologists rely on long-established principles to describe interactions between

When you look at the ecology of a grassland, it is not too complicated to work out which types of plants and animals live there, their relative abundance, and who is eating what, or who.



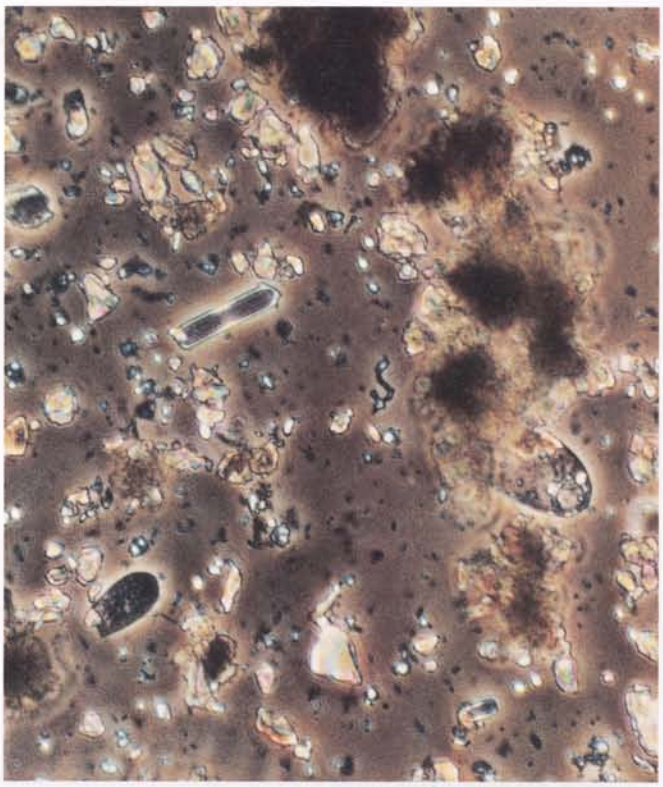
For a macro-ecologist a quick glance is enough to establish that a rabbit and a mouse are different species (drawing by Andrew Gonzales, Centre for Population Biology).

plants and animals. Energy transfer in food chains begins with photosynthesizers and ends with top predators. If this were assumed to be the case in microbial food webs, we would miss 90% of the picture. At the microbial level some species of primary producers, referred to as mixotrophic algae, can eat other protists. Some protozoa can themselves photosynthesize, equivalent to a carnivore becoming a primary producer, while other protozoa, ciliates in particular, keep a 'farm' of algae within themselves and use the algal photosynthetic bi-products as a source of energy. Algae and protozoa can also eat detritus, or absorb nutrients directly from their surrounding medium. Arguably, very few micro-organisms have a single trophic role, and energy and nutrients are cycled between them, so that, instead of a web of food chains there is a web of microbial loops. This cycling makes the role of individual organisms extremely complicated to determine. In addition, some micro-organisms have the ability to change their form as well as their function according to environmental conditions.

The microbial loop is a concept that is alien to the ecological principles used by macro-ecologists and makes it difficult to apply macro-ecological concepts and theories to problems in microbial ecology. The idea that single organisms can have multiple trophic modes further complicates the application of macrobiological theories to microbiological systems.

Microbial ecology is at a stage where we are trying to understand what individual organisms are doing and their role within this complex cycling of carbon and nutrients. Effort is being made to assign many protists to functional groups, to step into line with current macro-ecological thinking, but it will take time, as we do not yet know even the full range of functions of the majority of protists. With many protists having multiple functions, macro-ecological theories may need considerable adaptation before they can be applied to microbial systems.

It is becoming increasingly important to demonstrate to macro-ecologists not only the importance of protists, but also the complications associated with ascertaining their importance. If you look at a few grains of soil under the microscope you will see a variety of bacteria, flagellates, ciliates, amoebae and small metazoans. But these are just the organisms visible to the microscope-aided eye, and are only part of the picture. Many amoebae look like pieces of detritus. Cysts are very hard to spot, and many micro-organisms will be deeply immersed in particles of soil. There is no all-encompassing method for observing all the organisms present in a soil sample the size of a pinhead. Using simple observation, much of the picture is missing and since it is virtually impossible to understand the microbial ecology of a volume of soil the size of a pinhead, how could this then be extrapolated to, for example, an area of grassland? Even harder is the problem of understanding how the protozoa in the soil interact with the plants and animals. One way of appreciating



If you look at a few grains of soil under the microscope...
Garden soil mixed with water and observed under a ×20 objective.

this situation is to look at the plants and animals of a grassland community in the way one is forced, by practical necessity, to look at a soil-based microbial system. For example, if you had to work out which species of plants and animals were present, as well as their functions, while studying the grassland from the top of a tall tree, you could get a reasonable idea of the overall picture, but the detail would be lost. You could see that plants and animals were present, and a rough idea of the size of those that you could see and what they were eating. But many would be hidden from view and the numbers and functions of hidden plants and animals would be pure guesswork.

Microbial ecology is decades behind macro-ecology in terms of our understanding of processes and the interactions between organisms. Until microbial ecology is better understood it will be extremely difficult to combine micro- and macro-ecological studies. Microbial ecology is at the stage of exploring the organisms that are present and trying to identify their functions and ecological roles. In soil, in particular, new species are continually being discovered. This exploratory stage means that there is a lack of specific questions allowing the formation of detailed ecological theories. Such questions arise only when the microbial community is treated as a whole, as a source of energy for macro-organisms. And yet it is what is going on within the micro-organism 'black-box' which is so intriguing and so important to understand, before interactions between micro- and macrosystems can begin to be understood. Micro- and macrosystems are only divided by scientists. In nature they are one system, interlinked and dependent on one another. It is therefore essential that macrobiologists appreciate both the importance of protists and the problems involved in studying microbial ecology. Microbiologists should, in turn, capitalize on the advances made in macrobiology to help accelerate our understanding of microbial interactions. Perhaps we could then combine micro- and macro-ecological studies and start studying the complete picture.

ACKNOWLEDGEMENTS

I would like to thank Lindsey Thompson, Lex Kraaijeveld and John Lawton from the NERC Centre for Population Biology for their contributions to this article.

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Microbial Risks of Transfusion – A Distorted Perception?

John Barbara

Media attention to the infectious complications of blood transfusion has never subsided since the dramatic days of the identification of AIDS. Subsequent interest has encompassed HCV and now HGV and the possible relevance of CJD. Yet, paradoxically, blood has never been safer.

Blood transfusion is the ideal portal of entry for blood-borne micro-organisms when medical intervention transfers up to half a litre of blood from one person directly into the blood stream of another. Fortunately, only a relatively few infectious agents actually pose a potential threat to the safety of the blood supply in the UK because the majority of infections render the victim too unwell to donate blood or cause obvious symptoms that would occasion their exclusion. This is an important element of donor selection – the cornerstone of blood safety – which I will return to later. So the agents that pose the most significant threat as transfusion-transmissible infections (TTIs) are those that may be asymptomatic or have a very long incubation period prior to the development of symptoms. Obviously, the agent must be present in the blood, either in the plasma or in the cellular elements (or both as is the case with HIV) and must retain viability under the conditions in which blood and its derivatives are stored – up to 35 days at 4 °C in the case of red cells. The longer an individual is silently infected, the more chance there is that the infection could be transmitted in a blood donation. Therefore, the most significant of the TTIs are those in which there is a long-term carrier state, where free virus is in the plasma, or when viral DNA is incorporated into white blood cells, integrated in the host DNA. CMV is the classic example of the latter state but more recently the retroviruses (HIV and HTLV), whose reverse transcriptase makes DNA copies of their RNA genomes, have achieved greater prominence in this context.

When up to 20,000 different plasma donations are pooled for the efficient production of fractionated products, the risks of contaminating the pool, and hence all the derived products, are greatly enhanced, as was so tragically demonstrated by HIV. Fortunately, modern methods of inactivating viruses by heat or solvent/detergent treatment are extremely effective. Thus, products such as the clotting factor concentrate, factor VIII, which has revolutionized the treatment of haemophilia, can now be rendered virologically safe.

Microbes that can be readily transmitted by transfusion in the absence of preventive measures are shown below.

Bacteria

Exogenous (e.g. skin or environmental contaminants) such as *Pseudomonas* or *Serratia* species

Endogenous, causing asymptomatic bacteremia (e.g. *Yersinia enterocolitica*)

Protozoan parasites

Malaria (several *Plasmodium* species)

Chagas' disease (*Trypanosoma cruzi*)

Nantucket fever (*Babesia microti*) in the USA

(*Toxoplasma gondii* and *Leishmania donovani* have also been transmitted, but only rarely)

Viruses

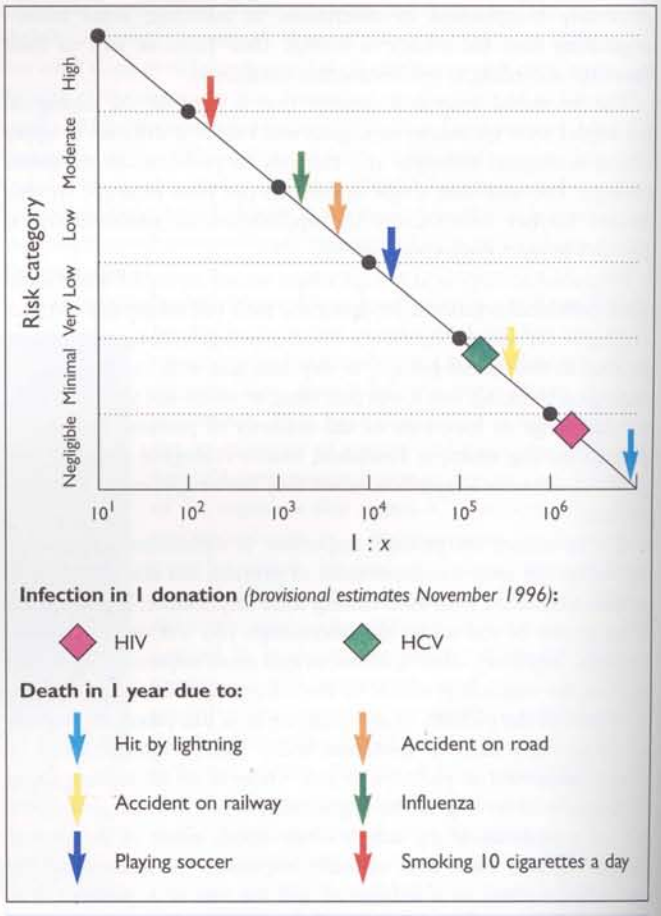
Hepatitis viruses	(A), B, C, D, 'G'
Retroviruses	HIV-1 and HIV-2, HTLV-I and HTLV-II
Herpes viruses	CMV (EBV, rarely)
Parvovirus	B19

Because hepatitis A virus (HAV) and parvovirus B19 infections do not become latent, only a handful of post-transfusion (PT) cases due to these agents have been recorded worldwide. However, because both viruses lack a lipid envelope they are not susceptible to inactivation by solvent/detergent treatments and such procedures would not eliminate these viruses in fractionated plasma products. Hepatitis D (or delta agent) is an RNA virus which relies on HBV to 'rescue' it by providing an HBsAg coat. As such, screening blood for HBsAg effectively removes the risk of transmission of HDV. Hepatitis G virus (HGV, better referred to as GBV-C since it has not been proven to be hepatotropic) is a relatively common recently cloned flavivirus distantly related to HCV, but of very low pathogenicity.

With current procedures to protect the safety of the blood supply, residual risks of transfusion transmission are extremely low. From analysis of infection prevalence, incidence and of inter-donation interval data, residual UK risks have been calculated as 1 in 200,000 for HCV and less than 1 in 2 million for HIV. Such risks should be seen in the context of other adverse occurrences as illustrated in the figure below. The safety procedures available to us are:

1. Donor selection, a prime factor in ensuring safety, based on the exclusion of donors with sexual or intravenous drug use risks and the maintenance of a completely voluntary and unpaid donor panel.
2. Laboratory testing of all blood donations for syphilis, anti-HIV-1 and -2, anti-HCV and HBsAg. With 2.5 million donations annually in the UK, testing is completely automated with full process control, use of national QC samples and electronic information transfer. All aspects of testing performance are collated and monitored nationally.
3. Viral inactivation procedures for fractionated products made from large pools of plasma.
4. Education of medical personnel in the avoidance of unnecessary transfusions.

Various questions relating to the microbial safety of blood continue to be debated and assessed in the context of national working parties. In the UK, blood donations are not tested for the



Are we at risk from blood that is donated? 'Risk category' is adapted from *Health of the Nation* by Dr K. Calman (1996). *Data courtesy of Kate Soldan.*

human T cell leukaemia viruses I and II, nor for anti-HBc to detect HBV-infected donors with subliminal levels of HBsAg. The recently reported transmission of HIV by a seronegative donor in the North West during seroconversion (the so called 'window period') has again raised the specific question of additional testing for HIV antigen. Experience in the USA has shown, however, that only one additional HIV-infected donor was detected in 6 million donations tested for HIVAg. This would represent only one instance in 3 years in the UK and reflects the fact that the recent transmission was the first recorded in England since anti-HIV donor screening commenced in 1985. The more general question of the use of genome detection techniques such as PCR is also raised. Currently, however, the question is academic because, apart from the cost, no rapid, consistent and robust systems for automation of such tests compatible with the exacting quality requirements of blood services and the need to avoid cross-contamination in bulk testing exist. Nevertheless, the use of PCR for testing of 'mini-pools' of donor samples when their plasma is destined for pooled-product fractionation is imminent. This will undoubtedly extend to the development of systems which will allow the release of individual labile blood components, in a timely fashion, on the basis of cost-effective PCR testing in systems yet to be determined.

Other agents are also being monitored for any potential impact on blood safety. Does HHV8 (the virus associated with Kaposi's sarcoma) have any relevance to transfusion safety? Preliminary data from the USA indicates a lack of transmission by transfusion, even from cellular blood components. The so called 'hepatitis G' virus has already been mentioned. What risks, if any, are associated with Creutzfeld–Jakob Disease (CJD)? Again, although prions can be demonstrated in the blood of experimentally infected laboratory animals, no transmission has been demonstrated in such animals by intravenous inoculation, but only by intracerebral challenge. Nor is there any evidence of prion transmission when the recipients of blood from donors subsequently shown to have CJD are studied. The identification of 'new variant CJD' (nvCJD) in patients presumed to have been infected by the cattle BSE prion has brought with it the need to extend our monitoring of prion disease to encompass this 'new' agent. The challenges seem considerable, but the practical reality remains that most of the potential risk is 'perceived' rather than demonstrated. When appropriately prescribed, the risks to the patient of receiving blood are strikingly less than the risk of treatment in its absence, and certainly far less than the risk of being the victim of a fatal road accident! The blood services clearly recognize the challenges and are fully confident that they can, and will, be met.

Dr John Barbara, Microbiology consultant to the National Blood Authority, National Blood Service, North London, Colindale NW9. Also honorary senior lecturer, Division of Virology, University College London Medical School. Currently President of the British Blood Transfusion Society. For nearly a quarter of a century he has studied the detection, prevention and relevance of the whole range of transfusion-transmissible infections.

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COMPUTER-ASSISTED LEARNING – WHAT'S NEW?

LARGE CLASSES, DIMINISHING RESOURCES, REDUCED LABORATORY FACILITIES – TEACHING MICROBIOLOGY TODAY PRESENTS MANY DIFFICULTIES. ELECTRONIC METHODS OF LEARNING HAVE GREAT POTENTIAL FOR ALLEVIATING SOME OF THESE PROBLEMS. IN THIS FEATURE MIKE TAIT REVIEWS SOME CURRENT DEVELOPMENTS IN THE FIELD AND RECIPIENTS OF SGM TEACHING FUND AWARDS DESCRIBE THEIR RECENTLY COMPLETED PROJECTS.

LEARNING TECHNOLOGY FOR MICROBIOLOGISTS

A report on the Education Group Symposium at Heriot-Watt University

Mike Tait

THIS SYMPOSIUM was held on Monday 24 March this year and formed part of the 137th Ordinary Meeting of the Society. Despite being in competition with the Main Symposium and two other Group symposia, the morning talks were attended by over 60 participants. A similar number turned up at the afternoon demonstration session despite having to navigate a circuitous route to the Biological Sciences computer room. Our thanks are therefore due to the staff of Fergus Priest's department for not only providing the computing facilities but also for patiently directing lost participants to the computer room.

The morning session was held in a lecture theatre which has recently been equipped with state-of-the-art computer-controlled projection and video-conferencing facilities. These were used to good effect by all of the speakers with the exception of the final one (the author of this report) whose demonstration was foiled by a corrupted disk and his poor organizational skills in forgetting to bring a back-up!

The first talk of the day was delivered by Alan Cann of the University of Leicester. He had used an intriguing title, *Microbiology CAL: a Nerd's-eye View*, which left everyone in the room wondering exactly who was being called a nerd! Thankfully, it became clear over the course of his talk that he was referring to one of his categories of students who use his CAL (computer-aided learning) resources. Alan uses the Web to deliver much of his CAL and linked live to his Web pages during his talk to demonstrate his excellent microbiology tutorials and videos.

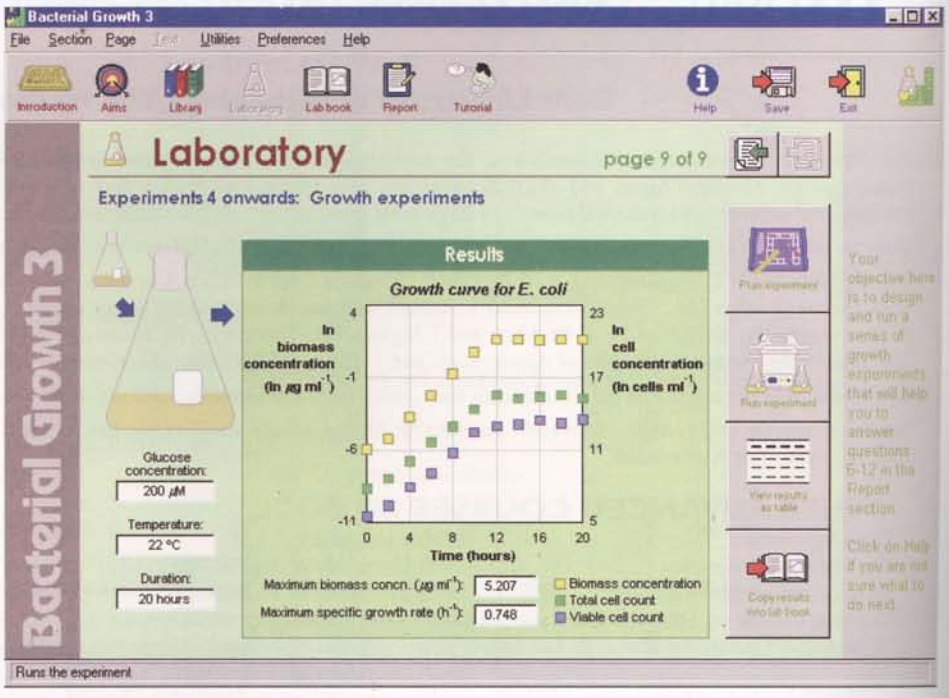
During his talk, Alan described some of the advantages of CAL as a solution to many of the issues which confront teachers in higher education today, such as the need to innovate in course delivery and to accommodate increasing numbers of students, sometimes at physically distant sites, without an associated increase in resources. This theme was developed further by the second speaker, Suzanne Robertson from the University of Sunderland, in her talk on *Mixed Media in Microbiology Teaching*. She made the very important point that technology should not be used for its own sake and must form part of a well-designed delivery strategy. She was also able to provide a live demonstration of one of the new technologies now being used for microbiology teaching: video-conferencing. This is useful not only for distance education but also within an institution where staff and students may be at different locations on the campus.

It occurred to some of us attending the official post-symposium debriefing session (in the bar) that we really missed an opportunity by inviting Suzanne to Heriot-Watt as it would have been an excellent demonstration of video-conferencing if she had delivered her talk live from Sunderland. We could also have bought a few more drinks with the money saved on travelling expenses! In the end, however, everyone agreed that it was better that she had attended in person. It will be interesting, though, to see if some of the other SGM Groups use video-conferencing in the future as a way of introducing more overseas speakers to their symposia.

A video-conferencing link would also have been useful for the intended third speaker of the day, Mark Pallen from Imperial College, London. He was scheduled to talk on *The World-Wide Web and Internet as a Resource for Microbiology Teaching and Research*. Unfortunately, due to a mix-up over dates, he was still putting the finishing touches to his talk in London while we were awaiting his arrival in Edinburgh. We were, however, able to link live to his 'Microbial Underground Website' which has many links to useful microbiological resources, including on-line courses and strain and sequence databases.

Therefore, the third talk of the morning was delivered by a double act of Helen Watt and a colleague from Glasgow University. They described their experiences in computer-based assessment which has been introduced to a newly modularized course in the Institute of Biomedical and Life Sciences at Glasgow. This has been achieved using an optical mark reader and a PC running *Microsoft Excel*. Although this had proved to be a more difficult task than expected, they now have a working system that elicited a lot of interest from those attending the symposium.

The final talk of the morning was given by the author of this article who also chaired the symposium. The aim of this talk was to provide an overview of the use of learning technology in microbiology and to try and make some predictions about its future. *Bacterial Growth 2* was used as an example of currently available microbiology CAL resources and was used to show how CAL can develop transferable skills such as experimental design and data interpretation. This is achieved by providing a virtual laboratory where over 700 different growth experiments can be designed and run. The results of each experiment are plotted automatically by the program and must be analysed by the student before the next experiment can be run. Version 3 of this program is now available



A screen shot from *Bacterial Growth 3*.

and a demonstration version can be downloaded from the Scotcal Web site. The new program is extensively rewritten and has a number of new features including an optional tutorial on growth kinetics for those who are willing to inflict this experience on their students. The optimistic conclusion of this talk was that learning technology would in future offer microbiology teachers the chance to enhance their teaching by introducing alternative modes of learning that will develop skills that conventional systems do not.

In the afternoon, demonstrations of various CAL packages and Web resources were provided by Chris Dodd from the University of Nottingham, *The 'Microbe' CAL Package for Food Microbiology Undergraduates*; Adrian Eley from the University of Sheffield, *Computer-assisted Learning for the Teaching of Antimicrobial Chemotherapy*; Peter Miller from CTIBiology, University of Liverpool, *Use of a Concept Mapping Tool for Developing Courseware in Microbiology*; Jen Harvey from the LTDI, Heriot-Watt University, *Computer-aided Learning in Microbiology*; and Hamid Ahmed from Halton College, *Training Materials in Microbiology Based on NVQ Standards*. The fact that all of these demonstrations were busy throughout the afternoon is a clear indication of the increased interest in the new technologies.

For more information on this subject, you can contact the author of this article by Email at m.i.tait@abdn.ac.uk or scotcal@dial.pipex.com

Mike Tait, DISS CAL/Web Unit, Queen Mother Library, University of Aberdeen, Aberdeen (Tel 01224 272602).

RESOURCES

Alan Cann's microbiology tutorials:
http://www-micro.msb.le.ac.uk/Tutorials/Tutorials.html

Alan Cann's microbiology videos:
http://www-micro.msb.le.ac.uk/Video/Video.html

Mark Pallen's Microbial Underground site:
http://www.qmw.ac.uk/~rhbm001/

Scotcal Web site: http://www.demon.co.uk/scotcal/

Bacterial Growth 3 demo program:
http://www.demon.co.uk/scotcal/growth3

Symposium abstracts: http://www.demon.co.uk/scotcal/sgm/

Developments in Teaching Fund Reports

The Society has been providing small grants to aid the development of novel teaching aids since 1990, but in recent years the applications for laboratory-based projects have been replaced by requests for help with computer-assisted learning systems. In 1994 five such projects were funded and the Award Panel was a little concerned that the bias of the applications had changed so markedly. However, most of the projects have now been completed and as the reports from the awardees below show, great successes have been achieved. Interestingly, student reaction to electronic methods of teaching appears to be mixed, demonstrating the importance of evaluating new packages and ensuring that they meet the objective of enhancing learning.

All of the systems outlined below were demonstrated at the Society Spring meeting at Heriot-Watt University where, as Mike Tait has already described, they provoked considerable interest.

COMPUTER-ASSISTED LEARNING OF MICROBIOLOGY & IMMUNOLOGY

Delivery of High Quality Teaching Materials via the Web

Alan J. Cann

In the first two years of operation, the flexible, interactive system I have developed has been extensively used by undergraduate students at all levels and is proving to be a popular additional source of detailed factual information and method of learning important concepts in biology and medicine. This is a relatively low-cost approach to delivery of CAL which makes maximum use of higher education institutions' existing investment in network technology and an increasing commitment to the the Web as a central information system. The types of information which can be used currently with this system include:

- text (all documents produced with this system are fully searchable using a simple 'Find' Command)
- lecture notes (text plus full colour images)
- video and audio recordings
- image maps – a graphical interface containing links to further hypertext information
- access to additional on-line information sources, linked directly to teaching documents
- interactive on-line tutorials, with or without recorded assessment, as required
- text submission facilities to accept and record information submitted by students
- on-line projects for students to undertake in their own time.

Over 100 Mb of materials, including text, high quality images and video, are now available from this system, which can be viewed on-line (http://www-micro.msb.le.uk/).

However, the most innovative aspect of this project is the use of interactive teaching materials, including multiple choice questions, student text submission facilities and interactive tutorials. As an indication of the popularity of this system, I present a copy of the usage statistics for the month of July 1996 (Web Server Statistics, Dept of Microbiology and Immunology, University of Leicester):

Analysed requests from 1.7.96 to 31.7.96 (31 days)	
Total completed requests:	46,947
Average completed requests per day:	1,514
Number of distinct files requested:	1,833
Number of distinct hosts served:	4,893
Corrupt logfile lines:	6
Unwanted logfile entries:	438
Total data transferred:	597,370 kb
Average data transferred per day:	19,271 kb

ADVANTAGES OF THIS SYSTEM OF LEARNING

This initiative provides a rich learning environment for the students. Interactive computer-based courseware represents a move towards active learning, i.e. self-guided teaching. It is intended that the system will be used as a constantly available learning resource for students. The particular virtues of this type of courseware are as follows.

- Can be made available outside normal class hours, limited only by necessary security arrangements. Documents are constantly available to students anywhere on any computer platform. However, access to any document or set of documents can be easily controlled as required, e.g. unrestricted world-wide access, local access only, password-protected (e.g. sensitive clinical materials).
- Self-administered learning/revision/assessment – at the student's own pace, with no direct staff involvement, resulting in a considerable efficiency gain.
- The system can provide a high quality mix of line diagrams, full colour images and text, with interaction by means of hypertext

indicators. In-line video and sound recordings can now be incorporated into hypertext documents and these are a particularly important resource for this project. Visual images are important in medicine – computer-based systems allow a degree of interaction not possible by conventional methods (lectures).

- Selectivity – hypertext enables individual students to either concentrate on a particular topic or browse more widely through the subject. The student chooses which topics are to be investigated.
- Adaptability – new material can be easily incorporated or present materials updated – unlike CD-ROM materials which are expensive, platform-restricted and liable to become rapidly outdated.

Moreover, CAL provides perhaps the best opportunity for student self-guided learning. It is self-planned with the students themselves choosing their own paths through the mass of information encompassed by the package. Successful use of this package will not only increase student's knowledge, but will require them to develop other important skills, including self-assessment and planning of studies, information technology skills, creativity and self-motivation. I am currently considering the use of additional formats (such as VRML) which will be added to the package to further enrich the learning environment as these technologies become widely available in Web format.

Dr Alan J. Cann, Department of Microbiology & Immunology, University of Leicester, PO Box 138, Medical Sciences Building, University Road, Leicester LE1 9HN (Tel 0116 252 2954; Email nna@le.ac.uk).

For a review of the Microbiology Video Library part of this package, see *ASM News* **63** (3), p. 158.

DEVELOPMENT OF COMPUTER-ASSISTED LEARNING FOR THE TEACHING OF ANTIMICROBIAL CHEMOTHERAPY

Adrian R. Eley

AIMS OF THE PROJECT

THE ORIGINAL AIM was to develop a self-access hypertext tutorial package on antimicrobial chemotherapy, put it into the university computer network in approximately 12 months and be evaluated by the first cohort of students within 18 months.

These aims have been met as the package was put onto the university network in April 1996 and evaluated in May.

FINAL PROGRAMME LAYOUT

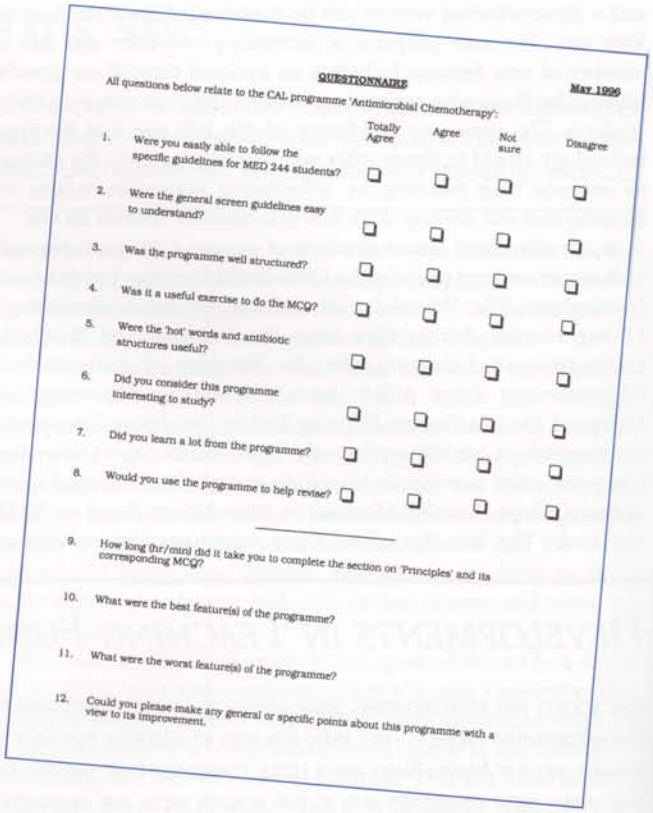
Guidelines for Use
General Introduction
Principles of Therapy (and Multiple Choice Questions – MCQ)
Specific Therapy (and MCQ)
Properties of the Antimicrobials (and MCQ)
The Future (includes immunotherapy, vaccines etc.)
Glossary

All MCQs consisted of 10 questions with correct answers indicated.

CHANGES TO ORIGINAL CONCEPT

Following a series of discussions with the multimedia officers of the university it was decided that the package be constructed around *Tool Book* rather than *Guide* software.

Although the commercial software (MICRO: Computerised Cases in Medical Microbiology and Infectious Diseases) was installed on the computer network at the same time as my own, it has not yet been possible to link this software directly to our CAL programme. At present, at appropriate positions in our programme we advise students to consult the case histories whenever relevant.



QUESTIONNAIRE May 1996

All questions below relate to the CAL programme 'Antimicrobial Chemotherapy':

		Totally Agree	Agree	Not sure	Disagree
1.	Were you easily able to follow the specific guidelines for MED 244 students?	☐	☐	☐	☐
2.	Were the general screen guidelines easy to understand?	☐	☐	☐	☐
3.	Was the programme well structured?	☐	☐	☐	☐
4.	Was it a useful exercise to do the MCQ?	☐	☐	☐	☐
5.	Were the 'hot' words and antibiotic structures useful?	☐	☐	☐	☐
6.	Did you consider this programme interesting to study?	☐	☐	☐	☐
7.	Did you learn a lot from the programme?	☐	☐	☐	☐
8.	Would you use the programme to help revise?	☐	☐	☐	☐

9. How long (hr/min) did it take you to complete the section on 'Principles' and its corresponding MCQ?

10. What were the best feature(s) of the programme?

11. What were the worst feature(s) of the programme?

12. Could you please make any general or specific points about this programme with a view to its improvement.

STUDENT EVALUATION

After the BSc students (module MED 244) had been given four weeks to consult the package, a questionnaire (see above) was given out and replies were received from approximately 60% of students. Overall there was a very mixed response with summaries to the questions as follows:

1. The majority of the students were easily able to follow specific guidelines.
2. The vast majority considered the general screen guidelines easy to understand.
3. Approx two-thirds thought the programme was well structured.
4. Most students agreed that the MCQ was a useful exercise.
5. Surprisingly, many students were not sure whether the 'hot' words and antibiotic structures were useful.
6. Many students considered the programme interesting to study although almost half fell into the 'not sure' or 'disagree' categories.
7. For this question the response was about 50/50 on whether students learnt a lot from the programme.
8. Again surprisingly, although many students said that they would use the programme to help revise, the majority were either not sure or disagreed.
9. Many students said that the section on 'Principles' and its corresponding MCQ took approximately 2 hours to complete although variations ranged from 15 min to 4 hours.
10. The best features of the programme were the pictures, that they were easy to understand and to follow, and were well presented.
11. The worst features included the fact that the programme was too long, that it had no index and that the page size was too big for the screen.
12. A number of comments were made about the programme and these included:
    - Make it shorter
    - Improve screen size
    - Useful to have a booklet as well
    - Do a lecture instead
    - Give handouts instead.

To summarize the response to the questionnaire, it is clear that a number of issues have been raised. In some areas of the curriculum,

several CAL programmes have been introduced and the novelty value may have declined. It is also imperative that the requests of students are clear and specific, and demands on their time should be as reasonable as possible. Even though some students will enthuse about the subject and spend many hours on the CAL programme, the majority only want to take enough time to complete the task set. I thought that the 'hot' words (describing key terms which expand into a description, etc.) and antibiotic structures would have received a more favourable response than they did. However, I suppose that to many, antibiotic structures might not be that interesting. Perhaps more surprising was the fairly large proportion of negative responses to questions 6, 7 and 8. Presumably if a sizeable proportion of students did not consider the programme to be interesting, then this would reflect their responses to questions 7 and 8. Again this response could have been influenced by interest in the subject rather than just the programme.

OVERALL SUMMARY

Although there was a mixed student response in the questionnaire, I consider the outcome of my first CAL programme to be relatively positive. The package overall was probably about the right length even though it is very important to issue specific guidelines to students. This is especially true when one is trying to use one package for several groups of students.

It became apparent that not all students like CAL packages, perhaps for a variety of reasons, and that this would be reflected in the responses in the questionnaire. However, it was useful hearing that problems had arisen regarding the page size being too big for the screen. This was not realized immediately as I was still waiting to be connected to the network, and when I visualized it myself, the problem was not apparent.

FUTURE RECOMMENDATIONS

- To make sure that the screen size can be corrected on every computer by making an addition to the guidelines.
- Further attempts to see whether the commercial software MICRO can be more fully integrated into the CAL programme.
- Possible responses from medical and dental students as well as further questionnaires to science students.
- Further amendments and updates to the CAL programme as necessary.

Dr A.R. Eley, Department of Medical Microbiology, University of Sheffield Medical School, Beech Hill Road, Sheffield S10 2RX (Tel. 0114 272 4072).

'MICROBE'

A CAL Package for Food Microbiology Undergraduates

Christine Dodd & Catherine Rees

WITH A GRANT from the SGM Teaching Fund we have been developing a CAL package for first year undergraduates taking the Food Microbiology course in the Department of Applied Biochemistry & Food Science at the University of Nottingham. The program is designed to allow students to apply their knowledge of food poisoning bacteria by identifying isolates from given food sources using test results and colony and cell morphology information (*see front cover of this issue*).

The students are presented with pictures of foods laid out for a barbecue; on choosing a food source they are then given annotated pictorial information about one of the potential micro-organisms that they might expect to find in that food (knowledge of food microflora should help the students narrow the field!). There are several appropriate micro-organisms associated with each food and the one given is chosen at random by the computer. Having made their decision, the correct identification is then given together with a summary of the rationale they should have followed. They are then led through a series of questions relating to the characteristics of the food-borne disease caused by that organism. At each point additional support revision material is provided to reinforce the learning process.

The student responses are automatically recorded and a final score allocated. A coursework mark is generated as a mean of three final scores for each student (the package ensures that the student is presented with three different organisms).

The program was developed as part of the TLTP project awarded to the Department and was written using *Authorware* software. Access is free to academic institutions but handling costs for discs and postage are charged. The package requires as a minimum a 486 PC with 8 Mb RAM running *Windows 3.1* (or better) or *Windows 95* with SVGA graphics. Contact Chris Dodd for further details (Chris.Dodd@nott.ac.uk).

Drs Christine E.R. Dodd & Catherine E.D. Rees, ABFS Department, University of Nottingham, Sutton Bonington Campus, Loughborough, Leics LE12 5RD (Tel 0115 951 6163).

Microbiology Welcomes Sequence Papers

Christopher M. Thomas

At the *Microbiology* Editorial Board Meeting in March this year it was pointed out that my *Microbiology Comment* article 'Complete sequence figures are out' (*Microbiology*, **143**, 1) may have given the mistaken impression that *Microbiology* was becoming less enthusiastic about publishing papers based on large bodies of sequence data. On the contrary, the Editors recognize the vital importance of these sorts of data in the rapid advancement of microbiology and want the journal to play its role in making the knowledge resulting from these projects available to the scientific community. *Microbiology*'s close involvement with the *Bacillus subtilis* genome project is an example of this.

However, changes in editorial policy were seen to be necessary to cope with the growing volume of sequence data that is becoming available through the use of automated sequencing facilities. Electronic databases are now so universally accessible that the Editors must assume that anyone who wishes to use DNA sequences will not need to have the primary sequence data presented in full. The job of a published article should be to present the results of the analysis of the determined sequence and the experiments that make sense out of the sequence. The purpose of the January *Microbiology Comment* article was to signal to authors that sequences should not be shown unless they illustrate an important feature of function or organization.

It should be emphasized that *Microbiology* does not wish to lay down rigid rules about sequence figures: the Editor or Member of the Editorial Board dealing with a paper will use their discretion about what sequence data should be shown.

Christopher M. Thomas, Genetics Editor

Internet News

ROYAL MICROSCOPICAL SOCIETY

The Royal Microscopical Society now has an Email number (info@rms.org.uk) and a home page on the World Wide Web (http://www.rms.org.uk).

NEW ZEALAND MICROBIOLOGICAL SOCIETY

Richard Cannon, Secretary of the New Zealand Microbiological Society informs us that they have created a website at http://www.nzms.org.nz. Richard can be contacted at richard.cannon@stonebow.otago.ac.nz

New Minister for Science and Technology

Prime Minister Tony Blair has appointed John Battle MP as Minister for Science and Technology, with the rank of Minister of State within the Department of Trade and Industry. Mr Battle previously shadowed this post when in Opposition. The Office of Science and Technology, headed by the Government's Chief Scientific Adviser, Sir Robert May, will remain within the DTI which will still ring-fence the Science Budget. Science graduate Mrs Margaret Beckett, as President of the Board of Trade and Secretary of State for Trade and Industry, will have overall control of the OST. Lord Clinton-Davis will deal with science and technology issues in the House of Lords. The scientific community awaits their policies with interest.

European Federation of Biotechnology

Task Group on Public Perceptions of Biotechnology
Briefing Paper 6: *What's What in Biotechnology?*

The aim of this briefing paper is to explain concepts and jargon frequently used in biotechnology. The central role of DNA is described, as well as the techniques and tools used by biotechnologists to alter the characteristics of living organisms. The paper also clarifies the terms which are used in biotechnology. For copies of this leaflet contact: Prof. John Durant, Research & Information Services, National Museum of Science & Industry, London SW7 2DD.

Medical Research Council
New Response Mode Funding Schemes for Research in Universities

The MRC has recently announced a range of new funding schemes for the support of response mode research in universities. The objective of these new schemes, which are complemented by enhancements to the Council's programme grants scheme and a modified strategic project grant scheme, is to enhance the support of high quality research in partnership with universities in furtherance of the MRC mission to improve human health. The new forms of support are:

Centre Grants – to support multi-disciplinary, research-centred environments in partnership with universities, and having full-time, focused scientific leadership and management.

Co-operative Group Grants – to establish or bring together critical research mass, normally within single universities, in ways which add value to individual research projects and improve the productivity of research environments.

Development Grants – to help universities get to the point where they can make competitive applications for funding under the Co-operative Group Grants Scheme.

Career Establishment Grants – to provide long-term support for a fixed period for scientists recently appointed to university academic posts to help them establish themselves as independent research workers capable of winning support in open competition.

Innovation Grants – to provide short-term funding for high-risk, speculative or innovative research and awarded on the basis of the applicant's track record of achievement.

There are significant changes to existing MRC grant schemes consequent to the introduction of the new funding policy.

For more information consult the MRC home page (http://www.mrc.ac.uk) or consult the New Funding Schemes Support Office, MRC, 20 Park Crescent, London W1N 4AL (Tel. 0171 637 6003; Fax 0171 636 6289; Email new.schemes@headoffice.mrc.ac.uk).

Notices

Annual General Meeting 1997

THE ANNUAL GENERAL MEETING of the Society will be held on Tuesday 2 September 1997 at the Society Meeting at the University of Southampton. Agenda papers, including reports from Officers and Group Conveners, and the accounts of the Society for 1996 are in the separate booklet distributed to all members with this issue of the *Quarterly*.

Microscene Noticeboard

AT THE SEPTEMBER MEETING of the Society at the University of Southampton, a board will be set up with notices of jobs, post-doctoral positions, studentships, courses, conferences etc. Contributions are welcome and may either be brought to the meeting or sent beforehand to Janet Hurst at Marlborough House.

News of Members

Dr Michael Bushell has been appointed Professor of Microbial Physiology in the School of Biological Sciences, University of Surrey.

Professor John M. Walker has been appointed Head of the Department of Biosciences at the University of Hertfordshire from 1 April 1997.

The Society notes with regret the deaths of ***Dr Tokuya Harada*** (member since 1960) and ***Professor Oense M. Neijssel*** (member since 1974).

SocietyNews

May Council Meeting

Vacation Studentships

COUNCIL WAS PLEASED to learn that good quality applications for vacation studentships had come in at a reasonable level this year, and 36 studentships were to be funded. It remained the case, however, that larger numbers of applications would be welcome, and it was agreed to increase the stipend in line with other funding bodies of such schemes, as well as to consider some support for laboratory expenses (see p. 96 for details).

Regulation of Experiments in Genetic Engineering

MEMBERS OF THE SOCIETY had recently expressed concern about the legislation to control genetic engineering with respect to both its efficacy as a safeguard and its sometimes over-restrictive effects, especially relating to pathogens. It was agreed that approaches should be made to the regulatory bodies concerned to consider holding a workshop at which these issues might be aired since it is some time since the current regulations were widely debated. The Society might be well placed to organize such an event under the aegis of an appropriate authority.

Editor-in-Chief, *Journal of General Virology*

COUNCIL WAS PLEASED to approve the appointment of Professor S.G. Siddell of Würzburg, Germany, as the next Editor-in-Chief. This appointment, while of a person highly qualified and appropriate for the task, is particularly gratifying as the Society aims to enhance the credibility and level of service to members throughout Europe, especially in the field of virology where there is a recognized need for a strong and focussed effort.

Staff News

GOODBYE ...

Recent months have seen the departure of two long-serving staff.

In June we bid farewell to Hilary Bower who had worked for the Society in various capacities since 1975, most notably as Executive Secretary. Fifteen months ago Hilary resigned from that post to work part-time as our financial accountant, but the attractions of a life completely devoted to leisure have proved too great and she has now taken retirement. A full account of Hilary's considerable contribution to the work of SGM was published in the May 1996 issue of the *Quarterly*. We all wish her well in the future and hope that she and husband Doug Watson (a former SGM Treasurer) enjoy their well deserved retirement to the full. Hopefully the greenhouse presented by the Society at the time that Hilary stepped down as Executive Secretary will now be built and many happy hours will be spent in the garden.

We were also sorry to see Denise Allnatt leave in April after 6 years as receptionist for the Society. Members and other enquirers will miss her cheerful greetings on the phone. We wish her well for the future.

...AND HELLO

Denise has been replaced by Christine Pickett, who has been helping Sandra Fabry to run the Membership Office on a temporary, part-time basis for several months.

Finally, congratulations to former employee Sylvia Stubbs, a former Staff Editor on JGV (1988–1994) and Production Editor of the *Quarterly*, who left to live in Holland where her husband Rob now works, on the birth of a son, Oliver David, on 20 May 1997.

Marlborough House Staff

IT WAS REPORTED that Hilary Bower would be retiring as part-time Financial Accountant in July. Hilary's major contribution to the Society during her time as Executive Secretary is well known to members, and she has continued to serve us expertly on the financial side since April 1996. Council wished her well at the last meeting before her retirement. Moves are afoot to recruit as her successor a full time Finance Manager, who will not only continue in the role of financial accountant but will also be involved in the introduction of some major changes in financial systems which will be inevitable as, for example, electronic sales of Society publications take off due to new developments in scientific publishing.

Charles Penn, General Secretary

SGM WEB SITE

http://www.socgenmicrobiol.org.uk

Meetings Programmes Go on the Net!

WITH THIS ISSUE of the *Quarterly* you will have received a copy of the programme booklet for the September meeting of the Society at Southampton. If you've lost it already, help is at hand. Now the full meeting information, including detailed programmes of the symposia and workshops, lists of offered papers and posters and such essential items as the meeting arrangements and a map of the venue, is available on our Web Site. There are links between the meeting timetable and all the events. You can even download the booking form. Just fill it in, return it to SGM HQ with your payment, and you will be registered for the meeting.

In future we hope to have the details of meetings on the Web well in advance of the event and you will be able to find the answer to most queries at the touch of a button, without the tiresome chore of 'phoning the meetings office.

SocietyNews

Grants & Awards

VACATION STUDENTSHIPS 1997

IN 1995 COUNCIL INSTITUTED a scheme to enable undergraduates to work on microbiological projects during the summer vacation before their final year. The studentships are intended to provide undergraduates with experience of research and to encourage them to consider a career in laboratory-based science. Support is provided at the rate of £100 per week, for a maximum period of 8 weeks. Students are required to submit a brief report of their research on the completion of the studentship, which in itself is a useful exercise for them. The scheme has proved to be very successful and popular. This year 43 applications were received. After careful scrutiny by referees and the Award Panel, studentships were offered to 36 applicants. This is a much higher success rate than in previous years, reflecting the greatly improved standard of applications. A list of awardees is available from the SGM Grants Office on request.

Council has set aside a further sum to fund vacation studentships next year, and it has also been agreed that in addition to raising the weekly rate of support, a small sum will be made available for the purchase of consumables. Full details of the 1998 scheme will be announced in the next issue of the *Quarterly*.

The Watanabe Book Fund

MEMBERS WHO ARE PERMANENTLY RESIDENT in a developing country are reminded that they may apply for funding to acquire for their libraries books, or possibly journals, relating to microbiology. These annual awards are available as a result of a generous donation from Professor T. Watanabe of Japan. Full details of the scheme were published on p. 19 of the February issue of the *Quarterly*. The closing date for the receipt of applications, which should be made to the Grants Office at SGM Headquarters, is **26 September 1997**.

International Development Fund

MEMBERS ARE REMINDED that Council has established an International Development Fund for competition this year. The purpose of the Fund is to make small grants available to help microbiologists in developing countries and Eastern Europe. Members may apply for funding to run training courses in laboratories in developing countries appropriate to the needs of those countries, or for any other small project to assist in technology transfer from Western Europe.

Full details of the scheme were published on p.68 of the May issue of the *Quarterly*. The closing date for applications is **26 September 1997**.

Fund for Developments in Teaching

MEMBERS MAY APPLY FOR GRANTS to support projects intended to lead to an improvement in the teaching of any aspect of microbiology relevant to secondary or tertiary education in the UK. Examples of work which might be funded include the provision of teaching materials (e.g. videos, slides, posters), the development of reliable, novel practical exercises, new approaches to teaching/learning familiar concepts (e.g. computer simulations or tutorials) or any other appropriate aspect. Grants are also available to assist members wishing to visit overseas higher education institutions to study methods of teaching large classes. The full rules of the scheme were published on p. 67 of the May issue of the *Quarterly*. The closing date for applications is **31 October 1997**.

SEMINAR SPEAKERS FUND 1997/98

THE PURPOSE of this Fund is to promote talks on microbiological topics in departmental seminar programmes. Applications are invited from Higher Education Institutions where microbiology is taught for grants of up to £200 towards the travel, and if necessary, accommodation expenses of an invited speaker.

Applications will be dealt with on a first come, first served basis during the academic year, which is defined as running from September 1997 to June 1998.

Written submissions should be sent to the Grants Office at SGM Headquarters for consideration. Details of the scheme were published on p. 68 of the May issue of the *Quarterly*.

SGM MEMBERSHIP SUBSCRIPTIONS 1997

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

ORDINARY MEMBER		
Membership Subscription (inc. *SGM Quarterly*)	£33.00	(US$55.00)
Additional subscriptions for publications:		
Microbiology	£54.00	(US$95.00)
JGV	£54.00	(US$95.00)
STUDENT OR RETIRED MEMBER		
Membership Subscription (inc. *SGM Quarterly*)	£15.00	(US$25.00)
Additional subscriptions for publications:		
Microbiology	£27.00	(US$50.00)
JGV	£27.00	(US$50.00)

SocietyNews

NEW PRESIDENT

Professor Howard Dalton FRS

HOWARD DALTON is a Professor in the Department of Biological Sciences at the University of Warwick. He started his career in microbiology as an undergraduate in John Pirt's newly formed Microbiology Department at (the then) Queen Elizabeth College, London in 1962 where the fresh-faced staff included many of our current professors of microbiology (Bull, Kelly, Trinci, etc.). In 1964 he joined the Society as a second year undergraduate. Following a lecture delivered by John Postgate in the Department, Howard went to join him in the ARC Unit of Nitrogen Fixation at Sussex University as a DPhil student to study the effect of oxygen on metabolism of *Azotobacter chroococcum* in continuous culture. This work led to the important discovery of respiratory and conformational protection of nitrogenase in the azotobacters, a theme that has been extensively developed by workers at the Unit and elsewhere in subsequent years. In 1968 he joined Len Mortenson at Purdue University to develop a deeper understanding of the biochemistry of nitrogen fixation in *Clostridium pasteurianum*. This experience kindled a strong interest in metalloenzymes and, in particular, molybdoenzymes from *Aspergillus nidulans* (nitrate reductase) and *Veillonella alcalescens* (xanthine dehydrogenase) which he studied by electron paramagnetic resonance spectroscopy with Bob Bray in the Chemistry Department back in Sussex (1970–1973).

In the early 1970s, Derek Burke had just set up a Department of Biological Sciences at Warwick and had appointed Roger Whittenbury to a Chair to initiate microbiology there in 1972. A year later Howard was appointed to a lectureship at Warwick to strengthen its microbial physiology and biochemistry. His chosen field of study was methane oxidation that Roger had so elegantly opened up as a field of research a few years earlier by identifying over 100 new bacterial strains. In a very productive period the mysteries of the biochemistry of methane oxidation were unravelled by a dedicated group of postdocs and students. In particular, the early studies with John Colby, John Lund, Dave Leak, Marc Woodland and David Stirling showed how a complex array of proteins are necessary to effect one of the most difficult reactions in chemistry, namely the controlled oxidation of methane to methanol. Out of this work the phenomena of co-metabolism and fortuitous metabolism was refined (Stirling) and further elaborated (Dave Leak) to show how methanotrophs could be used for the industrial purposes of chemical production and bioremediation. The assiduous efforts by Jeff Green and Pat Wilkins finally showed how the various enzyme components interacted to activate and control the reaction. This work is still continuing and, with Colin Murrell, has moved into the molecular biology arena where site-directed mutagenesis is helping to define the precise involvement of metal ligands in the process. Other areas of microbiological research have been developed at the same time, particularly in the use of microbes for the production of speciality chemicals through biotransformations where he has developed an interest in the exploitation of microbial oxygenases and dehydrogenases to synthesize chiral products.

Howard was made a Professor in 1983 and elected Fellow of the Royal Society in 1993. He sits on the editorial board of a number of microbiology and biotechnology journals and was a member of SGM Council from 1985 to 1989.

In his spare time he plays real tennis in Leamington and builds Japanese gardens (visitors to Warwick University can see these in the Humanities and Biological Sciences courtyards).

Professor Dalton will take over from Professor Trinci as SGM President in September.

New Convener for the Physiology Biochemistry & Molecular Genetics Group

Dr David A. Hodgson
Department of Biological Sciences, University of Warwick

David Hodgson will be taking over from Simon Baumberg as Convener of the PB&MG Group in September.

His biography was published in the November 1994 issue of the *Quarterly* (p. 120), when he was elected to Council.

FLEMING LECTURER

Tony Carr

DR ANTHONY CARR OF THE MRC CELL MUTATION UNIT, UNIVERSITY OF SUSSEX, HAS ACCEPTED THE SOCIETY'S INVITATION TO DELIVER THE 1996 FLEMING LECTURE. THE TITLE OF THE LECTURE, WHICH WILL TAKE PLACE AT THE SOCIETY MEETING AT SOUTHAMPTON ON MONDAY 1 SEPTEMBER, WILL BE *CELL DIVISION AND MITOSIS IN THE FISSION YEAST SCHIZOSACCHAROMYCES POMBE*.

Tony was born in Dunfermline, Scotland on 2 May 1960 and brought up in Cornwall where he attended the Helston Comprehensive School. University education started at the University of East Anglia and continued with a PhD at the University of Sussex, under the direction of Paul Nurse. During his PhD, Tony studied the structure and function of the fission yeast *cdc2* gene, graduating in 1987 after working at both Sussex and at The Imperial Cancer Research Fund (London). His next scientific endeavour was a temporary position studying potential recombination by-products in bovine brain, but he soon moved back to fission yeast, working at the MRC Cell Mutation Unit studying DNA repair genes.

Following the publication of the Weinert & Hartwell paper (1988) on the loss of checkpoint controls in *Saccharomyces cerevisiae rad9* mutants, Tony looked at checkpoints and their loss in *rad* mutants of *Schizosaccharomyces pombe*. He initially found that four genetic loci resulted in the complete loss of all the checkpoints that respond to changes in DNA structure.

Tony continues to integrate his knowledge of cell cycle and DNA repair, working for 7 years for the MRC, who recently gave him tenure. Tony also works on the mammalian homologues of the yeast genes.

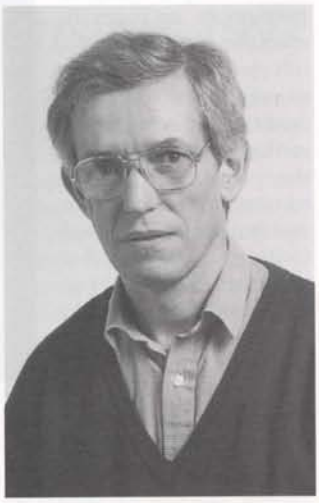
SocietyNews

The 1997 Fred Griffith Review Lecturer

THE 1997 FRED GRIFFITH REVIEW LECTURE HAS BEEN AWARDED TO ***PROFESSOR KEITH F. CHATER FRS*** OF THE JOHN INNES CENTRE, NORWICH.

The invitation to give the lecture is offered in recognition of long and distinguished service to microbiology.

Professor Chater will deliver his lecture entitled *Taking a Genetic Scalpel to the Streptomyces Colony* on Tuesday 2 September at the Society meeting in Southampton.



KEITH CHATER'S interest in biology started early – he began catching butterflies at age four. Later, E.B. Ford's classic *Butterflies* encouraged the interest in genetics that still sustains Keith's work. He left Trinity School, Croydon in 1963 for the Department of Bacteriology and Virology at Birmingham. After unsuccessfully trying to switch to Richard Hoggart's English Department (in which his future wife, Jean, was a student) he became deeply interested in bacterial genetics, thanks especially to Derek Smith's outstanding teaching. Derek subsequently supervised Keith's PhD work on *Salmonella* genetics. In 1969, an inspiring seminar by David Hopwood led Keith to join David's *Streptomyces* group at the John Innes Institute, which had just moved to Norwich. Apart from brief interludes at Cold Spring Harbor with Rich Roberts (1975) and Harvard with Rich Losick (1983), Keith has been there ever since, focussing on the genetics of sporulation, antibiotic production and phages.

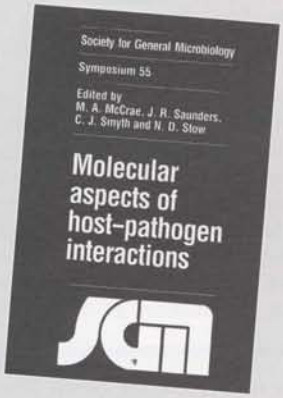
He has acquired four children, become an Honorary Professor at the University of East Anglia and and FRS, and learnt to live with the fluctuating fortunes of Norwich City FC!

SGM Symposium Volume 55

Molecular Aspects of Host–Pathogen Interactions

Edited by M.A. McCrae, J.R. Saunders, C.J. Smyth & N.D. Stow

Published by Cambridge University Press (1997)



Normal price £65.00/US$115.00

Special Members' price £26.00/US$46.00 plus £2.50 p&p

ISBN 0-521-59215-1

An understanding of the relationship between a pathogen and its host is essential for the development of effective disease control measures. This volume, based on the successful symposium at the Society's meeting at Heriot-Watt University in March 1997, focuses on interactions at the molecular level, specifically between the proteins of the infectious agent and the proteins of the host that has been invaded. Both viral and bacterial systems are considered, with specific examples illustrating the rapid advances being made in defining the molecular mechanisms underlying infection.

For a review of the book, please see p. 76 of the May 1997 *Quarterly*.

The book is now available to members at the special discount price. It can be ordered by post on the grey form included in this issue. Student Members are entitled to buy the book at a greater discount price of £16 and should write to the Grants Office at SGM HQ for a special order form.

NOTES & NEWS

British Association Annual Festival of Science

University of Leeds, 7–12 September 1997

EXPLORE SCIENCE, engineering and technology at the 1997 Festival. The programme includes:

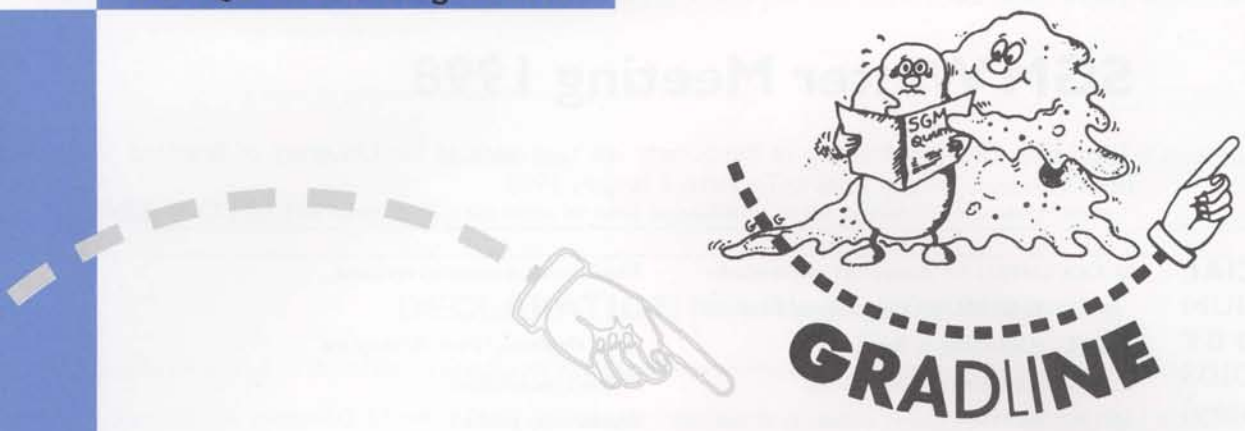
- *a wide variety of talks and discussions with leading scientists presenting the newest developments in their fields*
- *a fun-packed hands-on programme for families and young people*
- *exhibitions showing the application of science and technology in industry and the world around us*
- *a series of lunchtime and evening public lectures*
- *visits and field trips to local areas of scientific interest*
- *debates on a broad range of ethical and social issues*

Further information about the meeting may be found on the Web (www.britassoc.org.uk) or by contacting: British Association Major Events Dept, Fortress House, 23 Savile Row, London W1X 2NB (Tel. 0171 973 3500; Fax 0171 973 3051; Email ba.major.mgr@mcr1.poptel.org.uk).

World Federation for Culture Collections

Postal, quarantine and safety regulations: status and concerns

WE CAN NOW SEND scientific information around the world at the touch of a button, but microbiological cultures still have to be transported by more traditional means. The safe handling of biological agents is also a matter of prime concern to every microbiologist. Each country has its own regulations with respect to these areas and the WFCC Postal, Quarantine and Biosafety Committee monitors changes in regulations and guidelines around the world. This report summarizes their findings for the period 1994–1996. It also provides information on new sources of information and lists some relevant, useful publications. The report begins by discussing a series of issues, that in the opinion of the committee, require further consideration and development. There is much of interest in this report for SGM members. Copies may be obtained from Dr D. Fritze, Secretary, WFCC, DSMZ-Deutsche Sammlung von Mikroorganismen und Zellkulturen GmbH, Mascheroder weg 1B, D-38124 Braunschweig, Germany. The cost is US$10.00 including postage.



News From Student Microbiology Societies

University College Dublin Microbiological Society

Karen McGillycuddy

Microsoc is a student run society which organizes academic and social events for undergraduate and postgraduate students of microbiology. This year we have organized three lectures in the areas of medical, industrial and environmental microbiology. Dr Declan Bolton from the National Food Centre came to talk to us about the very topical *E. coli* 0157:H7; Mr Danny Curran described his role as a microbiologist in McGhan Ltd, Arklow, a medical devices company and Dr Graham White was sponsored by the SGM (see below) to speak about his research into the biodegradation of surfactants. We also organized a guided tour of the fermentation plant and the quality assurance laboratories in the Guinness Brewery. Our social events included a freshers' week disco, a table quiz and a Christmas party. These allow the students to mix with those in other years and hopefully give them a better idea of what microbiologists do.

Report of SGM Sponsored Lecture

Biodegradation of Surfactants: For Better or For Worse?

Dr Graham White, University of Wales, Cardiff

The speaker gave a brief introduction to the history of the detergents industry and to the range of uses for surfactants in daily living. The widespread use of these agents both industrially and domestically has led to foaming in natural waterways, so manufacturers in the detergents industries took it on themselves to make their products more biodegradable. Dr White outlined the methods by which micro-organisms in the natural environment break down the new biodegradable surfactants, either by cutting off the hydrophilic tail, and then using the carbon-rich hydrophobic end as a source of carbon for growth, or by attacking at the hydrophobic end, breaking off carbon for growth up to the hydrophilic end. He showed the results of this biodegradation whereby a river previously destroyed due to the foaming of surfactants had 13 years later cleared up sufficiently that two little boys were sitting on its bank fishing.

However there is a twist to this tale. Recent studies have shown that a certain group of these new biodegradable surfactants may be posing a new problem. Their biodegradation products, alkyl phenol ethoxylates, have been implicated in 'hormone pollution' and falling sperm counts in human males, possibly due to the similarity in their structure to oestrogen. They have also been linked with sex changes in certain species of fish, where the males have been found to produce female yolk proteins. Therefore is it better for us to have foam-free rivers or healthy males?

SGM Meeting at Southampton University

1–5 September 1997

DON'T MISS THE FOLLOWING EVENTS!

Promega Prize

1400, Tuesday 2 September 1997
Lecture Theatre 2, Boldrewood Conference Centre

Promega Ltd have generously sponsored two prizes of £200 each for the best oral offered papers presented by young researchers. Five presenters of the best oral or poster papers at earlier SGM meetings in 1996 and 1997 have been chosen to go forward to the final. Please come along and support your fellow students.

Keynote Speaker
Prof. A.P.J. Trinci, SGM President
Developments in graduate education in the UK

M. Emery (University of Leicester) – *Identification of a two-component regulatory system downstream of the Campylobacter jejuni htrA gene*

M. Farris (University of Southampton) – *BIPA: a tyrosine-phosphorylated global regulator that mediates bacterial responses to host-defence peptides*

C. Dunne (University College Cork) – *Evaluation and genetic investigation of the ability of Stenotrophomonas maltophilia strain W81 to confer plant protection against fungal pathogens*

E. Cannell (Ludwig Institute for Cancer Research) – *Cell cycle activation by Epstein–Barr virus*

C.-A. Reid (The Scottish Agricultural College) – *The effects of dietary starches on the microflora of the monogastric large intestine*

The winner from this session will go forward to compete against winning colleagues from other UK learned societies for the title of Promega Young Life Scientist of the Year, with a prize of £2,000.

Evening Wine Reception for Younger Members

1900, Tuesday 2 September 1997
Lecture Theatre 2 & Common Room, Boldrewood Conference Centre

Theme: Science Communication

Younger members of SGM (postgrads, first postdocs and research assistants) are invited to attend this session. There will be a short, entertaining presentation by a journalist about communicating science, followed by a glass or two of wine and a finger buffet. There will also be a display of relevant material.

The two Promega Prize winners from the afternoon will be announced and presented with their prizes by a representative from Promega.

After the session, the adjacent bar will remain open so that young members can continue to help the Promega winners celebrate their success.

PLEASE NOTE – entry is free but will be by *TICKET ONLY* and restricted to younger SGM members (as defined above). Please tick the appropriate box on the booking form in the enclosed Programme Booklet if you wish to attend. Further details are available from the External Relations Office, SGM HQ.

Contributions to Gradline....

are always very welcome from younger members of SGM. Why not make your voice heard? Send your articles, notices or news to Janice Meekings at SGM HQ.

Careers Conferences 1997

ORGANIZED JOINTLY BY THE BIOCHEMICAL SOCIETY, THE SOCIETY FOR GENERAL MICROBIOLOGY AND THE BRITISH PHARMACOLOGICAL SOCIETY FOR FINAL YEAR UNDERGRADUATE AND POSTGRADUATE STUDENTS OF LIFE SCIENCES.

- 1 November University of Manchester
- 15 November University of Bristol
- 29 November Queen Mary and Westfield College, London

Each conference comprises a programme of useful lectures and an exhibition attended by employers of life science graduates and universities offering postgraduate education.

The lecture programme includes topics such as:

- research opportunities in large companies
- non-research based scientific work
- sales, marketing, publishing
- further qualifications
- CVs, job hunting & interviews

Time will be set aside for discussion with the speakers.

Cost per person: £6 (inclusive of lunch)

Individuals or parties of undergrads/postgrads are welcome to attend, on a first come, first served basis. Early booking is advisable.

Further details of the programmes and application forms are available from:

External Relations Office, SGM, Marlborough House, Basingstoke Road, Spencers Wood, Reading RG7 1AE
(Tel. 0118 988 5577; Fax 0118 988 5656;
E-mail admin@socgenmicrobiol.org.uk)

97TH GENERAL MEETING OF THE ASM

4–8 May 1997, Miami Beach Convention Centre, Florida

This, the largest microbiology conference in the world, was very successful with approximately 12–15,000 delegates attending.

There were many interesting posters and opportunities to discuss the content of the work with the delegates. My own poster was entitled *The influence of dormancy and stringent response upon bacterial susceptibility to anti-microbial agents*. I gained a great deal from the conference personally due to helpful and encouraging advice, ideas and opinions from many people who were interested in my work.

The President's Forum was entitled *Mad Cow Disease and a Human Counterpart: Science and Technology Policy*. The two talks, given by Stanley Prusiner (University of California, San Francisco) and John R. Patterson (University College London Medical School), discussed the way in which the disease was contracted and has developed in cattle, cats and humans. They described the differences between the form of CJD which has been around for many years and the new variant which has come to the public's attention since the outbreak of BSE in cattle, and the link between the two forms. The discussion included the extensive methods being undertaken by both researchers and government officials to reduce the incidence of both BSE and new variant CJD.

The attendees of the forum discussion were invited to attend the President's reception, which included an evening poster session, providing a relaxed atmosphere to talk about the meeting.

The symposia covered a wide range of topics. Rita Colwell (University of Maryland) delivered an excellent lecture entitled *Bacterial Survival* concerning the routes by which *Vibrio cholerae* and subsequent disease were transmitted around the world. The very emotive lecture by James A. Lindsay (University of Florida, Gainesville) about *Sudden Infant Death Syndrome* and its link to clostridia, was very interesting.

I wish to thank the SGM for awarding me a grant from the President's Fund, providing me with the opportunity to attend this most prestigious conference, which was both socially and educationally rewarding.

Jane Leitch, University of Abertay Dundee, Bell Street, Dundee DD1 1HG

Cells & Cell Surfaces

Southampton, 1–5 September 1997

An outstandimg list of speakers are contributing to the Main Symposium, *Checkpoints and Non-linear Dependency Relationships*, which was sponsored by this Group. Full details can be found in the accompanying Programme Booklet.

Bradford, 6–8 January 1998

The Group is organizing a symposium on *Pathogenicity and Chemotherapy of Anaerobe Infections* jointly with the Microbial Infection Group in whose News can be found full details (see p. 105).

Nottingham, 30 March–3 April 1998

The group will be holding a one-day symposium on *Intracellular Pathogens* organized by Ian Sutcliffe (Sunderland) and Andrew Johnston (UEA). There will be opportunities for both offered papers and posters. Further details will be provided in the next issue of the *Quarterly*.

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 Ian Sutcliffe (Sunderland). There will be opportunities for both offered papers and posters. Further details will be provided in the next issue of the *Quarterly*.

Committee Membership

Our thanks go to Laura Piddock (Birmingham) and Andrew Johnston (UEA) who have now retired from the Committee although both are continuing to organize Group symposia. We welcome two new members to the committee, Colin Stirling (Manchester) and Vassilis Koronakis (Cambridge).

Convener:
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Clinical Virology

Joint Meeting with the European Society for Clinical Virology, Royal Society of Medicine, London, 5–7 January 1998

Following the success of this January's joint meeting, a similar programme is planned. A symposium on *Nosocomial Infections* will be followed by a debate. Other sessions with keynote speakers will include Viral gastroenteritis, Immune evasion and New developments in laboratory diagnosis – with particular emphasis on quantification. Offered papers are invited and are particularly welcome for inclusion in any of these sessions; also offered papers on nosocomial infections. Titles should be sent to Dr Jenny Best, Department of Virology, UMDS, St Thomas' Hospital, London SE1 7EH (Fax 0171 922 8387; Email j.best@umds.ac.uk) **before 1 November 1997**. For further information, please contact Dr Best or consult the SGM Web site (www.socgenmicrobiol.org.uk).

The Royal Society of Medicine is a convenient venue in central London. The meeting is free to SGM members who register by **6 December 1997**; a late registration fee is payable by all those who register after that date or on site (see booking form in this *Quarterly*). A dinner will be held at the Royal Society of Medicine on the Monday evening.

Nottingham, 30 March–3 April 1998

At the Spring 1998 meeting of the Society Dr Irving is organizing for the Group a symposium on *Viruses and the Nervous System*. Speakers and topics will include Prof. S. Love (Bristol), Neuropathology for virologists; Dr J. Fazakerley (Edinburgh), Virus–neurone interactions; Dr M. Rodriguez (Mayo Clinic, Minnesota, USA), Is multiple sclerosis an infectious disease?; Dr J. Garson (UCL, London), Retroviruses and multiple sclerosis; Dr I. Lipkin (California, USA), Borna viruses and psychosis; Prof. J. Ironside (Edinburgh), New variant CJD; Dr V. Askonas (University of Southern California, USA), Inflammatory muscle diseases and virus infections.

Membership Drive

The Group Committee is pursuing a membership drive at present and members are encouraged to nominate suitable candidates for SGM membership: also to vote for new members of the Group Committee on which three vacancies have arisen this year.

Convener:
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PHLS Virus Reference Division
Central Public Health Laboratory
61 Colindale Avenue
London NW9 5HT
Tel. 0181 200 4400
Fax 0181 200 1569

Education

Southampton, 1–5 September 1997

For details of the symposium *Microbial Informatics: Data Acquisition, Management and Exploitation* (organized by Peter Miller, Liverpool) see the accompanying Programme Booklet.

Nottingham 30 March–3 April 1998

Peter Wyn-Jones (Sunderland) is organizing a symposium on *Sandwich Training in Microbiology*; this will include contributions from industry, the public sector, recent sandwich students and University supervisors. Issues to be addressed will include assessment, finance, sandwich curricula and starting placements for new employers. A round table discussion is planned so that all those involved can exchange ideas in this important area of microbiology education.

East Anglia, 8–10 September 1998

Alan Jacob (Manchester) is organizing a symposium on *Teaching Microbial and Molecular Genetics.*

Group Committee

Two new members are welcomed onto the Committee, Ron Bishop (Ulster) and Trevor Cartledge (Nottingham).

Convener:
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Environmental Microbiology

Southampton, 1–5 September 1997

The speakers for this Group meeting on *Waste Treatment*, have now been finalized. Full details can be found in the accompanying Programme Booklet. Additional information may also be obtained from the meeting organizer Keith Jones, Lancaster University (K.Jones@lancaster.ac.uk).

Nottingham, 30 March–3 April 1998

The programme for this two-day meeting on *Ecophysiology of Microbial Pigments* is nearing completion and will include a half-day workshop entitled *Microbial Responses to UV-B Radiation and Effects of the Ozone Hole* on day two. The two main topic headings are Ecophysiology of photosynthetic processes and Community ecophysiology under light regimes. The Group organizer is David Wynn-Williams (British Antarctic Survey) who will be speaking about Strata and light/UV Antarctic endoliths. The other speakers and topics will include: J. Overmann (Germany), Pigmentation of photosynthetic sulphur bacteria; D.-P. Hader (Germany), Phycobilins and accessory pigments in cyanobacteria; I. Joint (Newcastle), Pigments and phytoplankton species composition in the North and South Atlantic; R. Castenholz (USA), Scytonemin as a Cyanobacterial UV-protectant in the field and laboratory; H. Edwards (Bradford), Raman spectroscopy of lichen pigments; J. Ellis-Evans (British Antarctic Survey), Strata and light/UV Antarctic freshwater cyanomats; A. Buma (Belgium), Vertical migration of phytoplankton; and A. Oren (Israel), Discoloration of red salt lakes (halobacteria). Please contact David Wynn-Williams, (ddww@pcmail.nerc-bas.ac.uk) if you would like to offer a paper or a poster, or require further information.

Future Meetings

A further meeting is also being planned for September 1998 when the topic will be *Biosensors and Indicator Organisms*. There will be an opportunity to present papers; postgraduate students are particularly encouraged. If interested please contact the organizer of this meeting, Mark Bailey (mbj@pcmail.nerc-oxford.ac.uk). Additional meetings are also planned to cover the topics of *Detection of Bacteria in Natural Environments* and *Survival of Pathogens in the Natural Environment*. The Committee would also welcome suggestions for future meetings.

Convener:
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Email
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Fermentation & Bioprocessing

Bradford, 6–8 January 1998

In collaboration with the Systematics & Evolution Group we will be holding a two-day symposium on *Screening for New Therapeutic Agents*. The Group's organizers are Mike Bushell, Craig Gershater and Dave Langley. The symposium will seek to address current approaches to natural product screening for novel biopharmaceutical discovery. The invited papers are as follows: S.J. Brewer (Monsanto, USA), Scientific principles underpinning the screening approach; R.C. Durley (Monsanto, USA), Screen management approaches – optimizing throughput; H. Gurtler (Novo Nordisk, Denmark),

Convener:
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Screen management approaches – optimizing sample diversity; J. Johal (Xenova, UK), Innovations in screen targets; A. Buss (Glaxo Wellcome, UK), Alternative approaches to natural products screening; M. Embley (NHM, UK), Innovations in microbial prospecting; N. Magan (Cranfield, UK), Environmental influences on secondary metabolite production; K. Wilson (Merck, USA), Screening for antimicrobials – strategy and results; D. Hawksworth (IMI, UK), Where are all the undiscovered fungi?; P. Stead (Glaxo Wellcome, UK), Efficient approaches to natural product lead discovery and optimization – biotransformation screening and focussed library synthesis; Jean Jacques Sanglier (Novartis, Switzerland), tbc; M. Legg (Zeneca, UK), Opportunities for microbial natural products in the agrochemical industry; K. Horikoshi (Kawagoe, Japan), Alkaliphiles and their applications. If you are interested in offering a short paper (postgraduate students are particularly encouraged) then please contact the Convener as soon as possible, but **before 22 August 1997**. Abstracts will be required **by 30 October**. We are also hoping to hold an evening debating session on *Natural Products versus Combinatorial Chemistry*.

Nottingham, 30 March–3 April 1998

The Group is planning a two-day meeting entitled *Towards the Ideal E. coli Expression System: Meeting the Needs of Fermentation and Downstream Processing*. The meeting is being organized by Bo Kara on behalf of the Group. There will be an opportunity to present short papers and if you are interested please contact the Convener in the first instance.

UEA, 8–10 September 1998

We are planning a one-day meeting on *Mycelial Fermentations* organized by Dave Langley on behalf of the Group. There will be an opportunity to present short papers and if you are interested please contact the Convener in the first instance.

Future Meetings

The Committee is in the early stages of planning a two-day meeting on *Archaea* to be organized by Rod Herbert 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 of symposia within the area of Fermentation & Bioprocessing. Please contact the Convener or any Committee member.

Committee Membership

Mike Bushell (Surrey) and Nigel Woods (British Biotechnology) retired from the Committee at Easter and I would like to take this belated opportunity to thank them for all their hard work over the last 3 years.

Irish Branch

University College Dublin, 18–19 September 1997

A symposium on *Micro-organisms: the Answer to Environmental Pollution?* will be held at Univeristy College Dublin. The invited speakers are: C. Knowles (Kent), Microbial degradation of cyanide; A. Cook (Konstanz), Sulphonated aromatic compouds – desulphonation reactions in aerobic and anaerobic bacteria; E. Doyle (Dublin), Microbial degradation of pentachlorophenol; K. Jorgensen (Finland), Application of composting techniques for the remediation of contaminated soils; A. Thomas (Italy), Bioremediation strategies for PAH-contaminated soils and groundwaters; A. Dobson (Cork), Application of white rot fungi in biodegradation; G. Gadd (Dundee), Microbial treatment of toxic metal and radionuclide pollution – chemical and physiological mechanisms underlying process development for contaminated soils and waters.

Oral and poster communications on any microbiological topic are invited, especially from postgraduate students. A prize will be awarded for the best postgraduate presentation in each category. The closing date for abstracts is **15 August 1997**. For further information contact Dr Evelyn Doyle, Department of Industrial Microbiology, University College Dublin, Belfield, Dublin 4 (Tel. +353 1 7061300; Fax +353 1 7061183; Email Evelyn.Doyle@ucd.ie).

Convener:
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The Queen's University of Belfast
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Tel. 01232 255314
Fax 01232 668376
Email m.collins@qub.ac.uk

Dublin City University, 8–9 January 1998

A symposium on *Microbes as Vaccine Delivery Vehicles* will be held at Dublin City University. Invited speakers will include: J. Wells (Cambridge), Vaccine delivery by recombinant lactococci; A. Mercenier (Lille), Development of lactic acid bacteria as live vaccines for mucosal vaccination; F. Bowe (London), The use of live attenuated *Salmonella* strains as carriers of heterologous antigents to the mucosal immune system; B. Rima (Belfast), Viral vector vaccines; K. Mills (Maynooth), DNA vaccines/microparticle delivery (provisional title).

Oral and poster communications on any microbiological topic are invited, especially from postgraduate students. A prize will be awarded for the best postgraduate presentation in each category. For further information contact Dr Michael O'Connell, School of Biological Sciences, Dublin City University, Glasnevin, Dublin 9 (Tel. +353 1 7045000; Fax. +353 1 7045412; Email Michael.OConnell@dcu.ie).

Microbial Infection

Bradford, 6–8 January 1998

A one-and-a-half-day meeting on *Pathogenicity and Chemotherapy of Anaerobe Infections* is being jointly organized with the Cells & Cell Surfaces Group. Our organizer is Ian Poxton (University of Edinburgh). It is planned that this symposium will be complementary to the Anaerobe Society meeting to be held earlier in the year. Speakers will include S. Patrick (Belfast), Virulence of *Bacteroides*; M. Wilcox (Leeds), Epidemiology and management of *Clostridium difficile* disease; W. Wade (London), *Eubacterium* and periodontitis; P. Marsh (Porton Down), Survival of anaerobes in microbial communities; D. Devine (Leeds), Interactions of oral anaerobes with antimicrobial peptides; M. Curtis (London), Proteases of *Porphyomonas gingivalis*; E. Goldstein (USA), Anti-anaerobe antibiotics; S. Moncrief (USA), Molecular action of the toxins of *Clostridium difficile*; J. Lamont (USA), The pathogenesis of *Clostridium difficile* disease. There will be an opportunity to present offered papers. The organizers are very keen to receive submissions from postgraduates and new postdocs. Those interested should contact Ian Poxton (University of Edinburgh), to whom titles and abstracts should be sent **by 22 September 1997.**

Convener:
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Email pwa@le.ac.uk

Nottingham, 30 March–3 April 1998

A two-day symposium on *Iron and Infection*, organized by Paul Williams (Nottingham) and Julian Ketley (Leicester), will be held. There will be an opportunity to present offered papers. Please send titles and abstracts to one of the organizers **by 15 December 1997.**

Leicester, 1–2 July 1998

The Society has agreed to co-fund a series of meetings jointly arranged by this Group and the Microbiology Section of The Pathological Society. The first of these meetings 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 papers. Our co-organizer is Peter Andrew (Leicester), to whom titles and abstracts of offered papers should be sent.

Warwick, 5–7 January 1999

A two-day meeting on *Respiratory Pathogens* will be held at this joint meeting with the Systematics & Evolution and Clinical Virology Groups. Our organizer is Tim Mitchell (University of Glasgow). Please contact him if you have any suggestions for topics or speakers.

Future Meetings

Planning of a meeting on *Evasion of the Immune Response* is underway by Petra Oyston (CBDE, Porton Down) and Ian Poxton (Edinburgh). Please contact one of them if you have any suggestions for invited speakers and titles.

One subject under consideration for a future meeting is *Food-spoilage and Food-borne Diseases*. Ideas for symposium topics and speakers for future meetings are always welcome. Please contact the Convener or any Committee member.

Physiology, Biochemistry & Molecular Genetics

Southampton, 1–5 September 1997

The Group will hold a joint symposium on *Polysaccharides* with the Microbial Infection Group on Wednesday/Thursday 3/4 September. The Group's co-organizer is Colin Hughes (Cambridge). Full details are in the accompanying Programme Booklet.

Bradford, 6–8 January 1998

The Group will hold a symposium on *Post-transcription Initiation Controls of Gene Expression* on Tuesday 6 January. The organizer will be Simon Baumberg (Leeds). The speakers will include C. Squires (Tufts), P. Lovett (Maryland), T. Henkin (Ohio State), A. von Gabain (Vienna), C. Hughes (Cambridge), K. McDowall (Leeds), A. Brown (Aberdeen) and M. Tuite (Kent).

Nottingham, 30 March–3 April 1998

The Group will hold a symposium on *Morphogenesis in Filamentous Fungi* at this meeting. The organizer will be Sue Assinder (Bangor).

East Anglia, 8–10 September 1998

The Group will hold a symposium on *Versatile Pseudomonads* at this meeting. The organizer will be Dieter Haas (Lausanne).

Future Meetings

The Group Committee would be glad to hear from any SGM member with interests in the areas of its remit, of topics for symposia, workshops, etc., especially where these have not recently been covered (and do not appear to be about to be in the near future). Please contact the Convener or any member of the Group Committee.

Convener:
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Email gen6sb@south-01.novell.leeds.ac.uk

Systematics & Evolution

Bradford, 6–8 January 1998

The Group is hosting a one-and-a-half-day SGM Topical Special Symposium on the subject of *Biology of Exploitable Bacteria in the Genus Rhodococcus*. We have the support of and contributions from some relevant industrial groups. Invited speakers, collaborators and their general area of contribution include: Bull (novel rhodococci from the deep sea), Bunch (metabolism of organic nitrogen compounds), Cain (primary metabolism and bioremediation), Goodfellow & Alderson (systematics), Hardman (degradation of chlorinated compounds), Larkin & Kulakov (genetics), Oldfield (desulphuranase enzymes), Philp & Lang (surface-active lipids), Ramsden & Page (industrial utility of rhodococcal amidases), Sutcliffe (cell envelope composition and organization), Symes & Hughes (application of amidases and nitrolases in acrylic polymers). If you would like to offer a poster on a relevant topic, then please forward your proposal with a title and draft abstract to the Convener as soon as possible, but **before October 1997**. The deadline for finalized abstracts will be **26 November 1997**.

In addition, along with with the Fermentation & Bioprocessing Group, our Group is involved in a two-day collaborative symposium entitled *Screening for New Therapeutic Agents* – if you are interested in offering a contribution, please see under Fermentation & Bioprocessing Group News on p. 103.

Nottingham, 30 March–3 April 1998

At this venue, the group is holding a collaborative symposium with the British Mycological Society on the subject of *What Makes a Fungus? Advances in Fungal Systematics*. The symposium will be held over two days and will focus on the microfungi. Invited speakers will contribute on the value and impact of the new molecular and chemosystematic methodologies on both identifying and defining fungal taxa. If you can offer a poster on a topic relevant to our theme then please forward your proposal with a title and draft abstract to the Convener as soon as possible, but **before December 1997**.

Warwick, 5–7 January 1999

At this venue the Group is planning a collaborative two-day meeting with the Microbial Infection and Clinical Virology Groups on the subject of *Respiratory Pathogens*. If you are able, then please think about offering a short paper on this theme.

Convener:
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Fax: 01274 309742
Email g.alderson@bradford.ac.uk

Edinburgh, Spring 1999

The Group is in the early stages of planning for a two-day joint symposium with the Environmental Microbiology Group on *Detection of Bacteria in the Natural Environment* during this meeting. Developments will appear in future issues of the *Quarterly*.

Future Meetings

The Group is planning symposia in 2000 and further into the millenium. We think sub-specific classification and identification and also the impact of lateral gene transfer on systematics are useful topics. However, we are always happy to accept 'ideas from you out there'. So do please send any ideas for symposia, workshops or relevant activities to the Convener over the summer and autumn, or contact any Committee member and we will discuss your ideas at our next Committee meetings in September and January.

Virus

Southampton, 1–5 September 1997

The Group will host the 2nd European Virology Meeting contiguously with the normal autumn meeting of the Society. The theme of the meeting will be *Virus–Host Interactions* with a total of 12 invited speakers making 40 minute presentations throughout each morning of the meeting. The current list of confirmed speakers is: A. Alcami (Oxford), E. Domingo (Madrid), R.M. Elliott (Glasgow), P. Goulder (Oxford), H.D. Klenk (Marburg), M.G. Masucci (Stockholm), A. Maule (Norwich), H. Ploegh (Boston, USA), J.G.P. Sissons (Cambridge), G.T.W. Wertz (Birmingham, USA), T.F. Wild (Lyon). In addition to the invited speakers there will be both open paper (15 minute talks) and poster sessions during the meeting. The detailed programme for this meeting can be found in the accompanying Programme Booklet.

Nottingham, 30 March–3 April 1998

The main group activity at this meeting will be a Symposium entitled *The Use of Virus Vectors for the Delivery and Expression of Genes*. In addition there will be open paper sessions and a number of evening workshops. Anyone interested in organizing an evening workshop should contact the Convener.

Future Meetings

The Virus Group Committee is always keen to hear from members who have ideas for topics for future symposia or workshops, etc. Suggestions can be made directly to the Convener or through any of the current Committee members.

Convener:
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Book Reviews

The Structure of Plagues and Pestilences in Early Modern Europe. Central Europe, 1560–1640

By E.A. Eckert.
Published by S. Karger AG, Basel (1996).
CHF180.00/DEM216.00/US$156.50
pp. 180 *ISBN: 3-8055-6267-5*

This primarily quantitative and demographic approach to plague and epidemics in early modern central Europe – mainly southern Germany and Austria – written by an epidemiologist raises some interesting and basic historical questions.

Focussing as it does on mortality data (births, marriages and deaths) taken from over 800 parish registers, which only includes such major cities as Frankfurt, Eisenach and Basel, but excludes the largest cities in the region such as Cologne, Mainz, Bremen, Hamburg, Prague and Vienna due to lack of sources, can this study really claim to be representative for epidemics in central Europe? Furthermore, considering this under-representation of urban areas, can we rely on the author's refutation of the hitherto accepted view that plague in this period was primarily an urban disease?

Similarly, I find the approach of this work deeply anachronistic, based as it is on modern bacteriology and epidemiology. To try and diagnose epidemic diseases on information coming from an age when such views would have been alien hardly makes sense.

Ole Peter Grell,
Cambridge Wellcome Unit for the History of Medicine

The Biotechnology Directory 1997

Edited by J. Coombs & Y.R. Alston.
Published by Macmillan Press (1997).
£175.00 *pp. 643* *ISBN: 0-333-68787-6*

This directory has been issued annually since the 1980s – a period which has seen biotechnology diversify and grow amazingly. Reflecting these changes, the 1997 edition has received a facelift, with a new layout, presentation and a wider range of information. It provides a guide to organizations (including universities) that produce goods or services using a biotechnology process or are carrying out relevant research.

The first section is arranged alphabetically by subject – from Actinomycetes through Oligonucleotide synthesis to Yeast products – with companies listed under each heading. Then follow profiles of each organization, classified by country and identified as commercial/non-commercial. So if you want to find a company in Australia working on malodour treatment or where gene banks are in the USA, this is the ideal reference work. In addition, there is an extensive list of suppliers of products and equipment and, for intending entrepreneurs, sources of funding, staff, information and consultants. The microbiological content of this book is significant and it will prove a useful tool to applied scientists, although, of course, the coverage can never be complete.

Janet Hurst, SGM Marlborough House

Identification of Freshwater Diatoms from Live Material

By E.J. Cox.
Published by Chapman & Hall (1996).
£30.00 *pp. 158* *ISBN: 0-412-49380-2*

Diatoms are probably the most commonly encountered algae in freshwater environments. Therefore, it is a pleasure to review such a 'user friendly' key to their identification from living material. The book is laid out clearly and gives an admirable introduction to the diversity of diatom cell structure, chloroplast characteristics and colony types.

The route to identification involves two keys: a preliminary one dividing genera into 21 sections, which is followed by more comprehensive treatment of each of these groups into individual genera and species. The illustrations are outstanding – the drawings of the cells almost leap out of the pages into life!

The work is authoritative and most welcome as it fills a void between introductory books and the more obscure advanced German texts. It will prove essential to all concerned with freshwater ecology, from students through academics to those in the environmental and water industries. Its unique value is that it will enable the identification of fresh, live diatom material immediately on return to the laboratory without the lengthy process of making permanent slides of cleaned material.

My only reservation is the price, which may well be out of reach of students. Certainly I would wish to have multiple copies for university teaching.

Chris Happey-Wood, University of Wales, Bangor

Soil Microbiology and Biochemistry. Second Edition

By E.A. Paul & F.E. Clark.
Published by Academic Press Inc. (1996).
US$39.95 *pp. 340* *ISBN: 0-12-546806-7*

A highly readable account of the significance and role of micro-organisms in biological and biochemical processes in soil, emphasizing the interdisciplinary quality of soil microbiological research. This book gives a broad overview of the subject and as such it should appeal to the advanced undergraduate/postgraduate student audience whom it proposes to target. At the same time it usually provides sufficient in-depth detail for it to be helpful to the scientifically literate but non-specialist professional. There are a few exceptions to this, e.g. the small amount of space accorded to the occurrence and role of protozoa in spite of their great importance, but perhaps this is not entirely unexpected when one considers the relatively small number of scientists working actively in this area. I think that this is a useful and informative book, suitable both for institutional and personal purchases, although its price might put it beyond the reach of students and junior workers.

Gianfranco Novarino, Natural History Museum

Biosensors: An Introduction

By B.R. Eggins.
Published by Wiley–Teubner (1996).
£40.00 *pp. 212* *ISBN: Wiley 0-471-96285-6*
Teubner 3-519-02117-X

This potentially useful book, billed as "invaluable for anyone working with biosensors", is flawed by a lack of purpose. Much of it is devoted to electrochemical and other transducers, which convert changes detected by biological sensors into recordable signals. Biologists will welcome accounts of electrochemical cells and thermistors but not statements like "there is a genetically coded nucleic acid for each individual molecule created in and by a living cell, including proteins and hence enzymes". Lecturers might welcome the experiments for students, but hopefully not the crash course on logarithms. Statements such as "Mercury II can be detected with luciferase from Japanese pine-cone fish" are not useful without references or explanation of the principle. The omission of *lux* gene fusions is unfortunate, yet there are three diagrams of the Clark electrode and two of the 'bananatrode', a device for the detection of dopamine oxidized by the fruit's polyphenol oxidase.

Robert Poole, Krebs Institute for Biomolecular Research, Sheffield

Book Reviews

Micro-organisms in Foods, Vol. 5. Microbiological Specifications of Food Pathogens

By The International Commission on Microbiological Specifications for Foods (ICMSF).
Published by Blackie Academic & Professional (1996).

£99.00 *pp. 513* *ISBN 0-412-47350-X*

This book brings together a vast amount of information reflecting the long experience of its contributors. It was particularly heartening to find food-borne viruses, parasites and toxins included. However, despite being intended for technical readers, particularly those wishing to employ the HACCP system for controlling microbial hazards, e.g. food industry personnel and food inspection authorities, it is not particularly easy to use. Lack of any index precludes cross-referencing and the 'organism per chapter' layout requires knowledge of a microbe's identity before information can be retrieved. This and the price may deter would-be purchasers of a potentially useful volume.

Martin A. Collins, Belfast

Sequence Data Analysis Guidebook

Edited by S.R. Swindell.
Published by Humana Press (1996).

US$69.50 *pp.352* *ISBN: 0-89603-358-9*

There are many newcomers to the analysis of molecular sequence data who are sorely in need of a critical comparative guide to the available software This book does describe a number of competing software packages, but it is not comprehensive, comparative or critical. Nor does it expound general principles. In each chapter, a user explains in detail how to accomplish a particular task using a particular package and most of the chapters read like paraphrases of the instruction manual. The programs covered are mainly commercial products for Macintosh computers, plus a few isolated programs and a couple of chapters on services provided by the European Bioinformatics Institute. Oddly, it is hard to glean any information on how to obtain the software that is described. Existing users do not need this book, but nor will potential purchasers of software find the informed advice that they need. In short, a swindle.

Peter Young, University of York

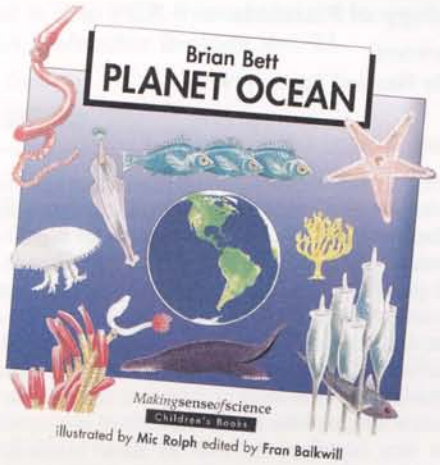
Eukaryotic Gene Transcription. Frontiers in Molecular Biology Series

Edited by S. Goodbourn.
Published by IRL at Oxford Science Publications (1996).

H/B £60.00 *pp. 312* *ISBN: 0-19-963487-4*
P/B £29.50 *pp. 312* *ISBN: 0-19-963486-6*

At first sight this is a publication that resembles David Latchman's excellent text *Gene Regulation: A Eukaryotic Perspective*. Both books are even very similar in size. On closer inspection, *Eukaryotic Gene Transcription* is rather different in that it generally deals with quite specific topics, instead of taking the broader perspective adopted in Latchman's book. Although the first chapter on the regulation of RNA polymerase II transcription serves as a useful introduction, and there is a helpful list of abbreviations, this is probably a book (unlike Latchman's) which is not suited to undergraduate purchase. The editors have done an excellent job in maintaining a continuity of style across the chapters, all of which are well supported with figures and diagrams, and this book will almost certainly have something for everyone researching in any area of eukaryotic gene regulation.

Philip Meaden, Heriot-Watt University



Planet Ocean. Making Sense of Science Children's Books

By Brian Bett. Series Editor F. Balkwill. Illustrator M. Rolph.
Published by Portland Press (1997).

£6.99 *pp. 31* *ISBN:1-85578-094-1*

Other titles currently available in this series are:

The Space Place by Helen Sharman (*ISBN: 1-85578-092-5*),
Satellite Fever by Mike Painter (*ISBN: 1-85578-091-7*)
Light Up Your Life by David Phillips (*ISBN: 1-85578-090-9*)

All priced at £6.99

NB: 10% discount will be offered to SGM members ordering direct from Portland Press Ltd, 59 Portland Place, London W1N 3AJ (Tel. 0171 580 5530; Fax 0171 323 1136).

I like the drawings in the book, they are very detailed. On some pages you see speech bubbles coming out of the pictures' mouths. Some of the speech bubbles are really funny.

You have to imagine that you are in a submarine going to the bottom of the sea. I think that it is an excellent idea. I thought that the animals were quite strange when I first saw them. The book does not say which animal is which, so it is hard to find out more about them. It does not describe what some of the names mean. I think the pages have too many words and some of the words are quite hard. My favourite animal in the book is the brittle star.

I recommend this book for children about 10 or 11 who are learning about the sea.

Karl Roberts (age 9), Isleworth

Computer Modelling in Molecular Biology

Edited by J.M. Goodfellow.
Published by VCH VmbH (1995).

DM178.00 *pp. 243* *ISBN: 3-527-30062-7*

'Computer modelling' of macromolecules refers to applications of three or four different types of software, and this book concentrates on simulations using (non-quantum) mechanics. It contains several short chapters, each with an overview of a published research project, written by the group concerned. Those outside the field will be struck by the thinness of the experimental validation of results and this seems to reflect the fact that available computing power falls short by about a millionfold from what would be required before computation could replace experiment in such areas as structure determination or protein folding.

Andrew Coulson, University of Edinburgh

Book Reviews

The Biology of Plasmids

By D.K. Summers.
Published by Blackwell Science (1996).
£16.95 *pp. 157* *ISBN: 0-632-03436-X*

Informative yet readable books on plasmids have been in fairly short supply over the past decade or so, but this small volume pleasingly corrects the situation. Its content concentrates on those functions of the plasmid as replicating circular DNA, rather than on those additional genes, naturally occurring or cloned, which plasmids carry as vectors. Its five first chapters are on plasmid anatomy, unity, replication, inheritance and dissemination, respectively. The well-written text reflects the author's clear enthusiasm for his subject and the line drawings complement and explain the text. As a result, the more intricate mechanisms by which control is exerted on plasmid replication are explained as well as their intrinsic complexity permits. A final short chapter does touch upon plasmid-borne phenotypes but, perhaps rather arbitrarily, only on antibiotic resistance and virulence under the heading of 'The Clinical and Veterinary Importance of Plasmids, 111'. However, my own prejudice for plasmids being carriers of interesting genes should in no way detract from a strong recommendation of this text as a route to an understanding of plasmid molecular biology for the final year undergraduate through to the experienced researcher.

Peter A. Williams, University of Wales, Bangor

Guidelines for Drinking Water Quality. Second Edition. Vol. 2. Health Criteria and Other Supporting Information

Published by World Health Organization.
Distributed by Microinfo Ltd (1996).
£165.00 + £7 p&p *pp. 973* *ISBN: 92-4-154480-5*

In the light of current interest in drinking water quality, the publication of this thoroughly revised and updated version of a 1984/5 set of guidelines is timely. Whilst a good part of this substantial book is concerned with the chemical and physical aspects of water quality and contamination, there is a significant, authoritative coverage of microbiological aspects ranging from the topical *Cryptosporidium* through *Legionella* to cyanobacteria, enteric bacteria and viruses. There are also sections on the Protection and improvement of water quality, Disinfectants, and Treatment residues.

Expensive, but good value for money – an essential reference book for all microbiologists and chemists working on water quality. The book should be used in conjunction with Volume 1, *Recommendations*, which lists the guideline values for each drinking water constituent.

Mike Hurst, Watermark

Genetic Analysis of Pathogenic Bacteria. A Laboratory Manual

By S.R. Maloy, V.J. Stewart & R.K. Taylor.
Published by Cold Spring Harbor Laboratory Press (1996).
US$85.00 *pp. 603* *ISBN: 0-87969-453-X*

Readers of Stanley Maloy's *Experimental Techniques in Bacterial Genetics* (Jones & Bartlett, 1990) will find much that is familiar in this new text. Both books are written around *Salmonella typhimurium* (with the new one also including material on *Vibrio cholerae*) and both use straightforward language and clear, simple diagrams to make even the most complicated concepts accessible to the general reader. As one who has used Maloy's earlier book in designing practical classes for undergraduate teaching, I am impressed by the potential of *Genetic Analysis of Pathogenic Bacteria* to provide a foundation for such laboratory courses. The book exploits the fact that *Salmonella typhimurium* is both a pathogenic bacterium and one that is amenable to genetic analysis by a large battery of classical and molecular genetic techniques. In keeping with the tradition of laboratory manuals from Cold Spring Harbor Laboratory, detailed methodologies are provided for every technique described, including helpful tips on possible pitfalls. However, this is no mere cookbook; it also includes information on the history of the development of the methodologies described and it strives to explain the science behind the technology. With a complete list of bacterial strains and information on how to obtain them, a good index and a useful bibliography, this book ought to find a home on the bench (as opposed to the bookshelf) of many practising bacterial geneticists. My only slight quibble is that for a book dealing with just two pathogenic organisms, the title is perhaps too broad.

Charles J. Dorman, Trinity College, Dublin

Protein and Peptide Analysis by Mass Spectrometry. Methods in Molecular Biology, Vol. 61

Edited by J.R. Chapman.
Published by Humana Press (1996).
US$69.50 *pp. 352* *ISBN: 0-89603-345-7*

Matrix-assisted laser desorption/ionization (MALDI) and electro-spray ionization have revolutionized the analysis of proteins and peptides by mass spectrometry. The practical information provided may be useful to a beginner, e.g. details on matrix preparation for MALDI, but a "50 ml pear-shaped flask" for reduction/carboxymethylation? Rarely do we have that much protein!

In specialized areas, e.g. Robinson's chapter on protein folding, these advanced techniques would surely not be attempted without recourse to the original literature. A major omission is the interplay of mass spectrometry and databases for protein characterization, using the nanoelectrospray technique of Mann & Wilm, or the on-line approach of Eng & Yates. These approaches are pointers to the future for the characterization of proteins using the wealth of genome data now available. In this regard, Oliver & Carrier's data-base chapter is disappointing, confined as it is to literature searching.

In summary, possibly useful for newcomers, but not at the frontier of current work.

Walter Blackstock, Glaxo Wellcome Medicines Research Centre, Stevenage

PCR Sequencing Protocols. Methods in Molecular Biology, Vol. 65

Edited by R. Rapley.
Published by Humana Press (1996).
US$74.50 *pp. 240* *ISBN: 0-89603-344-9*

The book is a must for investigators in molecular biology and particularly those involved with sequencing and setting up PCR protocols. The list of contributors is impressive and brings together in one volume world-wide experience of every aspect of the major PCR sequencing techniques. There are 26 chapters with protocols to suit every need, whether you are an advanced investigator or a relative novice. The importance of gel preparation and PCR product preparation are emphasized and explained with easy-to-follow techniques and useful hints to ensure that even the beginner can produce successful results. I highly recommend this most comprehensive volume for all molecular biologists.

Hugh J. O'Neill, Regional Virus Laboratory, Belfast

Book Reviews

PCR Cloning Protocols. From Molecular Cloning to Genetic Engineering. Methods in Molecular Biology, Vol. 67

Edited by B.A. White.
Published by Humana Press (1996).
US$69.50 *pp. 512* *ISBN: 0-89603-343-0*

cDNA Library Protocols. Methods in Molecular Biology, Vol. 69

Edited by I.G. Cowell & C.A. Austin.
Published by Humana Press (1996).
US$69.50 *pp. 336* *ISBN: 0-89603-383-X*

These two volumes share the high standard of organization and presentation which is characteristic of the series. In each chapter a concise introduction is followed by materials lists for each stage of the protocol, then accurate methods and explanatory notes, allowing rapid assessment of the equipment and preparation required.

Both of these volumes will be obvious bench top companions in many labs as they are complementary in method and application. With so many variations on the PCR theme described, a certain amount of redundancy in volume 67 is inevitable. This is more than countered by the convenience of the layout and the range of applications covered, including PCR mutagenesis and recombination, as well as a wide range of contemporary library screening and flanking sequence isolation protocols. The extensive consideration given to the issue of primer design is particularly welcome. Also of note are the chapters on use of internet and reference cDNA sources in volume 69 which also includes RACE- and PCR-based cDNA production strategies, as well as library construction and screening methods.

The breadth and general applicability of methods covered in these volumes suggest that they will appeal to molecular biologists everywhere. While not by any means an exhaustive manual for PCR and cDNA work, together they constitute a balanced and easy to use guide to the principle contemporary options. For dedicated gene hunters these volumes will represent a worthwhile individual investment, while their fine layout and ease of use suggest that the lab copy won't stay on the bookshelf for long.

David Horner, The Natural History Museum

Gene Isolation and Mapping Protocols. Methods in Molecular Biology, Vol. 68

Edited by J. Boultwood.
Published by Humana Press (1996).
US$69.50 *pp. 328* *ISBN: 0-89603-382-1*

This is a further addition to this series of excellent and detailed lab manuals. It provides the researcher with step-by-step methods for isolating genes where biochemical knowledge of their function may be lacking. Such methods have provided geneticists with the means to identify genes responsible for the vast majority of inherited human disorders and may be employed for the identification of genes encoding any given phenotype – even those that show complex genetic patterns. Not unexpectedly, the manual adopts a reductionist approach, firstly presenting methods enabling the chromosome of interest to be identified, followed by methods for defining and cloning the physical region and finally, a series of approaches and strategies for isolating genes of interest. Additional chapters provide much needed practical information on computational analysis of novel cDNA sequences, including a useful overview of information available on the Internet and Web site addresses. The book is clearly targeted at the devout 'disease-causing gene' hunter, but contains chapters that will be of general use to all those mapping and isolating genes – be they prokaryote or eukaryote in origin.

Paul Rainey, University of Oxford

PRINS and *In Situ* PCR Protocols. Methods in Molecular Biology, Vol. 71

Edited by J.R. Gosden.
Published by Humana Press (1996).
US$ 59.50 *pp. 180* *ISBN: 0-89603-395-3*

In situ hybridization has been compared with Southern hybridization as a major advance in eukaryotic molecular biology. Consequently, this book is aimed primarily at applications in human cytogenetics and virology, but will be useful to all those microbiologists increasingly applying such techniques to *in situ* analysis of host–pathogen interactions and in microbial ecology. This volume deals in detail with oligonucleotide-PRimed *IN Situ* synthesis (PRINS) and Fluorescence *In Situ* Hybridization (FISH). It contains 15 specialized chapters dealing with such topics as *in situ* amplification on glass slides of both RNA and DNA in both cultured cells and tissue sections. There is also an excellent overarching review chapter dealing with theory, which rather perversely comes at the end.

As with other volumes in this series, this book contains clear practical instructions that are easy to follow, and is well illustrated. It is essential for any laboratory contemplating exploiting this powerful technique

Jon R. Saunders, University of Liverpool

In Situ PCR and Related Technology

Edited by J. Gu.
Published by Birkhäuser Verlag AG (1995).
sFr58.00/DM68.00/öS496.40/US$29.00
pp. 149 *ISBN 3-7643-3870-9*

This book contains an overview of the general methodology of *in situ* PCR which is essentially a merging of the techniques of *in situ* hybridization and PCR. *In situ* PCR is a relatively new and emerging technology and it can be difficult to control. This book explains the difficulties and the major variations in the technique. There are chapters on specific applications, including reverse transcription *in situ* PCR. It is well written and pathologists will find it a useful volume for setting up robust *in situ* protocols. The technique is at an early stage of development and this volume is a successful attempt to promote the technique and to remove the mystique.

Hugh J. O'Neill, Regional Virus Laboratory, Belfast

Bacterial Invasiveness

Edited by V.L. Miller.
Published by Springer-Verlag GmbH & Co. KG (1996).
DM168.00/öS1,226.40/sFr147.00
pp. 115 *ISBN: 3-540-60065-5*

This volume contains six reviews covering advances in the biology of eukaryote cell invasion by pathogenic bacteria. The main bacteria used in these types of studies (*Yersinia*, *Shigella*, *Salmonella*, *Listeria*, EPEC and *Legionella*) are each represented by a separate paper written by leaders in the field. The articles are highly informative, being useful for a range of individuals, from students to senior researchers. The preface makes it clear that much may be learned from comparative analysis of the alternative strategies for invasion evolved by these bacteria. A slight criticism is that in one or two of the papers the copy-editing and proof-reading are not up to scratch. In one paper in particular this leads to some serious errors in gene symbols that make the paper quite confusing in places. Notwithstanding this, the book is a good resource and I would recommend it to anyone interested in invasive bacterial pathogens.

Duncan Maskell, Cambridge

Book Reviews

Viral Safety and Evaluation of Viral Clearance from Biopharmaceutical Products. Developments in Biological Standardization, Vol. 88

Volume Editors: F. Brown & A. Lubiniecki.
Published by S. Karger AG Basel (1996).
CHF315.00/DM377.00/US$274.00
pp. 350 *ISBN: 3-8055-6391-4*

The accelerating application of recombinant DNA technology to the manufacture of a rapidly increasing range of novel products continues to raise questions of safety, not least of viral safety. This timely volume deals knowledgeably with both theoretical and practical aspects of viral contamination in relation to products derived principally from cell culture, including: its avoidance and detection in raw materials, in intermediates and in finished products; and methods for its removal or reduction, most particularly by filtration. The associated and vitally important topics of (a) process validation and (b) risk-benefit analysis are well covered. The relevant guidelines under development by the International Conference on Harmonization (ICH) are also addressed.

There is a wealth of authoritative information in this volume. Readers will have to bear with a considerable amount of duplication between authors and also with a surprising number of typographical errors. These minor criticisms apart, the work will be an essential addition to the libraries of developers, manufacturers, quality controllers, regulators and licensing authorities in the field of biopharmaceuticals.

Tony Garland, Woking

Immobilization of Enzymes and Cells. Methods In Biotechnology, Vol. 1

By G.F. Bickerstaff.
Published by Humana Press (1996).
US$74.50 *pp. 384* *ISBN: 0-89603-386-4*

The above work is perhaps one of the most comprehensive collections of immobilization methodologies I have had the good fortune to encounter during my career. It is relatively unique in that it lists a wide range of methods relating to the production of immobilized biocatalysts [enzymes, cells (including mammalian), organelles and combinations of those]. In addition, each chapter includes an overall introductory description of the relevant technique, a comprehensive listing of the reagents required, an easy-to-follow description of the precise methodology and most importantly a section of 'notes' at the end of each chapter relating to possible pitfalls and health and safety issues. I suggest that the work would find extensive use as a methodology/reference text in any biotechnology-based laboratory, although not exclusively. The text would also be of interest to polymer chemists and process engineers. Reasonably priced, and I would recommend it as suitable for personal and institutional purchase.

Anthony P. McHale, University of Ulster, Coleraine

Nonconventional Yeasts in Biotechnology: A Handbook

Edited by K. Wolf.
Published by Springer-Verlag GmbH & Co. KG (1996).
DM128.00/öS934.40/sFr113.00
pp. 619 *ISBN: 3-540-59482-5*

By 'non-conventional', the Editor of this book means yeasts other than *Saccharomyces cerevisiae* and *Schizosaccharomyces pombe*. Other yeasts (e.g. *Schwanniomyces*, *Kluyveromyces*, *Pichia*, *Hansenula*, *Yarrowia* and *Candida* spp.) are now being utilized in modern biotechnology. In particular, the methylotrophic yeasts, *P. pastoris* and *H. polymorpha* are the hosts of choice for researching and developing human therapeutic proteins by recombinant DNA technology. This book clearly recognizes their biotechnological significance. Most chapters are devoted to a particular species and cover practical aspects of growth and preservation as well as classical and modern genetic manipulations. Some editorial inconsistency is evident in that over 70 pages are dedicated to *C. maltosa* and *Y. lipolytica*, but only 19 for the very important yeast *H. polymorpha*. Nevertheless, the handbook is full of practical information for cloning technologists and should find a useful home in yeast research laboratories. It will also be of value for established *S. cerevisiae* groups and for committed 'pombeologists'.

Graeme Walker, University of Abertay Dundee

Manual of Standards for Diagnostic Tests and Vaccines: Lists A and B Diseases of Mammals, Birds and Bees. Third Edition

Published by Office International des Epizooties (1996).
FrF800.00/US$160.00 *pp. 723* *ISBN 92-9044-423-1*

The aim of this volume is to facilitate trade between countries in live animals and animal products by describing internationally accepted laboratory methods for the diagnosis of disease and the requirements for the production and control of biological products (mainly vaccines). The volume follows the same order as in the OIE Animal Health Code. List A diseases are those which can spread rapidly across national borders and List B contains diseases of socio-economic and/or public health importance within a country and which are also significant to world trade. Each disease chapter is written by an expert(s) in the problem and most form a synthesis of present knowledge. The monographs commence with a summary of the disease, tests used for diagnosis and vaccines available from a clinical viewpoint followed by Part A which is a detailed account of the tests and Part B which defines the requirements for vaccines and other biological products. The book is a mine of information for all dealing with veterinary diseases but, because of its cost, it will mainly be purchased by libraries.

Anthony Andrews, Welwyn, Hertfordshire

Chemical Evolution: Structure and Model of the First Cell

Edited by C. Ponnamperuma & J. Chela-Flores.
Published by Kluwer Academic (1995).
Dfl310.00/US$230.00/£139.00
pp. 383 *ISBN: 0-7923-3562-7*

This book, assembled from camera-ready copy, is the proceedings of a 1994 conference. It covers the formation and evolution of the solar system, through to the appearance of the eukaryotes. Many chapters contain good reviews of the conditions on the early earth, which describe the building blocks that were available and the thermodynamic constraints on their use. The one area which is glaringly missing, however, is a serious treatment of the time-scale of these events, especially with regard to the heavy bombardment of the planet around 4,000 million years ago.

This book is not a light read, nor a succinct summary of current understanding: it is somewhat unevenly edited, with contradictory statements appearing in several chapters. It is clearly aimed at those involved in these problems at a research level. At this price it is unlikely to find its way onto many personal bookshelves, but is a good reference-library purchase.

Dave Roberts, Natural History Museum

Book Reviews

DNA and Protein Sequence Analysis. A Practical Approach. Practical Approach Series

Edited by M.J. Bishop & C.J. Rawlings.
Published by IRL at Oxford University Press (1997).
£29.95 *pp. 352* *ISBN 0-19-963463-7*

It is difficult to decide whether the extreme diversity of topics that are covered by this book constitute a strength or a weakness. Nonetheless, the high quality of the majority of the chapters more than make up for any misgivings. In particular, the excellent chapter by Altschul on sequence comparison and alignment deserves mention. Every molecular biologist, from fledgling postgraduates to the most experienced researchers, will get something out of this book. There are overviews of the major databases and computer software, the internet for molecular biologists as well as sections on gene and genome structure, finishing with chapters on molecular evolution. With the current flood of molecular sequence, knowledge of how to analyse these data is lagging far behind. This book will greatly assist in redressing this imbalance.

James O. McInerney, The Natural History Museum

Human Cell Culture Protocols. Methods in Molecular Medicine

Edited by G.E. Jones.
Published by Humana Press (1996).
US$79.50 *pp. 560* *ISBN: 0-89603-335-X*

The title suggests a reference manual suited to all those using human cell culture. However, the contents are protocol-based, esoteric and incorporate some specialized cell culture techniques which are likely to be of use only to the very specialist audience as explanation of rationale is abbreviated or absent. The detailed methods do appear easy to follow and will be helpful to those trying to set them up *de novo*. However, it is disappointing that a book on human cell culture does not mention the most commonly used human cell line of all, HeLa, or other common lines e.g Hep2, which are used for a multitude of purposes, and for which a variety of adaptations are possible. The indexing is less than perfect, tables are accessed at random and the subject grouping is muddled. This is a book for the specialist library, not for those routinely engaged in human cell culture.

Maria Zambon, CPHL, London

Laboratory Techniques in Rabies. Fourth Edition

Edited by F.-X. Meslin, M.M. Kaplan & H. Koprowski.
Published by World Health Organization.
Distributed by d/b Microinfo Ltd (1996).
£75.00 + £5 p&p *pp. 476* *ISBN: 92-4-154479-1.*

This book provides an authoritative, comprehensive laboratory manual for the diagnosis of rabies and the production and quality testing of vaccines and immunoglobin. Rabies worldwide persists as a major viral zoonotic, particularly in economically deprived areas and it is impressive how this publication is equally relevant to laboratories in these regions as well as developed countries.

The 47 chapters are in six sections starting with general considerations for the safe handling of the virus and an excellent review of its molecular biology. The sections on diagnosis, research techniques, methods of vaccine production and quality testing, and antiserum production are laid out clearly in simple language. Most are presented in a step-wise format with detailed formulations of all reagents given.

Inevitably with a multi-author publication there are inconsistencies and repetition, but these do not seriously detract from the value of this publication which will be a must for any laboratory engaged with rabies.

Hugh Watt Reid, Moredun Research Institute

Gene Cloning and Analysis: Current Innovations. Current Innovations in Molecular Biology, Vol. 4

Edited by B.C. Schaefer.
Published by Horizon Scientific Press (1997).
£34.99 *pp. 214* *ISBN: 1-898486-06-9*

Amongst the avalanche of commercial kits and technical bulletins, I found this book pleasantly refreshing and stimulating. It presents a selection of newly emerged technologies of the higher scientific standard with an emphasis on innovation and creativity. Some of the methods described may become routine in many labs and others would stimulate new developments. I would therefore welcome this new addition to the numerous published protocols on gene cloning and analysis.

The target audience of this book is most likely to be the seasoned investigator. 'Maniatis' proficiency would be essential as many of the described techniques go well beyond the kitchen of everyday molecular biology. Some would require an effort to set up, but the initial investment should be repaid with interest.

The book is well suited for personal purchase in specialized groups. Research-conscious institutions would be well advised to acquire this book for the infrequent user.

Irina R. Tsaneva, University College London

ASM Pocket Guide to Clinical Microbiology

By P.R. Murray.
Published by ASM Press (1996).
US$26.95 *pp. 290* *ISBN: 1-55581-109-4*

Athough much of the information needed by the clinical microbiologist is included here, and I would have this guide in my pocket when demonstrating to students, there are some problems. The listed human-pathogenic microbes, for example, are not the most common in clinical practice, nor the most dangerous, though some of both are included. The section on specimen collection contains much useful advice but does not give a clear idea of the most common, dangerous or important samples.

The section on identification reflects the excellence of the *ASM Manual of Clinical Microbiology*, while those on antimicrobial agents, immunodiagnostic tests and notifiable diseases are rooted in north American practice and, provided that limitation is recognized, are very useful.

This is a pocket guide to the factual basis, not a guide for judgement, in clinical microbiology. It would be of most value to the experienced microbiologist. There is no index, but it is an easy book to use.

Bo Drasar, London School of Hygiene & Tropical Medicine

Parasitic Infections of Domestic Animals. A Diagnostic Manual.

By J. Kaufmann.
Published by Birkhäuser Verlag AG (1995).
sFr68.00/DM78.00/öS569.40 *pp. 423* *ISBN: 3-7643-5115-2*

The manual provides a ready source of information on parasites of domestic livestock, but does not cover parasites of companion animals. The unique layout and colour-coded index, based on the host and predilection site, are easy to follow. The downside to this is that there is much repetition and cross-referencing between chapters. The colour plates are excellent but some of the b/w line drawings, particularly of life cycles, are of variable quality. Many of the b/w illustrations have been reproduced from other textbooks. The reader is cautioned as to the accuracy of drug dosage and administration. There are some errors in dose levels and some of the information on products is outdated. Criticism apart, the manual provides an excellent illustrated and practical guide for those involved in the diagnosis, treatment and control of parasitic diseases of domestic livestock.

Mike Taylor, Central Veterinary Laboratory, Weybridge

Book Reviews

Trypanosomiasis and Leishmaniasis. Biology and Control

Edited by G. Hide, J.C. Mottram, G.H. Coombs & P.H. Holmes.
Published by CAB International (1996).

£55.00 (US$100.00 Americas only)
pp. 384 *ISBN: 0-85199-139-4*

This book summarizes the major recent advances in our understanding of the molecular biology and biochemistry of the trypanosomatid parasites, *Leishmania* and *Trypanosoma*. Many of the research leaders in this fast moving field have written lucid chapters on their specific areas of expertise. Hence, the book will be of great interest to laboratory scientists carrying out sub-organismal research into *Leishmania* and *Trypanosoma*. However, readers may be misled by the book's title, as very few chapters are explicitly concerned with control of the diseases caused by these parasites and many key features of the biology of these diseases – such as immunology, host genetics, pathology, epidemiology and vector biology – receive little more than cursory attention. A comprehensive and up-to-date survey of the biology and control of trypanosomiasis and leishmaniasis is urgently required by scientists, physicians and public health workers alike, but this book does not provide it.

Clive Davies, London School of Hygiene & Tropical Medicine

Antibody Engineering. A Practical Approach. Practical Approach Series, Vol. 169

Edited by J. McCafferty, H.R. Hoogenboom & D.J. Chiswell.
Published by IRL Press (1996).

£27.50 *pp. 325* *ISBN: 0-19-963592-7*

This book is very useful for practising antibody engineers, providing extra information that enables them to adopt new techniques or expand into new areas. Thus, chapters describing how to determine affinities by ELISA and the problems of expression give useful tips and ideas.

However, it will be less useful for 'antibody engineering virgins'. Some chapters make little effort to explain the principles behind the protocols. In addition, the format does not lend itself to some topics that are either already routinely performed in the laboratory (probably to a slightly different protocol!) or will need more explanation than can be provided in a short protocol. Also the book is already somewhat dated. Most of the references are pre-1994, and so there is no substantial discussion of more recent developments such as very large phage libraries.

In conclusion, this is a useful and interesting resource for practising antibody engineers and I will make sure my students have access to it. However, if you are new to the field use it with caution – you may need some more help.

Andrew J.T. George, Hammersmith Hospital, London

Negative Staining and Cryoelectron Microscopy: the thin film techniques

By J.R. Harris.
Published by Bios Scientific Publishers (1996).

£19.95/US$39.95 *pp. 224* *ISBN: 1-85996-120-7*

There are now a variety of sophisticated microscopes available to the discipline of microbiology, but none is more valuable than the electron microscope. This was the first microscopy which (really) allowed the imaging of viruses and bacteria, and their component parts, in breathtaking detail.

This book describes the tried and true technique of negative staining (with subtle modifications for better results) as well as the more modern and difficult technique of cryoelectron microscopy. Initial chapters cover the development of negative staining, and preparative and specialized approaches. Each chapter builds on the other as methods become more complex until unstained vitrified specimens are described along with computer image processing. Examples are given for each technique and the reader gets to see what to expect when using them on a number of different samples (from red blood cell membranes to viruses to enzyme complexes). And, for researchers training to be microscopists, a picture really is worth a thousand words!

J. Robin Harris' book is timely, up-to-date, loaded with information, written in an understandable style, soft-covered and (relatively) inexpensive. I recommend his book to all microbiologists who have an interest in electron microscopy.

Terry J. Beveridge, University of Guelph, Canada

Fungi and Environmental Change

Symposium of the British Mycological Society held at Cranfield University, March 1994

Edited by J.C. Frankland, N. Magan & G. M. Gadd.
Published by Cambridge University Press (1996).

£60.00/US$95.00 *pp. 351* *ISBN: 0-521-49586-5*

Fungi have received relatively little attention in international concerns about the effects of environmental changes on living organisms. This text attempts to redress this imbalance by reviewing the current status of research into (i) the effects of environmental change and stress on fungi and (ii) some of the applications of fungi in environmental bioremediation. The 40 contributors present experimental evidence wherever possible – although this is interspersed with much speculation – highlighting the urgent need for more research activity in this field. Although there is a tendency to oversimplify some extremely complex problems, the text certainly achieves one of its aims in that it stimulates further reflection on the many issues surrounding the topics with which it deals. Recommended for purchase by those institutions with teaching and/or research activities in any aspect of environmental biology from the cellular to the ecological level – may prove a little pricey for the individual.

Vicki Tariq, The Queen's University of Belfast

Insect Cell Cultures: Fundamental and Applied Aspects

Edited by J.M. Vlak, C.D. de Gooijer, J. Tramper & H.G. Miltenburger.
Published by Kluwer Academic (1996).

Dfl265.00/US$172.00/£116.50
pp. 324 *ISBN: 0-7923-3403-5*

This book makes fascinating reading. A series of short well-focussed chapters moves rapidly from fundamentals of initiating insect cell cultures to the rapidly expanding applied field of insect cells and insect viruses, mainly baculoviruses and experimental manipulation to produce recombinant molecules. The focus then moves on to reviews of larger industrial-scale production followed by a very short section on current applications: parvovirus and swine fever virus vaccine and multidomain complement glycoprotein production. Finally, a short group of chapters deals with economic and regulatory aspects.

This is an authoritative reference text written by leading experts in their respective fields of insect cell culture. The book targets a potential audience ranging from students and researchers in academia through to those concerned in industry with biotechnology applications. Highly recommended, but with two criticisms – it is very expensive for an individual to purchase and it desperately needs a comprehensive cross-referenced index.

Colin Leake, London School of Hygiene and Tropical Medicine.

Book Reviews

Lecture Notes on Medical Microbiology, Third Edition

By T. Elliott, M. Hastings & U. Desselberger.
Published by Blackwell Science Ltd (1997).
£13.95 *pp. 343* *ISBN: 0-632-02446-1*

A very concise text focussed upon the essential factual details for a broad range of infectious disease states. A brief review covering introductory material gives way to 44 chapters covering topics from classical respiratory diseases and STDs to parasitology and zoonoses. Comprehensive details are given for each disorder, including epidemiology, pathogenesis, laboratory diagnosis and treatment. Sixty-four colour photographs adequately supplement the main body of text. This represents an ideal revision text for undergraduates majoring in medical microbiology but would equally be suitable reference material for medical laboratory scientists and general medical practitioners. Certainly an essential purchase for university and college libraries, and at £13.95 it is very reasonably priced for individuals.

Andrew Lamb, The Robert Gordon University, Aberdeen

Microbially Influenced Corrosion of Materials

Edited by E. Heitz, H.-C. Flemming & W. Sand.
Published by Springer-Verlag GmbH & Co KG (1996).
DM168.00/öS1,226.40/sFr147.00
pp. 475 *ISBN: 3-540-60432-4*

This book reports on a 1993 meeting of a Dechema working party on *Material Degradation and Protection*. This is the source of both the book's greatest strength and its major weakness. The strength lies in the book's dealing not only with corrosion of carbon, stainless steels and copper, but also with biodeterioration of a diverse range of inorganic and organic substrata. It also has the merit of bringing "together expertise from diverse scientific and engineering disciplines in order to give an overview of the individual problems associated with MIC".

The weakness, and it is a major one, is that the treatment given to each chosen subject is broad rather than deep, and on occasion, frankly shallow. A further problem is that of the 34 chapters, all but four are from groups in Germany. Inevitably this gives the book a narrowness of focus which does not fully square with the universal nature of the problems asociated with MIC, or with international efforts being made to understand and combat it.

Useful source of starting information for the non-expert.

Allan Hamilton, Aberdeen

A Dictionary of Virology, Second Edition

By B.W.J. Mahy.
Published by Academic Press Ltd (1997).
£17.50 *pp. 348* *ISBN: 0-12-465326-X*

As the author of this book points out, it is not a comprehensive dictionary of virology since only viruses of vertebrates are included. However, packed in amongst the descriptions of viruses are general, and even quite basic, biological terms making this dictionary a concise stand-alone data source. For those wanting more information, references are included for many of the entries.

Apart from a few annoying (especially to copy-editors!) but minor stylistic inconsistencies, this book is clear and easy-to-use. From Abadina virus to Zwoegerziekte virus and from one line to whole page entries it is a first-stop guide to vertebrate virology and is recommended to undergraduates.

Deborah Clegg, JGV Editorial Office

Life Chemistry & Molecular Biology

By E.J. Wood, C.A. Smith & W.R. Pickering.
Published by Portland Press (1996).
£16.00/US$26.00 *pp. 230* *ISBN: 1-85578-064-X*

This large format soft-backed text presents topics in a logical sequence with interspersed A-level examination questions, which should provide a useful self-study resource for the target student groups. However, whilst the technique of providing most data as figures with short interlinking text may aim to aid comprehension, the high density of figures on many pages could well muddle the inexperienced and lead to information overload. An effect exacerbated by the limited use of colour, presumably necessitated by cost considerations. Overall, a potentially useful publication in an interesting format capable of further development.

Martin A. Collins, Belfast

The Evolution of Life. *PC/MAC CD-ROM*

Editorial content by Richard Dawkins. Text by Olivia Judson.
Published by Notting Hill Publishing Limited (1996).
£29.95 *482 MB* *ISBN: 1-900143-10-0*
SGM Members £24.95 (telephone Cash Sales, Exel Logistics, on 01634 297123 quoting 'SGM reader offer')

Having greatly enjoyed Richard Dawkins' books and lectures, I approached this multimedia CD-ROM with eager anticipation. My conclusion is that it is informative and entertaining, but there are some pretty rough edges. Starting up takes you into Dawkins' study; a genie comes down the chimney and materializes as the man himself, to give his introduction. Click on the model of the double helix on the table, and you enter the DNA lab, where basic concepts such as the genetic code and replication are explained by a series of animations. Some of these are disappointing: they do not make the best use of the potential to illustrate and explain, and some are rather misleading.

Moving on, you enter the 'Evo-dome', where you can take a trip to the Galapagos, listen in on discussions between Darwin, Lyell and Lamarck, try the quiz and browse a large number of illustrative and interactive presentations on diverse evolutionary topics such as host–parasite interaction, mutualism, speciation, fossils, extinction, camouflage, etc. Many of these are rather well done; my assistant reviewers (aged 6 and 8) were absorbed and older children should readily pick up many of the concepts.

Underlying all these are a text database and glossary. Both are less than satisfactory, containing numerous spelling mistakes, and notes marking where information has still to be posted or checked. Some of the definitions – try bacteria and viruses – are poor, and the overall coverage is not encyclopaedic.

Ron Fraser, SGM Marlborough House

Books Received

The Biotechnology Software Directory. A Buyer's Guide

Edited by K. Ahern.
Published by Mary Ann Liebert, Inc (1995).
US$69.95 + US$10.95 p&h
pp. 281 *ISBN: 0-913-113-70-0*

Handbook of Essential Fatty Acid Biology. Biochemistry, Physiology, and Behavioral Neurobiology

Edited by S. Yehuda & D.I. Mostofsky.
Published by Humana Press (1997).
US$145.00 *pp. 432* *ISBN: 0-89603-365-1*

DIARY

SGM MEETINGS

Checkpoints and Non-linear Dependency Relationships
Southampton, 1–5 September 1997

***2nd European Virology Meeting:* Virus–Host Interactions**
Southampton, 3–5 September 1997
Further details can be found on the web at http://www.socgenmicrobiol.org.uk/evirfli.htm

***Joint meeting of the SGM Clinical Virology Group and European Group for Rapid Viral Diagnosis:* Nosocomial infections**
Royal Society of Medicine, 5–7 January 1998

Biology of Exploitable Bacteria in the Genus *Rhodococcus*
Bradford, 6–8 January 1998

Microbial Responses to Light and Time
Nottingham, 30 March–3 April 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

Contact: Meetings Administrator, SGM, Marlborough House, Basingstoke Road, Spencers Wood, Reading RG7 1AE (Tel. 0118 988 5577 ext. 153; Fax 0118 988 5656; Email meetings@socgenmicrobiol.org.uk; Web http://www.socgenmicrobiol.org.uk/meetings.htm).

See pp. 102–107.

SEPTEMBER 1997

International Symposium on the Biological Characterization and Assay of Cytokines and Growth Factors
Royal College of Physicians, London 10–12 September 1997
Contact: Dr Tony Mire-Sluis (Fax 01707 650223; Email: tmire@nibsc.ac.uk)

47th Harden Conference: Regulation of Carbohydrate Metabolism in Normal and Diseased States
Royal Agricultural College, Cirencester, 21–25 September 1997
Contact: Michelle Mandale, The Biochemical Society Harden Conferences, 59 Portland Place, London W1N 3AJ (Tel. 0171 580 3481; Fax 0171 637 7626; Email meetings@biochemsoc.org.uk)

Computers in Microscopy Course
Cambridge
21–25 September 1997
Contact: Royal Microscopical Society, 37/38 St Clements, Oxford OX4 1AJ (Tel. 01865 248768; Fax 01865 791237; Email info@rms.org.uk)

Emergence and Re-emergence of Negative Strand Viruses: Tenth International Conference on Negative Strand Viruses
Dublin, Ireland
21–26 September 1997
Contact: Dr B.W.J. Mahy, PO Box 33799, Decatur GA 30033-799, USA (Tel. +1 404 728 0564; Fax +1 404 728 0032; Email nsv@aol.com)

3rd Annual Conference and Exhibition of The Society for Biomolecular Screening
Sheraton Harbor Island Resort, San Diego, USA
22–25 September 1997
Contact: Society for Biomolecular Screening, 36 Tamarack Avenue, Suite 348, Danbury CT 06811, USA (Tel. +1 203 743 1336; Fax +1 203 748 7557; Email c_giordano@prodigy.com)

SEPTEMBER–OCTOBER 1997

37th Interscience Conference on Antimicrobial Agents and Chemotherapy (ICAAC)
Toronto, Canada,
28 September–1 October 1997
Contact: ASM Meetings Department, 1325 Massachusetts Avenue NW, Washington DC 20005, USA (Tel. +1 202 942 9248; Fax +1 202 942 9340; Email meetingsinfo@asmusa.org; Web http://www.asmusa.org)

OCTOBER 1997

Fifth International *E. coli* and Small Genomes Conference (sponsored by the American Society for Microbiology)
Snowbird, Utah, USA
12–15 October 1997
Contact: ASM Meetings Department, 1325 Massachusetts Avenue NW, Washington DC 20005, USA (Tel. +1 202 942 9248; Fax +1 202 942 9340; Email meetingsinfo@asmusa.org; Web http://www.asmusa.org)

Second European Meeting on Diagnostic PCR
Kurhaus Hotel, The Hague, The Netherlands
16–17 October 1997
Contact: Huub Schellekens, Tinbergenpad 6, 2912 BH Nieuwerkerk a/d Ijssel, The Netherlands (Tel. +31 180 313630; Fax +31 180 318795; Email huubs@xs4all.nl; GSM mobile phone +31 654686557)

XV Brazilian Congress of Parasitology
Salvador, Bahia, Brazil
27–30 October 1997
Contact: Executive Secretariat, Rua 8 de Dezembro, 547 – Graça, Salvador, Bahia, Brazil (Tel. +55 71 245 3477; Fax +55 71 237 3090)

NOVEMBER 1997

Microbial Contamination Detection and Control
Zurich Hilton Hotel, Zurich, Switzerland, 5–7 November 1997
Contact: Programme Division, Technomic Publishing AG, Missionstrasse 44, CH-4055 Basel, Switzerland (Tel. +41 61 381 5226; Fax +41 61 381 5259)

6th International Symposium on dsRNA Viruses
Cocoyoc, Mexico
9–13 November 1997
Contact: Drs Susana López or Carlos F. Arias, Instituto de Biotecnologia/UNAM, Apartado Postal 510-3, Colonia Miraval, Cuernavaca, Morelos, Mexico (Tel. +52 73 29 1661; Fax +52 73 17 2388; Email dsrna@ibt.unam.mx)

DECEMBER 1997

37th Annual Meeting of the American Society for Cell Biology
Washington, DC, USA
13–17 December 1997
Contact: ASCB Meeting Information (Tel. +1 301 530 7153; Fax +1 301 530 7139; Email: ascbinfo@ascb.org)

JANUARY 1998

International Congress on Extremophiles
Yokohama, Japan,
18–22 January 1998
Contact: Mr Katsumi Sakakura (Fax +81 468 66 5306; Email shimizut@jamstec.go.jp)

MAY 1998

4th International Symposium on Viruses of Lower Vertebrates
Weymouth, 12–15 May 1998
Contact: Prof. Barry Hill or Dr Peter Dixon, CEFAS Weymouth Laboratory, Barrack Road, The Nothe, Weymouth, Dorset DT4 8UB, UK (Tel. 01305 206600; Fax 01305 206601; Email b.j.hill@cefas.co.uk or p.f.dixon@cefas.co.uk)

JUNE 1998

2nd International Workshop on Bemisia and Geminiviral Diseases
San Juan, Puerto Rico, 7–12 June 1998
Contact: Mrs D. Guy, Secretary-Treasurer, IWBGD, 2120 Camden Road, Orlando, FL 32803-1419, USA (Tel. +1 407 897 7304; Fax +1 407 897 7337; Email rmayer@ix.netcom.com; Web http://www.wisc.edu/plhealthser/gv-wf/index.htm)

Diary

JULY 1998

MICRO 98 – Microscopy Conference and Exhibition
London, 7–9 July 1998
Contact: Royal Microscopical Society, 37/38 St Clements, Oxford OX4 1AJ (Tel. 01865 248768; Fax 01865 791237; Email info@rms.org.uk)

VII International Congress of Ecology (INTECOL). New Tasks for Ecologists after Rio 1992
Florence, Italy, 19–25 July 1998
Contact: Almo Farina, Vice-President INTECOL Secretariat, Lunigiana Museum of Natural History, Fortezza della Brunella, 54011 Aulla, Italy (Tel. +39 187 400252; Fax +39 187 420727; Email afarina@tamnet.it; Web http://www.tamnet.it/intecol.98)

AUGUST 1998

Eighth International Symposium on Microbial Ecology – Microbial Biosystems: New Frontiers
Halifax, Nova Scotia, Canada, 9–14 August 1998
Contact: Dr Colin R. Bell, Microbial Ecology Laboratory, Dept of Biology, Acadia University, Wolfville, Nova Scotia, Canada BOP 1XO (Tel. +1 902 542 2201 ext. 1328; Fax +1 902 542 3466; Email isme8@acadiau.ca; Web http://dragon.acadiau.ca/~cbell/isme8.html)

OCTOBER1998

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)

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)