

Challenges in science communication*

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I want to start with a question: who out of all men and women who have lived in the last 1000 years would you like to celebrate above all? This question was posed to a British audience some weeks back by a BBC radio programme. The results have just been announced. Top came Shakespeare. But alongside him, politicians and others in the top 10 were two scientists: Dalton and Newton.

You may share my pleasure that two scientists who more than any other have transformed our understanding of life and of the physical world were singled out in this way. But an additional point to make is that in contrast to many cultural and political giants, these scientific figures are surely of universal significance. For that reason it would be interesting to conduct such a poll internationally.

One thing is for sure: there is an enormous public fascination with science around the globe. It is surely not a coincidence, for example, that the weekly edition of the *New York Times* that contains a science supplement outsells issues published on all other days of the week. But I see this wide public interest more directly. *Nature* appears every Thursday. Although our international readership consists mainly of researchers, we also publish a press release summarizing many of that week's scientific results for journalists. As a result, we see, every week, stories in newspapers in many countries, often appearing in prominent positions. You may be interested to know that we recently commissioned an agency to count the coverage of *Nature* papers in the United States. Over three months we received 4313 mentions in print and 478 mentions in broadcasts. You won't be surprised to be told that, although our press release covers all disciplines, the stories that appeared were strongly dominated by biomedicine, astronomy and neurobiology.

I should note in passing that although such media attention, and its equivalents in Europe, Australia and many parts of Asia, speaks volumes about public interest, it says very little about public understanding of science. In my view, however, we must not be too hung up

about the lack of public understanding. One can hope that the understanding will inevitably grow over many years. The battle for public interest is already won – if ever it needed to be fought. But public awareness is something else again. I want to focus on a few key opportunities and challenges that face us, as scientists and others, including the opponents of some technologies, strive to enhance public awareness.

The challenges I want to mention are the following:

1. How can society keep up with science?
2. To what extent, and how can the public be involved and consulted in dealing with the impact of science?
3. How can we deal with the unexpected: for example, Dolly?
4. How can we reverse the widening of the information gaps between different parts of the world?
5. More generally, despite the voluminous coverage of science in the media, how can we do better?

Rather than address each of these questions one by one, I want to discuss one opportunity that can help us with all of them. I will then discuss what I see as important shortcomings in the communications of science to the public.

First, then, the opportunity. At the risk of boring you, I want to speak about something that more than anything else is sure to transform much more than it has already, the communication of science, namely the Internet.

I see three critical technological thresholds that need to be passed before the Internet, as manifested in the World Wide Web, can begin to achieve its full potential.

First there is speed: the time it takes to upload a graphics intensive web page plays a crucial role in the psychological acceptability of the medium. Interestingly, pessimism about this situation in poorer countries is giving way to optimism. First the growth in use is already expected to quadruple over the next year in many parts of Asia and Africa. Secondly with the help of organizations, such as the World Bank, investment in broadband infrastructure can be achieved more rapidly than in those countries burdened, as it were, with well-developed but narrow bandwidth networks.

Another technical threshold is security of information and of financial transactions. When I talk to people who know about such matters I am always told that this is just around the corner.

The third threshold I want to mention is portability. The day must surely come when print on paper will be replaced by a conveniently portable, possibly flexible, screen of equivalent quality and readability. That allied to reliably rapid uploading through high speed optical or microwave transmission will surely be the point where the Internet will begin to transform the daily lives of those who use it. The timescale? My slightly educated guess is less than a decade.

You may think that this techno-vision is naive. It certainly begs questions. For example, technology is not by any means the only obstacle to wider use. But whatever the technological development, I am sure that there will need to be a means of assuring quality of information on the Web, a need for filtering, and a reliance by information consumers on recognized brand names, such as dare I say it – *Nature*. That belief is one reason we at *Nature* do not see the Internet as a threat to our role in science communication.

Another thing that I am sure of is that the Internet represents a major opportunity for scientific bodies and for that matter, governments to communicate their views. More and more, a journalist or in the West at least, a school kid faced with a project, will browse the Web as part of their research. I did this recently when looking into debates about genetically modified foods. Given 'genetic modification of food', the search engine took me immediately to the several sites operated by organizations opposed to the technology. The manufacturers and other interested bodies – scientific organizations and institutes, regulatory committees – were nowhere in sight. There is surely a lesson here: the Web provides an excellent opportunity for a plurality of views to be communicated that will become ever more important.

Next I turn to gaps in the communications of science to the public.

In passing, I want to put in a plea for sciences, other than astronomy and the life sciences, physics and chemistry especially

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deserve more attention. All media find these disciplines hard to communicate, but they are being squeezed out of media coverage by the ever-increasing flow of stories emerging from biology. In such circumstances it takes extra effort by the physics and chemistry communities to communicate their results to maximum effect.

Another gap in Western coverage at least concerns the conflict between the good intentions, behind new technologies and local tradition. But to come back to the life sciences, one important gap relates to foresight and feelings anticipating developments, examining the potential impacts and also the ethical and social consequences. Not long ago, *Nature* held a seminar in which European approaches to bioethics consultation were compared. The meeting included chairmen of national bioethics committees, and there was a consensus that more should be done in this respect but that existing resources simply did not allow it.

What sort of issues am I talking about? The cloning of mammal from adults, as in Dolly the sheep, was anticipated in an article in *Nature* published a year ahead of that work. Few anticipated that subsequent progress would be made so rapidly. Furthermore, even fewer, I suspect, anticipated that such experiments would create such a sudden surge of alarm over the prospects of human cloning. It would be arguing too much from hindsight to have expected more anticipation from scientists or society, including bioethics committees, but such anticipation might have pre-empted some of the misleading arguments, that emerged. One must not forget, also that there are some dimensions of our response to such developments that are based on aspects of humanity that cannot necessarily be resolved by argument and analysis: for example, were cloning of human to be pursued, we might anticipate some psychological problems for the clone, given our knowledge of problems sometimes experienced by identical twins.

Other issues that can be anticipated and which deserve a much fuller discussion that has been achieved so far include germline gene therapy—in other words modifying the genome that will be inherited to remove certain diseases; modification of human genes not to remove genetic disease but to 'improve' appearance or physiological and mental performance; and extending the human lifespan.

National bioethics committees are an important component in the consideration of such problems in the West, at least. However, some of them, are poor at consulting or involving the public, and their activities do not stimulate much media exposure or public awareness. More resources are needed, as is more imagination and effort in their communication with the media.

But even then bioethics committees would certainly not be enough. Over recent years many other ways of exploring issues stimulated by bioscience have been attempted, with varying degrees of success—consensus conferences, for example. It helps such exercises if participants know that the results of the consultation will have some impact. An extreme example of such a consultation was the national referendum held recently in Switzerland, in which the population was given the opportunity to ban the use of all genetically modified organisms by a majority vote. For a long time during the period leading up to the vote, the outcome hung in the balance. I talked to a scientist closely involved in coordinating researchers involved in communicating the importance of their work to the public. According to him, public understanding of the research was not an important factor in the eventual decision not to ban it. More important was a realization that the Swiss pharmaceutical industry and research into public health would both be damaged by a ban. Had the referendum been restricted to the use of genetic modification in agriculture, the ban would almost certainly have gone through.

In my view such a drastic approach as a referendum is too blunt an instrument to apply to such issues. A more subtle and productive approach, as it happens, is being attempted in the UK. The approach as far as I know, is unprecedented, and is worth describing given its possible relevance to other countries.

I am talking about the British government's public consultation on the biosciences, which is due to end in April. One factor that has stimulated this exercise relates particularly to the UK: the country has a rather complicated and opaque system of regulatory bodies covering novel treatments in human reproduction transplantation using animal organs, embryo research, genetic testing and so on. The government has announced its intention to reorganize that system.

But another consideration behind the consultation is a wish expressed by the UK's minister for research to hear what 'citizen's' outside the industrial, professional and green lobby groups have to say.

It was crucial that the consultation is organized by a natural third party and not the government. So a body known as MORI, well respected for its organization of opinion polls, has been given the job. Over the next month it will be held in several 2-day workshops in various regions of Britain. In each workshop, representative sample of 20 people will discuss their existing awareness of and attitudes towards various controversial applications of bioscience in health and agriculture. They will be briefed on some of the science involved, on the issues that have arisen and on the existing regulatory system. They will then be asked to act as an imaginary regulatory body and make recommendations not only about how the technologies might be regulated but also about how scientific and other relevant information is disseminated. Following these workshops, there will be a series of face-to-face interviews with 1000 members of the public in their homes. The results will be used as consultative of the input to the government's reshaping of the regulatory system.

At the end of the consultation there will be some critical evaluation required: Was the scientific information given to the participants useful? Was it neutral? Did the consultation contribute more than would have been achieved by consulting only the lobby groups? As a member of the advisory panel for the consultation, I am glad to say that a pilot workshop was stimulating to all concerned in the way that it went much deeper than the simplistic pro- and anti-rhetoric that has dominated some debates. I anticipate, also, that the exercise will show how better to communicate the issues involved.

I have tried to indicate some of the challenges in science communication.

I am all too aware that the perspective I have is heavily biased by my experiences in the US and Europe. What works well in one culture may prove hopelessly ineffectual in another. I can only hope that some of what I have said is relevant given that, as I said at the outset, science and the issues it raises concerns all of us.

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