Session 6b Science in the public eye (2)

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A common perception is that science is nowadays the object of particular attention both because of its enormous potential for good and for its capacity to cause concern and apprehension about its influence. This modern ambivalence is often contrasted with what are traditionally thought of as the halcyon days of UK science. The book *Science and Society* by Hilary and Steven Rose has interesting things to say about the historical relationship between science and society; its datedness (1970) means this is now almost a 'classic', but it still well worth studying.

In reality, it seems fanciful to suppose that science has only recently been the subject of intense public concern and determined opposition. For example, the introduction of vaccines have long been controversial, perceived as 'risky' and an infringement on personal liberty and (a familiar argument) in some way 'against Nature' – as with the prolonged campaign opposing the introduction of the smallpox vaccine in the 19th C. (Spier 2001). Protests against animal experimentation are long-standing, as evident for example in the international campaign concurrent with Banting and Best's discovery of insulin in Montreal in the 1920s (Bliss 1988).

Despite this historical thread, the supposed 'toppling of the Gods' – the sentiment that opened Jonathan Freedland's 1999 piece in the Guardian (http://www.guardian.co.uk/comment/story/0,,288255,00.html) – is widely seen as a modern phenomenon. Freedland claims that the 'age of reverence (for science) seems to be drawing to a close', though the fall in scientists' credibility seems to be part of a bigger picture of a diminution of trust in expert knowledge. The type of issue that can be drawn from the Freedland article include;

- Is there any substance in the argument that 'the scientific community must take a large amount of the blame for the low esteem in which the public appear to hold it'?
- Is there indeed a sense in which scientists can settle arguments with 'independent research'?
- Dawkins' model of science as a 'provider of evidence', delivered by what he terms a 'scientifically literate' press – what problems are inherent in such a picture?
- Is there merit in the notion of science 'coming off its pedestal down to ground level where it might live amongst us - the people whose lives it promises to improve'?

Activity 1

Jot down your own thoughts about the Freedland article, especially assertions you'd like to challenge.

Of course, the article does pre-suppose that trust in scientists is some worrying way 'too low'; other measures paint a more optimistic picture. (see for example the article by Robert Worcester in the Wellcome Trust's very useful and wide-ranging publication Engaging Science http://www.wellcome.ac.uk/doc_WTX032706.html)

In your view, was the angry reaction to Freedland's article, mainly from scientists http://browse.guardian.co.uk/search?search=freedland+godbye+to+the+oracle justified?

I want to pick up the point about science 'settling arguments' later but of immediate interest is the issue of journalism as a conduit for science understanding. A previous session mentioned issues related to news values and journalistic practice, but I want to draw out a point relating more to the *processing* of scientific data. The authors Robin Millar and Brian Wynne make the following useful point (in the context of the risks posed by the radioactive fallout from the Chernobyl explosion in 1986.

> Some schools and teachers achieved media coverage (at both local and national level) for what amounted to pointing the school's Geiger counter out of a window, or at a patch of grass or pool of rainwater and recording counter-rates over a period of days. All this activity embodies the belief that generating scientific data is straightforward, and that universally recognised facts can be produced by instant observation, without the need for painstaking calibration, extensive piloting of sampling (which still remains uncertain), extrapolation and interpolation based on unverified or only partly verified assumptions and theoretical models, negotiation over relevant observations, techniques, classifications and frameworks, and extensive interpretive intervention in shaping the 'information' into meaningful forms for diverse audiences. In short, the conversion of measurement into data and then into useful technical knowledge is not as simple as that. Clearly, many people believe that science is rather simple, at least in the sense that the rules are clear, and that if one follows them (which of course requires competence) the automatic result is valid, universal scientific knowledge.
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> *Millar and Wynne (1998), pp 394-395*

For these reasons, ensuring that scientific information is always open and accessible is often problematic – quite apart from the issue of how science can and should mediated by news media to ensure that it is engaging and comprehensible. In this paper, Millar and Wynne argue in convincing terms for a greater emphasis on the communication of the *processes* of science to lay audiences, as opposed to the content of science. They draw attention to the far-from-straightforward issue of the nature of scientific knowledge and to the sorts of information that science can reasonably be expected to provide. They take the view that formal science education is critical in helping shape adult perceptions of science – a point which I feel has a critical bearing on how science and scientists are perceived amidst the furore of socio-scientific controversies.

Activity 2

If you are interested in finding out more about science education, spend some time sampling the OU text, *Issues in Science Education* at the OpenLearn site http://openlearn.open.ac.uk/course/view.php?id=3253. It's unlikely you'll have time to read all of it but Section 7 which critically looks at a review (*Beyond 2000*) that was an important forerunner of the new science curricula, which you can access in full from that OL site.

That section describes concerns about traditional science curricula; many seem more geared to the interests of those likely to go on study science professionally than to the needs of non-scientists as they encounter science in their everyday life. New curricula such as *21st Century Science* aim to reduce conventional science content and replace it by focussing on science that impacts on everyday life and/or is the subject of widespread public debate – hence an emphasis on aspects such as the safety of mobile phones and the risks of alcohol/drug addiction.

Searching on the web will reveal a mix of enthusiasts and concerns for what 21st Century has to offer. I find it an extraordinarily interesting idea – as clearly do the designers and teachers involved; http://www.21stcenturyscience.org/ Some are concerned that such an emphasis will encourage students to go beyond science's traditional (and healthy) belief in scepticism (you know of Merton's norms from the preliminary reading and from session 4) – see http://education.guardian.co.uk/gcses/story/0,,1896759,00.html. Its striking too that some teachers express concern about the course's effectiveness, though generally not those closely involved with it.

What are your own views on how a curriculum rich in controversies will influence perceptions of science? How for example might you go about designing a science curriculum that aimed to allow future citizens to make wise judgements about contentious issues? (Miller (1997) has written a very informative article on just this issue; another especially informative piece of writing is by Edgar Jenkins, which links the issues of science education and the Public Understanding of Science. This article (*School science, citizenship and the public understanding of science*) is included in the OU's *Issues in Science Education* text that you accessed right at the beginning of this Activity.

An answer of sorts to such questions might emerge from looking more closely at the factors that underpin contemporary controversies in science. We've touched on a number in class discussion throughout the two – the BSE episode, MMR and the controversy over the commercialisation of GM crops. There is a sense of history repeating itself here – with public displays of experts in disagreement, science often high in uncertainty, arguments about precaution, an uncomfortable mix of scientific and political aspects. What is striking is that the science element (or perhaps core) of these public disputes is but one component of many – as Alan Irwin has agued (2003), they are as much about issues of 'fairness', 'exploitation', effective governance, the accessibility of key information, the operation of vested interests, subjective perceptions of risk (often different from 'objective' assessment), etc. It may seem odd to add one more example to this already long list but there is significance in the presumed durability of these sorts of attention-grabbing spats – and by looking back from an episode many years past, its possible to address the question – what (if anything) has changed over the past 20 years – perhaps by way of sensitising or attuning 'the public' into such controversy?

I find the furore surrounding the disposal of the Brent Spar oil platform in the mid 1990s to be revealing. You might recall that Shell UK's intention at the time was to dispose of this redundant structure deep in the mid-Atlantic; Greenpeace and other NGOs objected to such a strategy, largely on scientific grounds – that deep-sea disposal would have uncertain effects on marine ecosystems, through the potentially damaging effects of heavy meatl contaminants. Of the many factors at work, qualifying the level of any such risk proved highly problematic, with (scientific) claims offered, retracted and contested. Greenpeace's actions took the form of direct protest – and occupancy of the platform, resulting in very newsworthy film-footage. Shell eventually abandoned its plans for deep water disposal (June 1995), against a background of an increasingly virulent communications war and mounting international concern

In an article from *New Scientist* at the time, which you can access in full on http://www.newscientist.com/article/mg14719865.000-never-mind-the-science-feel-the-emotion.html

Fred Pearce wrote;

> But in future, for its own sake as well as ours, Greenpeace should come clean. Forget the scientific trappings. Forget the mantras about sustainable development. Greenpeace is at heart an ethical movement. ….. Patrick Moore, an early Greenpeace stalwart, explained the thinking behind its anti-whaling campaign. 'You might ask whether the whales are really in danger of going extinct. That is a scientific debate that we don't want to get reduced to. We are interested in a conflict of values.
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> Fred Pearce (1995), p 48

Activity 3

Track some of the key features of the Brent Spar episode, for example by looking at the *New Scientist* archive covering that period. At the time, the episode was described as 'a triumph for the forces of ignorance'. Do you agree with those sentiments? In what way, if any, do you feel the episode might be differently handled in a present-day context. What lessons – again if any - do you feel can be taken away from the episode – you may find the web site http://w3.gre.ac.uk/~bj61/talessi/tlr3.html especially useful for that aspect.

The issue of how the values of science and what are perceived to be 'ordinary' or public values are opposed is a fascinating area to me – and relates strongly to what is now known about the way people use scientific knowledge – a topic I want to touch on in the remainder of this Commentary.

What science is known – and for what purpose?

What non-scientists know of science and what they think of science has featured a good deal in our discussion within the group. (The TV sequence that we looked at from an Open University broadcast raised exactly these two issues.) There still persists a wide scale assumption that the public is in some demonstrable and important way 'ignorant' of science. Certainly when the public is asked a succession of GCSE-style questions about particular science content, the proportion of correct answers can be lower scientists than many scientists would deem appropriate. For example it was reported that;

- 30% of those asked reported that electrons were smaller than atoms
- 31% reported that earliest humans lived at the same time as the dinosaurs
- 54% believed that antibiotics kill not just bacteria but viruses too
- 30% believe that the 'Sun goes round the Earth'.

Others such as Colin Tudge) http://www.independent.co.uk/news/science/a-brief-history-of-misunderstanding-630250.html
have questioned what value a 'GCSE test' of this sort in science has. Comments generally offered include:

- That the questions asked are the type of thing that scientists feel others *should* know – but why are these points especially memorable/significant?
- Are some of the questions loose and ambiguous – is it clear what is being asked?
- More generally, how sensitive are these 'blunt instruments' for assessing levels of awareness of science that go beyond simple factual recall

- Isn't understanding about the *processes* of science more important?
- How little such data says about the level of interest that non-scientists have in the subject and about their preparedness to learn, often as autodidacts
- Even if such 'ignorance' could be proven, why should this *matter* – given for example, that other sorts of knowledge (perhaps cookery or managing personal finance) might be more beneficial to adults?

Even assuming levels of public ignorance such information tell us relatively little about whether lack of formal understanding of science content should make a difference to the legitimacy of lay input into public debates relating to science – an issue very much to the fore in debates (as in Session 3) about the nature of expertise. Are opinions based on a 'good grasp' of the science essential to the structuring of coherent argument? Would we for example advocate that only those individuals with a 'some knowledge' of politics – (maybe a yardstick such as 'name the Chancellor of the Exchequer'?) would be eligible to vote in elections?

How is scientific understanding used?

The second major thread likely to emerge from discussion is how science understand is used by non-scientists to influence opinion and behaviour.

A good deal of sociological research has made it clear that scientific information is very often used *alongside others form of knowledge*. One famous episode concerns that way particular publics use scientific information related to the sheep farming community of Cumbria, in the aftermath of the Chernobyl episode. Issues of trust and credibility of the science communicated by the scientists were paramount. Sheep farmers felt that the information given to them was seldom free of 'social interest or implications'. What he found was that the credibility of scientific information was contingent upon issues such trust and observed familiarity with local contexts and traditional beliefs. It was interesting too that when farmers encountered the messiness of everyday science – for example when they saw how radiation values could vary over a short distance, or the problems if getting a stable, consistent reading in a single location, farmers tended to alter their opinion about the reliability of scientific knowledge. In such ways Wynne argued that the 'credibility of expert opinion was revised, indeed re-negotiated, during the course of the farmer's experience of scientists' daily practice' (Yearly 2005 and Wynne 1996).

Such research findings were largely responsible for the change of approach evident over the past years in relation to the public understanding of science. It's striking that this broader picture has permeated now into such a wide range of documentation – for example, a DTI report on the GM nation debate points out

> The public do not view GM as purely scientific, environmental, economic, political or ethical issue. All of these aspects are important to them. They do not regard science and scientific method, or academics, or politicians, or any other discipline as a single source of evidence or guidance.

see http://www.aebc.gov.uk/aebc/reports/gm_nation_report_final.pdf

What this quote reveals is just how far arguments about expertise, about decision-making and the role of non-scientists have come in the past 20 years to so – helped in part by the types of past controversies such as Brent Spar. Scientific decision-making, at both the personal and institutional level, is now a very different beats than that of yesteryear. A very useful analysis of this change of climate, taking into account the limitations of what came to labelled as 'the deficit model' and what we now know about how individuals interact with science in real situations is on; http://www.scidev.net/Features/index.cfm?fuseaction=readfeatures&itemid=384&language=1, which I'd strongly recommend you to read. What has certainly changed is the rhetoric and language this is used to describe the relationship between science and the public; what is less certain of course is whether practices and perceptions 'on the ground' have genuinely changed (Irwin 2009).

To conclude, this Commentary has suggested that controversies of the type mentioned have contributed to changing perceptions of science – and that the removal of scientists from their pedestal may in some respects be no bad thing, if it leads to a more honest appraisal of true nature of science and a better understanding of how science and society might most productively interact. That realisation has had profound effects on how science is perceived by the public, and about how the subject is best taught and about what is lies behind the intriguing but problematic phase 'citizen science'.

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