

Science for the public  
Tracey Brown

We seem to be in a second golden age when it comes to sharing science. If this article has caught your eye, the chances are that you are involved in some kind of public outreach activity. Compared to just seven short years ago, when we battled against an absence of scientific voices in civil society, Sense About Science now works in a much more 'can do' environment, where researchers embark on their careers with some expectation of a public interface, where research grants regularly stipulate it, colleagues often support it and institutions run science programmes and festivals. Yet, if we look at all the sharing and engaging activity according to its purpose, we find that, as a society, we have barely begun to explore popularising science as a tool for empowering the public.

There has been a proliferation of activity that might be described as Wow Science. That's the kind that includes books about star birth, interactive exhibitions, television programmes on the mating rituals of poisonous frogs, or attempts to stuff a packet of Mentos into a cola bottle for the entertainment (frequently disappointment) of gathered children. There are kits, books, films, and shows for schools; Wow Science introduces us to the manipulation of natural forces, for education and enjoyment. I don't know (and no-one else seems to yet) what effect it has on the number of pupils enrolling for science A-levels or whether anyone who makes a 'volcano' with sodium bicarbonate is spurred on to re-acquaint themselves with the periodic table and electrons. I don't know whether that is even the goal of Wow Science. It seems good and important that science should be publicly entertaining and that many scientific researchers divert energy and imagination into maintaining the public's cultural or educational interest in the natural world. But whether public education in science is uniquely important is debatable. One could argue that the public should understand compound interest rates or the principle of equality before the law, just as much as that they should be more familiar with DNA or super-colliders.

Then there have been significant efforts to popularise Science the Sector: the university expenditure code and the Treasury's budgetary allocation. This is where 'science' refers to the labs and infrastructure, the research programmes and the funding of researchers, which must compete for favour and finance with the arts or international policy. Science, in this sense, is necessarily particular. Why, say, a biochemistry department over an archaeological dig? While there may be public-spirited arguments around the relative merits of what should be pursued or funded, it is driven by the pragmatic considerations of departments, businesses, institutions and national economies.

But there is another purpose to popularising science, one which has received relatively little attention and resource and yet it is universal in character: science as a public tool of truth-seeking and myth-busting. Popularising science for this purpose involves giving people the tools to question pseudo-science and misleading claims. It involves sharing the scientific reasoning and evidence that help people to transcend the noise around a scientific or medical issue. It appeals to people - from the pub pedant to the worried parent - who want to cut through the presentation of a subject to ask, 'what do we know?' and 'how do we know that?'

Yet, while Sense About Science and a handful of others have found this aspect of popularising science to be much in demand, we barely even have a language to describe it. Perhaps there are still reverberations of the more defensive mood of the last decade that followed a succession of debates about scientific issues 'going wrong' and public discussion being characterised by hostile campaigns and media scare stories, memorably the subject of the 2000 House of Lords report on Science and Society. At that time the handful of scientists who braved public exposure to counter bad science or

misleading claims often felt isolated; most preferred not to chance it and many were pessimistic about their ability to 'reach' the public.

Discussions following that House of Lords report catalysed several initiatives for putting the relationship between science and the public on better terms. Sense About Science was among them. Born into the fire of debates raging about cloning, GM, 'manmade' chemicals, the Measles Mumps and Rubella (MMR) vaccine, organ donation, alternative medicine, mobile phone radiation and more, our small organisation was set up to deal with the huge question: how can the public get a handle on the scientific evidence?

In the years since, still small but with the relative luxury of over 4,000 scientists who give their time freely, and a track record in equipping the public with questions and evidence on a wide range of subjects, we have realised that those anxieties about the science and society relationship reined in the democratic impulses of earlier popularisers. Instead of maintaining that scientific inquiry is a better way for everyone to understand the natural world than intuition or anecdotes, science was relegated to the less presumptuous role of being a cultural hobby and an economic interest.

But what can this do for the people and civic groups who ask for help about a wide range of science-related subjects? They want to sort through scare and hype stories, to determine which products and practices are effective or what might be a scam, to come to conclusions about the reliability of scientific claims or assess controversies. Our enquiry log at Sense About Science is testament to the public's interest in finding a way into discussions from climate change to mercury chelation 'therapy'. We can respond to this need only by rediscovering science as a public tool for testing the plausibility of competing claims in civil society and holding them to account.

In the 1950s, Jacob Bronowski talked about the dangers of losing "a sense of science as a social activity" and noted that chief among its symptoms was the decline of a common language.<sup>1</sup> It is a language that emerges when we lay bare the reasoning behind different claims about science and evidence, not in the sterile and cynical way that rests at 'who funded what' or that satisfies itself with narrow-minded glee at pointing out limits and errors as though scientific inquiry is just a pretension, but in a way that empowers us all to question our assumptions and prejudices.

Addressing myths and misconceptions, in our view and in the view of the hundreds of early career researchers who have worked with us to form the VoYS (Voice of Young Science) network over the past five years, is an integral part of being a civic scientist. This means addressing directly the claims that are in circulation, whether in advertising material, advice columns, campaign statements, public health schemes, common prejudice or celebrity health fads. Scientists often ask 'what are we to do when commentators can make sweeping, unsupported assertions but our responses must be tentative and full of caveats?' The key seems to be to start with what is misleading in public debate.

When there is a significant gap between scientific reasoning and public discussion, we work with groups of scientists and with different civic groups to identify frequently occurring misconceptions. We go in search of the insights that can equip people better to weigh things up for themselves. This was the way that we first developed *Making Sense of Chemical Stories* in 2006, when we took a group of chemical scientists and asked them to work out the most common misconceptions behind inaccurate claims about chemicals. It is how we worked on *Making Sense of GM* in 2009, when we collated media records, online discussions and our own enquiries log to identify recurring questions. We then asked the UK's leading plant science institutes to explain what they are doing with genetic modification and why - reasoning which had been almost impossible for anyone to find in the polemical GM row. It is how we put together *Making Sense of Screening*, when we asked members of the public to tell us which of the insights and arguments from clinicians helped them to re-

evaluate the frenzied calls to widen screening programmes which followed Jade Goody's death from cervical cancer. In work on radiation, our group of physicists and epidemiologists worked out that the main difference between their reading of a wifi scare story and that of a school governor was that they knew radiation was not all the same thing. This led to *Making Sense of Radiation* for local authorities and community groups. Similarly, working out that the most common misconception about homeopathy was that it contained an active ingredient ("a herb or something") has helped us to develop effective interventions into that debate.

The public's use of these kinds of insights has shown that there is an appetite for understanding how others (notably scientists and policy makers) have reasoned something through. For example, nearly quarter of a million people have requested our leaflet, *I don't know what to believe*, which explains peer review and how to work out whether a research claim has been published in a scientific journal. Intermediaries such as patient help-lines, libraries, teachers, and online resources use it to explain why some research claims are more significant than others.

The appeal of these kinds of tools to the public seems to be that you don't, for example, have to become a gastroenterologist to ask searching questions about the status of claims regarding the MMR vaccine and autism – you can talk about peer review, replication, consensus, stability of the science, levels of confidence and certainty. You don't have to become a chemist to appreciate and own for yourself some counterpoints to claims about chemicals (such as that 'natural' doesn't mean 'good for you' and that 'it's a question of the dose'.) Over 2010, collaborative projects to make sense of statistics, to clarify the meaning of scientific uncertainty, and to weigh up stories claiming 'links' to causes and cures, are set to emerge from the same process of starting with the public discussion and pinning down misconceptions and insights with scientists and members of the public.

In the decade ahead we need a lot more of this kind of science popularising. We still face a situation where discussions of GM, vaccines and radiation give way to superstition, where evidence is used cynically in policy making, where websites promote miracle cures to desperate patients and where the heir to the throne sells the public detox tinctures at £10 a time. But much as we feel acutely that the task of raising the standard of science in public debate is often daunting and frustrating, and that we face challenges to which there are not ready-made answers, there is enough in the experience of this past decade to tell us that what we are dealing with is not a wall of impermeable public irrationality or hostility. We are dealing with misleading claims not yet challenged, with scientific reasoning not yet shared, and of having but scratched the surface of what is possible in engaging people with discussions about the frontiers, and uncertainties, of knowledge. It's time to reach into the bathwater through all those Coke-and-Mentos bubbles, and find the baby.

*Tracey Brown is managing director of the UK-based charitable trust Sense About Science, which equips the public to make sense of science and evidence. She joined Sense About Science as director in its founding year 2002. Tracey has a background in social research, and previously spent four years working on a European Commission programme to establish social research and teaching in the former Soviet Union, and a year setting up a commercially based risk analysis centre. She is a trustee of Centre of the Cell and a trustee of the Responsible Nano Forum. In 2009 she became a commissioner for the UK Drugs Policy Commission. She sits on the Outreach Committee of the Royal College of Pathologists and in 2009 was made a Friend of the College. She is also chairman of DCA Hernhill Junior FC.*

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<sup>i</sup> Bronowski J. *The Common Sense of Science*, Harvard University Press, Cambridge Massachusetts 1978, first published 1951