[O20] Microbiology and art: a comfortable combination?

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Art provides an opportunity for visualisation and communication of science, and I have found that in this context and others, microbiology and art link very well. Over the past few years, I have collected examples of this interdisciplinarity, and produced a lecture which I give to first year Biology undergraduates. The lecture is one of a series given during a module entitled 'Frontiers in Biology'. In the module, a lecture is presented by each specialist subject area within our School, and students sign up to an assignment in any of the six subjects. For all other subjects, the accompanying assignment is a poster plan. For microbiology, students have the opportunity to produce, alone or in groups, an item to illustrate some link between art and microbiology. There is no upper limit to the number of students who can take this option; students can work alone or in groups. Ideas are discussed during a tutorial, and assessment criteria are negotiated between myself and the student(s). The outcomes are diverse, often creative and inspiring, and several have been used to illustrate this article.

The topics covered in the lecture, entitled 'Microbiology and Art: the Final Frontier' are:

Deterioration of Art
Microbially-induced spoilage of art and heritage material is perhaps the most obvious link between the subjects, but I also describe aspects of prevention and control of such deterioration, and give examples of microbiologically-induced remediation. Students were especially interested to hear of this unusual example of applied microbiology, and several opted to do assignment work on, for example, spoilage of film, ancient Egyptian art and stone monuments, and on some of the EU funded conservation projects. Their work was primarily presented in poster format.

Beauty of microorganisms
The excitement generated when a 'good' specimen is found 'down the microscope' can be infectious: it is not only the success of finding the microorganism – sometimes they look really nice! Indeed, sophisticated imaging techniques enable differentiation of components of microbial communities, or individual cells, and such images are common in textbooks and in lecture presentations. Images can be enhanced and modified, and find a diverse range of uses: calendars (e.g. **www.veeco.com**), websites, graphic art posters, clothing (**www.iawareables.com**), toys (**www.giantmicrobes.com**) collage and so on. Student products included three-dimensional models; customised lab coats; silk paintings; and designer jewellery!

Microorganisms in art
Surprisingly, microorganisms themselves may provide material as well as inspiration for art: pigmented bacteria can be used to 'paint' images on agar plates; pictures made on microscope slides from diatoms can be purchased for educational use (**www.diatoms.co.uk**);

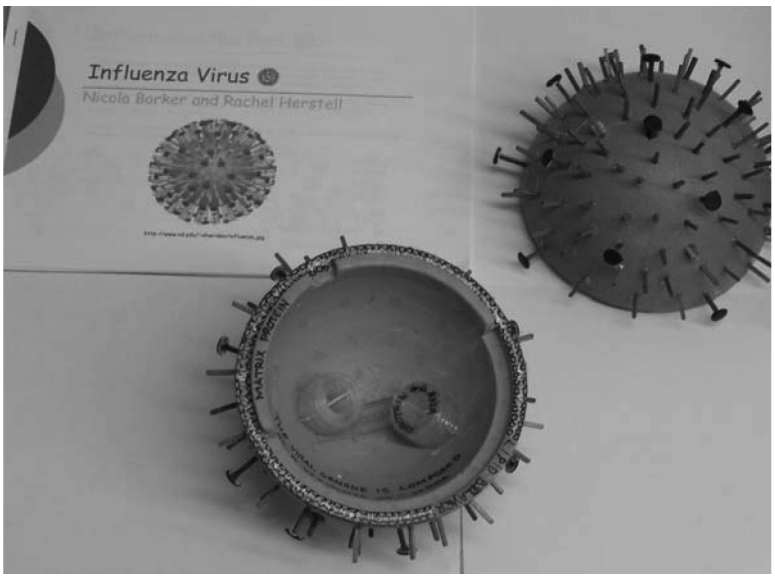

Figure 1: Model of influenza virus and accompanying PowerPoint presentation

models of toadstools can be found in many a craft shop, with more scientifically accurate models also available for purchase, or viewing (**www.hps.cam.ac.uk/whipple/explore/models/glassfungi**; **www.britmycolsoc.org.uk/resources.asp**). The 20-sided polygon, the icosahedron, provides the maximum volume for the minimum building material, thus is an ideal structure for both viruses and geodesic buildings such as the Eden project. During the assignment, some students produced 3-D models of viruses (**Figure 1**): one group ingeniously used the clear balls used for guinea pig exercise, as the transparent envelope!

The consequences of bacterial and viral diseases, rather than the microorganisms themselves, provide ideal subjects for visualising the destruction wreaked by plagues through history (e.g. **www.wellcome.ac.uk**), and upon individuals (e.g. The *Inheritance* by Edvard Munch). Students created PowerPoint presentations outlining the influence of plague on contemporary art; produced conceptual images using FISH technology; painted a representation of the history of science; produced a collage in 1930s style of the importance of tuberculosis in literature (**Figure 2**); designed panels for the AIDS quilt; profiled artists who interpret science through the medium of paint, constructed a large model of influenza virus, accompanied by PowerPoint lecture notes and smaller cutaway models, for use in lectures. Of course, not all products are aesthetically pleasing, nor do they meet the negotiated assessment criteria (**Figure 3**).

Combining Microbiology and Art

Previously, projects in poster and leaflet design (Verran, 1992, 1993) have incorporated consideration of communication, cost and co-operation with peers. More ambitious cross-disciplinary projects involved undergraduates in art and biology working together to design an artwork for the foyer of a new science building. Although not successful due to the cost implications, one proposed installation considered the importance of repeating, yet evolving structures in all aspects of science (fractals, DNA, evolution, polymers).

Discussions with artists at the University have led to projects where the outcome has been artwork, exhibition, or installation, rather than scientific paper, report or presentation. Postgraduate art students have also used microorganisms and/or principles of microbiology as part of their project work. Such ‘SciArt’ partnerships are not uncommon, and the Wellcome Institute is particularly interested in this type of development.

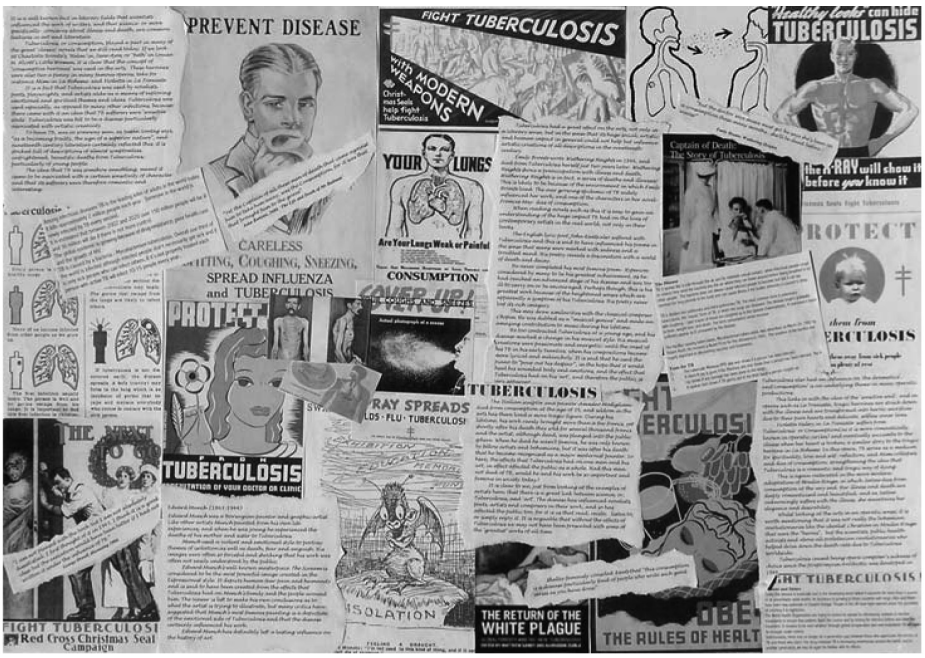

Figure 2: Tuberculosis and mid-20th century graphics, accompanied by text describing links between the disease and the arts

Figure 3: Fairly anaesthetic and poorly conceived collage to demonstrate use of fungi (wrappers, labels etc): unfortunately the real mushrooms which were also part of the collage went mouldy, necessitating the disposal of the piece!

Microbiology and. . . .

It rapidly becomes apparent that the combination of microbiology with other subjects such as literature (5), where the impact of disease on the development of particular novels can be explored; or music, where composition or lyrics can assist in recall of complex terminology, is easily possible. Subjects such as history, geography, politics, and economics are inevitably associated with the epidemiology and management of emerging and re-emerging disease – thus whatever the interest of the audience, microbiology becomes of interest and relevance! Indeed, this lecture has been given externally to a range of different audiences who have enjoyed its rather different slant on science.

Figure 4: the overall prize-winner of the 2005-6 competition produced three pieces representing Aspergillus in different formats. The montage of pieces is completed by a library image of the fungus, and a plaque commemorating the award.

Evaluation

This academic session (2006-7) marks the third iteration of the assignment. From a small initial group in the first year (approximately 20 students and 12 products), to over 50 in the second year, and a more modest 10 in the current session, the feedback from students has been very positive. Since the students are self-selecting, there is no sense of inadequacy, and there is a significant enthusiasm to employ talents other than those perceived as 'scientific'.

Assessment for the Frontiers module is '100% coursework', and comprises assignments in note taking, essay writing, writing lecture synopses in addition to the poster/art work. Marks awarded were generally high, provided that the students adhered to the negotiated assessment criteria. In 2005-6, from 50 students, 24 'products' were awarded the following marks: 90 – 100%, 4 products; 80 – 89%, 3 products; 70 – 79%, 5 products; 60 – 69%, 7 products; 50 – 59%, 5 products.

It was also important not to use my office as a repository of dusty posters or models. Thus the students' art was displayed at an event for which industrial sponsorship, including prizes, was forthcoming. The sponsor, Leica Microsystems, is well aware of the potent imagery which their equipment can generate, and have published a book of such images (**www.fluorescence-microscopy.com**). One of the student montages has been framed (funded by the sponsor) and is displayed in the School reception area (**Figure 4**); others have been used as teaching aids; even more satisfying is the number of students who ask for their work to be returned for them to use as home decoration.

An awareness of the different interests and learning methods of students is important in providing an appropriate stimulating educational environment, particularly when the numbers of students is increasing, and their entry qualifications and abilities are more

varied. Enabling the expression of creativity amongst first year science undergraduates has been a particularly rewarding experience.

References

Verran, J. (1992) A student centred learning project: the production of leaflets for 'live' clients. *J.Biol. Ed*., **26**: 135 - 138

Verran, J. (1993) Poster design: by microbiology students. *J.Biol., Ed*. **27**: 291-294