Now for the Science Bit - *Concentrate!*

communicating science

John Pollock and David Steven

August, 1997

now for the science bit – concentrate! [1]

Science, engineering and technology define modern life. From food and medicine to transport and computers, **it is hard to identify a single area untouched by science**. And as this scientific century closes, the pace is hotting up. Genetic engineering is just one discipline with profound implications for the human condition.

Inevitably science gives rise to contentious issues. **Controversies regularly ignite in public.** Recent examples include BSE, Dolly the cloned sheep and Brent Spar. As Mark Dyball at the Office of Science and Technology says:

> Obviously we come from the view of seeing science, engineering and technology as a net positive – but that means there are negatives, too.

If science is a two-edged sword, technology helps wield it. EastEnders brings fertility issues to the tellies of the nation. Villagers listen to the World Service on a wind-up radio in the African bush. Money goes digital. **Technology helps us discuss technology.**

Emerging from this loop is growing concern about scientific literacy. The challenge is to *communicate* the nature of science today – and to do so as widely as possible. But the information marketplace is crowded and many **key messages are not getting through**. What then should the science communicator do?

We talked to forty experts. Most were the usual suspects: academics, journalists, politicians, policy-makers and members of research councils or professional bodies. We also talked to the private sector and less obvious players like the Data Protection Registrar.

We asked them what their work involved – and why it was important. We explored what is going wrong (and right) and encouraged them to speculate about '**where next for science communication?**'

Many sensed that a new agenda is emerging, with concepts like context and trust taking on greater importance. As ***now for the science bit*** shows, the trend is towards changing the message – and the messenger.

cast list

River Path Associates would like to thank those who agreed to be interviewed for this research:

Sue Allenby Hertfordshire SATRO Science
Adrian Alsop Deputy Director Research, Economic and Social Research Council
Nic Arnold Author of *Horrible Science* books
Jane Bevan Head of Marketing and Development, Natural History Museum
Sir Walter Bodmer Principal of Hertford College
Frank Burnet Senior Lecturer in Science Communication, Faculty of Applied Science, University of West of England
Prof. Peter Cochrane Head of Research, British Telecom
Tam Dalyell Member of Parliament and New Scientist columnist
Keith Davies Organiser of various schools projects, including 'The Value of Electrostatics to Society'
Nigel Duncan Head of Communications, British Medical Association
Mark Dyball Manager of Public Understanding of Science Programme, Office of Science and Technology, Department of Trade and Industry
Graham Farmelo Head of Exhibitions, Science Museum
Elizabeth France Data Protection Registrar
Helen Gateshead Editorial Director of Non-Fiction at Scholastic Children's Books, Editor of *Horrible Science* series
Samantha Hellawell Community Programmes Manager, IBM UK
Roger Highfield Science Editor, The Daily Telegraph
Jane Inman University College, Stockton, organiser of *Women Into Science*
Alistair Kinley Association of British Insurers
Barbara Knowles, Senior Communications Officer, Natural Environment Research Council
Eileen Meadmore Chairman, National Federation of Women's Institutes
Colin Morton Head of Information, Forestry Commission
Liz Morgan-Lewis Head of Public Communications, Medical Research Council
Ted Neild Communications and Science Officer, Geological Society
Mike O'Connor Director of Policy and Corporate Affairs, Millennium Commission
Blair Palese Head of Public Relations, Body Shop
Paul Pearce-Kelly Curator of Invertebrates, Zoological Society of London
Gillian Pearson Oxford Trust, Oxford Centre for Innovation
Prof. Roy Porter Wellcome Institute for the History of Medicine
David Ridley Marketing and Publicity Manager, Economic and Social Research Council
Eric Robinson Geologists' Association
Francine Rosen CEO, Worldcall plc
Philippa Senior Public Affairs Manager, Institute of Physics
Anthony Tomei Director, Nuffield Foundation
Dr Jon Turney Senior Lecturer in Science Communication, University College London
Dr Helen Wallace Senior Scientist at Greenpeace UK
Stephen White Director of Information, British Psychological Society
Barney Wyld Director of Communications, Human Fertilisation and Embryology Authority
Prof. Brian Wynne Centre for the Study of Environmental Change, Lancaster University
Prof. Robert M. Young University of Sheffield, Editor of *Science as Culture*

two reports, three problems

> The Bodmer group had three problems. What's the public? What's science? What's understanding? They were happy with the word *of*.
>
> Senior policy-maker

When a Royal Society ad hoc group, chaired by Sir Walter Bodmer, published 'The Public Understanding of Science' in 1985, it set out to show 'why it matters that all sections of the public should have some understanding of science.' The report argued that:

> Science pervades our society. Most of our industry and much of our national prosperity are based on science. In the home as well as work we use machinery that is the product of this industry. Science affects many, if not most, policy issues of national and international importance. It also affects a wide range of personal activities, from health and diet to holidays and sport.

In conclusion, it directed its 'most direct and urgent message' at scientists, exhorting them to 'learn to communicate with the public, be willing to do so, indeed consider it your duty to do so.'

This impetus lies at the root of the Public Understanding of Science movement. Since its publication significant progress has been made. According to Stephen White, Director of Information at the British Psychological Society since 1985, 'if you go back over the past ten years – it's mushroomed, it's phenomenal.' Walter Bodmer himself agrees:

> There's been an enormous change – it's become almost politically correct to say PUS is important. It's much more overt.

The Bodmer Report was followed ten years later by Wolfendale.[2] Both reports made two key arguments in favour of a scientifically literate public. A widespread knowledge of science is seen as vital to **economic** prosperity:

> To contribute to the economic wealth and quality of life of the Nation, particularly by drawing more of our best young people into careers in science, engineering and technology.
>
> Wolfendale Report

and to the health of our **democracy**:

> Public opinion is a major influence in the decision-making process. It is therefore important that individual citizens, as well as decision-makers, recognise and understand the scientific aspects of public issues.
>
> Bodmer Report

> to strengthen the effectiveness of the democratic process through better informed public debate of issues of public concern arising in the fields of science, engineering and technology.
>
> Wolfendale Report

Thirdly, Bodmer makes a **cultural** argument. Science has discovered some extraordinary things about how the universe functions and these 'profoundly influence the way we think about ourselves.'

Unsurprisingly, all three arguments crop up when science communicators talk about their work. Mike O'Connor, Director of Policy and Corporate Affairs at the Millennium Commission, argues that 'it's important we have a skilled and informed community for the economic health of our country,' while Stephen White restates the democratic argument:

> when people are making decisions, they make them on the basis of the best information… you can't make proper decisions until you are properly informed.

Gillian Pearson of the Oxford Trust at the Oxford Centre for Innovation, meanwhile, wants to 'put science into the general culture, in there with the arts, part of the fabric of life.' To do this science needs to be entertaining, a point made clearly in the first line of the OST publication *Going Public* by Michael Kenwood, a former editor of *New Scientist*:

> communicating science and technology to the public can entertain – both the communicator and the audience.

scientific wealth (technopoverty)

While we found much agreement with both Bodmer and Wolfendale, differences in emphasis emerged. These are rooted in a widespread recognition that the nature of our economy, democracy, culture (and, indeed, entertainment) is undergoing rapid – and fundamental – change.

Some communicators, for instance, note that the relationship between science and the economy is an increasingly complicated one. One warned that many people explain science to the public to 'sell a product' and that, while there *is* interest in 'possibilities which offer some hope for the future of the world,' it is important not to 'underestimate the importance of profit.'

Alistair Kinley is meanwhile motivated by a *threat* to profit. He work for the Association of British Insurers and is responsible for alerting insurers to the possible implications of climate change. While he believes 'the private sector getting involved does change the ball game' and the 'level of awareness is getting higher all the time', he concludes that, as yet, 'there's a lack of understanding in the private sector – not just amongst the public.'

Dr Helen Wallace, Senior Scientist at Greenpeace UK, argues that 'more and more science is privatised, jointly funded with industry or in commercial confidence.' She finds this 'a worrying trend,' not simply because of industrial involvement *per se*, but because of the possibility for vested interests to be forwarded under the cloak of scientific objectivity.

Others recognised that the structure of scientific funding could influence public perception of scientific 'objectivity'. Professor Robert Young, a philosopher of science and editor of *Science As Culture*, has strong views, and cites a (not uncommon) example to make his point[3]:

> I had a friend in research in the physics of optics at Imperial College who said it was almost impossible to do work separate from military priorities and funding. He eventually left the field…. Research is in no way free from values. It is funded by patrons, who have agendas, assumptions, world views. They promote ways of looking into things.

Technology increasingly affects the way our economy works. Professor Peter Cochrane, Head of Research at British Telecom, sees removing 'the fear of technology' as his top priority. 'Technofear is a killer,' he says, 'for the company people work for, for their country, for themselves and for their future.' This view is common, particularly among those directly involved in 'selling' technological change. Francine Rosen, CEO of Worldcall, an international telecommunications provider, notes that:

> a lot of people have a very negative view of technology, when technology can be very positive in their life… and yet there's also a big underclass who aren't being reached because they don't buy computers.

Samantha Hellawell, Community Programmes Manager for IBM UK, is also concerned by 'the overall impact of technology on poor people' and works directly on this problem:

> Information Technology is non-hierarchical and challenges current power structures. It should offer people a way into the mainstream. In practice, though, there's a widening divide between the haves and the have nots. What we desperately need are appropriate projects which start with where disadvantaged communities are at the moment – and then move quickly to give them access to technological advances.

Mark Dyball, Manager of the Public Understanding of Science Programme at the Office of Science and Technology (OST) in the Department of Trade and Industry (DTI), reports encouraging policy interest in precisely this area, reflecting wider political shifts:

> It's all very well working in the leafy suburbs, but we're interested in broadening inclusiveness… particularly through reaching harder audiences like those in the inner cities.

moo

The political atmosphere is changing in other ways, too. A growing body of research has identified declining public confidence in democratic structures – and this has undoubtedly affected public confidence in science. The problem, according to Professor Roy Porter, at the Wellcome Institute for the History of Medicine, is that clashes between the government and their scientific experts will keep happening while the primary motivation is 'not to worry the public.'

But the public does worry. The BSE issue was repeatedly cited as an example of bad science communication, described as 'a fiasco', 'a disaster' and 'a mess'.

> I think the Government made a huge mistake with BSE. How on earth can a Minister talk about this rather than a scientist? You talk to civil servants and say this and they're incredulous… the Government should rethink completely the way it presents that kind of science.
>
> Sir Walter Bodmer.

Professor Robert Young, editor of Science As Culture, agrees, noting that 'the BSE thing has been a tremendous engine for scepticism,' while Roger Highfield, Science Editor of The Daily Telegraph, reports that 'if you look at BSE, we know that the public are more mistrustful of scientists as a result of that saga.'

The repeated exposure of difficult and complex issues like BSE demonstrates both the importance of the 'democracy argument'– and its inherent weakness. Bodmer writes[4] that 'the facts should be the same whatever one's views' and believes progress lies in supporting 'systems where the objective facts on controversial issues such as AIDS and animal experiments can be presented to the media.' Yet when the public looks to science for certainty, science is often unable to deliver.

As John Durant, Professor of Public Understanding of Science at Imperial College notes: 'a great deal of science is in the public domain precisely because it is problematic.'[5] A similar line of reasoning leads Roy Porter of the Wellcome Institute to conclude that the waters have been muddied by 'the hype, conscious or unconscious, over the past fifty years, in favour of science.' Helen Wallace, of Greenpeace, goes further:

> The politicians have lost credibility, and if the scientists don't change, they will lose credibility as well.

ignorance and bliss

These political pressures call for a new approach – one that stresses context, transparency and trust. Some communicators look to America. Jane Bevan, Head of Marketing and Development at the Natural History Museum, talks of the 'greater sense of accountability you already have in the USA,' while Ted Neild, Communications and Science Officer at the Geological Society, argues that:

> The Americans are so much better than the British. They're more ebullient. They don't have the 'keep your head down' mentality.

This view is percolating through at all levels. Colin Morton, Head of Information at the Forestry Commission, detects a new attitude emerging from government, arguing that it is now 'making more effort' and developing policies on communication which 'talk of openness and transparency.' Meanwhile, Adrian Alsop, Deputy Director of Research at the Economic and Social Research Council, reports that ESRC are already developing work which brings together research into 'the complex interplay between context and trust' in science communication. A shift, he argues, away from the old school towards 'looking at people in context, and at who is saying what when.' This shift encompasses a renewed willingness to engage with difficult issues as routes into public understanding. As Mark Dyball of the OST puts it, 'We're quite happy for people to build on issues that are difficult or newsworthy.'

Complaints still surface about the average politician's knowledge of things scientific. Peter Cochrane of BT states this stridently:

> Most of our decision-makers are appalling ignoramuses. You wouldn't ask them to select a washing-machine. I want to ask them "if your wife is about to give birth, do you want a plumber in attendance or a gynaecologist?" They make the wrong decisions because they don't have the knowledge to make the right ones.

Others acknowledge the improvements that have been made over the years in reaching parliamentarians. Graham Farmelo, Head of Exhibitions at the Science Museum, thinks that there should be campaigns that target MPs: 'I would put a lot of resources into that small group. I would have a strategy for dealing with them.'

The rules of political lobbying, however, have changed. One senior communicator caricatures the once widespread view that 'if only we can get the politicians to understand – everything will be alright.' But as Ted Neild at the Geological Society points out, you have to build a public constituency first – and use that to influence the political process. He refers to his experience as a Press Officer for the universities:

> They assumed that everyone loved them… the cuts came and they waited for the public outcry. None came. So it becomes a matter of building public support to get political support.

wonder wall

> I think people's sense of curiosity should be kept alive.
>
> Tam Dalyell, MP

One of the most powerful recent expressions of the cultural argument for understanding science was made by Richard Dawkins in his 1996 Dimbleby Lecture *Science, Delusion and the Appetite for Wonder*. He writes of his worry that:

> Science is so useful as to overshadow and distract from its inspirational and cultural value. Usually even its sternest critics concede the usefulness of science, while completely missing the wonder. Science is often said to undermine our humanity, or destroy the mystery on which poetry is thought to thrive. But mysteries do not lose their poetry because they are solved. Quite the contrary. The solution often turns out more beautiful than the puzzle, and anyway the solution uncovers deeper mystery.

Richard Dawkins brings to life this sense of wonder by an attention-grabbing example: 'it's an astonishing fact that when you listen to your lover pleading over the telephone, every catch in the voice, every nuance, has been translated into numbers and then translated back into sound.' Elsewhere Dawkins has summarised the issue neatly:

> The science is wonderful… but we're working on explaining it. [6]

Roy Porter also recognises the value of culturally embedding science, but he turns for inspiration to popular culture (in this case baseball) not high culture (Dawkins's poetry):

> I like Stephen Jay Gould, because he is not only making scientific concepts and discoveries extremely intelligible, but he also manages to communicate a genuine enthusiasm which makes it sound like the sort of thing lively and intelligent people like to do – he manages to make scientists sound like baseball players, to communicate the awe and mystery and glamour of science.

Gillian Pearson shares this enthusiasm for launching science into the fast-flowing worlds of popular culture. 'Mainstreaming science,' she suggests, 'could be done through a process of product placement.' Barney Wyld, Director of Communications at the Human Fertilisation and Embryology Authority agrees. He describes how pleased the Authority has been at the way that *EastEnders* has featured a couple with infertility problems.

The heart of popular culture, however, is a competitive place – and many communicators recognise science will need to develop a sophisticated toolbox of creative resources to survive there. Phillippa Senior, Public Affairs Manager at the Institute of Physics, admits that often 'we know what we want to say, but don't know the best way to say it,' while Roger Highfield of The Daily Telegraph argues that:

> If we really want science to have a sexy image we have to spend money on bringing in some more professional image makers.

pus

> I hate that acronym.
>
> Roger Highfield, The Daily Telegraph

With economic, political and cultural shifts to deal with, it is not surprising that many interviewees are questioning some of the fundamentals of the Public Understanding of Science movement. As is so often the case, this results in a lively debate about what language should be used. 'Understanding' was seen, by some, as an inappropriate word:

> Notice I don't say 'understanding' because there are more appropriate words in the thesaurus. If 'understanding' is used as the norm, it sets up unreasonable expectations of what the public is expected to achieve.
>
> Graham Farmelo, Head of Exhibitions, The Science Museum

Frank Burnet, Senior Lecturer in Science Communication at the Faculty of Applied Science, University of West of England, agrees:

> I'm not fixed on the idea of 'understanding' – I think what the public needs is to have lines of communication to science and scientists.

Some preferred the Wolfendale interpretation of 'awareness and appreciation.' Barbara Knowles, Senior Communications Officer at the Natural Environment Research Council (NERC) explains that 'most of our activities are aimed at awareness and appreciation rather than going out to teach an "ignorant" public.' Philippa Senior at the Institute of Physics makes a similar point, saying 'we're concentrating on raising awareness, we're not trying to educate.'

Peter Cochrane at BT doesn't believe that the public is as stupid as people think:

> By and large, people are not dumb, they're just disinterested. Take some inner-city estate somewhere, they spend their time drinking and smoking and watching TV. They know nothing about science. Then the council announces plans to build a plastics incinerator down the road. Within three weeks, you've got a bunch of experts on your hands… If they need to, they'll find out.

Graham Farmelo of the Science Museum identifies 'snobbery' as a major problem and he is not alone. Brian Wynne, Professor at the Centre for Environmental Change (CSEC) at Lancaster University, reiterates the point, and sets it in a wider communications context:

> There are loads of audiences who aren't being reached because they're actually switched off – because they've had experience of being patronised, treated arrogantly or even been misinformed. There's an element among some scientific organisations of the Englishman abroad, who can't be understood in a shop and so he simply shouts louder… Attempts to professionalise the communication process are often counter-productive, because any kind of deliberative communication is already taking place in the context of other types of communication which are tacit – what I've called 'institutional body language.' If institutions aren't open and genuinely engaging with the pubic then no amount of deliberative communication will smooth over the problem.

Blair Palese, Head of Public Relations at the Body Shop, also argues that 'when it comes to science, *us* and *them* is part of the problem'

The trend is away from a (rather unfortunate) acronym, and towards more inclusive language – which itself should be lodged in a more inclusive *approach*. Anthony Tomei, Director of the Nuffield Foundation, thought his personal view was 'slightly non-standard' – when in fact, it broadly accords with the trend found in this research:

> Traditionally, scientists were telling the public what they do – as it were, explaining science. That goes back to Bodmer and COPUS. But anticipating issues, and how to reach those who will be affected by them – this is an integral part of the issue. In many ways it *is* the issue… If you take issues that worry people, and genetic screening is a good example, it isn't enough to say these fears are irrational and we should just pass on some understanding of risk analysis and genetics.

Dr Jon Turney, Senior Lecturer in Science Communication at University College London, notes that some scientists have become distracted by 'beating up on straw men,' when 'science doesn't need promoting any more than astrology needs putting down.' John Durant at Imperial College argues it is time for those explaining science to move beyond the missionary role, 'a top down approach' resulting in 'a celebratory approach to science and technology.' Scientists need to stop 'treating the public like the great unwashed.' Jon Turney agrees:

> There's good evidence that if scientists just talk without resting on their authority, people are interested in what they have to say – and realise they have something to say that carries a weight of its own.

the desire to know

What is emerging is a more dynamic, less certain agenda than the one envisaged in the Bodmer Report. Of many elements, perhaps the most important is a quite different approach to the audience. As Helen Wallace of Greenpeace puts it:

> it's just as important for scientists to be listening to the public, as for the public to be listening to scientists.

Gillian Pearson of the Oxford Trust argues that 'dialogue is important,' while Frank Burnet of the University of West of England suggests that 'opening up a dialogue with the public about science is of crucial importance. I think what the public needs is to have lines of communication with scientists.' Jane Bevan, at the Natural History Museum, agrees:

> to communicate you have to put together a contract with people and accept that it isn't a one-way street.

Dialogue can have positive effects on scientists themselves, according to Gillian Pearson. She believes that institutions 'get back someone who is livelier' when they encourage their employees to go and do activities involving the public. 'It's good for scientists to have the lay public bouncing some appreciation back to them,' she says. Paul Pearce-Kelly, Curator of Invertebrates at the Zoological Society of London, is just one of a number who made the same point:

> I think the most efficient way to get people enthused is to bring them into contact with what you're actually doing. The feedback is very, very rich.

In return, however, scientists have to be prepared to listen when people start, in Helen Wallace's words, 'questioning the way science has been used to make decisions.' One communicator talks of educating 'people so they can understand what is being done in their name.' Others, like Roy Porter at the Wellcome Trust, go further:

> The ultimate purpose is the old cliché, that science is too important to leave to the scientists. It must, somehow or other, be the public at large which decides if we go ahead on these new ventures. The public also, crudely speaking, foot the bill – and you don't write out blank cheques for anybody.

Mike O'Connor at the Millennium Commission agrees that 'it's important that we increase awareness to be able to control science. Science and technology are too important to be left to scientists and technologists.'

This is a view being put into practice by one of our interviewees. Elizabeth France, the Data Protection Registrar, is at the cutting edge of brokering two-way dialogue between scientists and the public. She is responsible for making people aware of the 'risks they take with their personal privacy' when using new technology. But, in trying to 'build an information-handling culture that respects people,' she is also keen to influence how scientists develop new technology. She wants:

> to educate scientists themselves to be 'ethical engineers' and to design technology which is socially responsible in terms of privacy…We need to educate scientists themselves to take on board citizens' rights and interests.

trust me, I'm a scientist

The belief that the public should be encouraged to question – and control – science is some way from Lewis Wolpert's oft-stated view that 'the idea you should restrain scientific research is

monstrous.' Wolpert's line fits with the perception among a number of interviewees that some scientists see issues in the public eye as a threat, and believe the public cannot be relied upon to make sensible decisions.

Yet most communicators recognise that these perceived 'threats' actually represent opportunities. Jane Inman, at University College, Stockton, has been developing courses since 1992 to bring women into education. She finds that 'women often pick up on issues in the media and want to know more.' Ted Neild at the Geologists' Association, likewise, sees his job as 'mining something attractive for the press out of our information, maximising the value of our existing activities.'

Roy Porter is also more optimistic. Public interest should be seen as an opportunity to get a more vigorous debate underway. He was pleased by public interest in things green:

> The growth of environmental awareness has been rather admirable… people at large have become quite environmentally conscious to the extent that they want to know the consequences of this or that pesticide or medicine.

Brian Wynne at CSEC takes a similar line. Indeed, he argues that an organisation which is suspicious of the public will never communicate successfully – whether these suspicions are made explicit or not:

> The kinds of insights that we're trying to get across – the need to build up trust by changing the way organisations communicate – needn't threaten information departments or professionals. They can become catalysts of much wider organisational redevelopment rather than simply streamlining communications. Because otherwise, professional communications simply highlight the difference between explicit and tacit communications. And the public picks up on this.

At issue here is an organisation's *credibility*, which Jana Bennett, Head of BBC Science Television and Radio, recently argued[7] was an essential part of the BBC's formidable reputation as a provider of science programming. Mike O'Connor makes a similar point when discussing the issues surrounding food biotechnology: 'The way it's been handled has been very poor, food manufacturers have made very little effort… they could have been more transparent and open about what they're doing – and why.' It is only retailers, he argues, with a track record of listening to what the public wants, who had any success explaining the issues.

For John Durant, the key word is *trust*. The priority, he argues, is to add:

> the aim of cultivating trust between scientists and non-scientists [to an agenda] dominated by the twin aims of inspiring interest and fostering learning.

need to know, want to know

The widespread sense that science communication needs to shift towards a two-way dialogue, based on trust and transparency, makes it necessary to look at what this means in practical terms.

First, it is useful to expand Tam Dalyell's point that science communication should concentrate on 'anyone who is interested,' to note that the *quality* of people's interest will be very different depending on the *kind* of scientific issue they are facing. Colin Morton at the Forestry Commission draws this distinction neatly. On one hand, there is the 'need to know', where 'the public is saying *what does this mean for me?*' On the other, is the 'want to know', where it is the 'the awe and wonder of science that attract people', the pleasure of 'seeing we can do it.'

Issues that fall on the first side of this divide can have important social consequences. Barney Wyld of the Human Fertilisation and Embryology Authority points out that:

> Fertility issues are intrinsically of great personal interest to many people. Nationally, one in six couples are affected. A key aim is reducing the stigma. Younger people are more willing to talk about personal issues nowadays. One young man recently said to me "my sperm's wrong." I think we can build on this more open attitude.

Much of this type of work can seem routine – food safety campaigns, information on the safe use of pills or initiatives to manage demand for scarce resources like water. It is important, however, that such work is done well – and vital that scientists and policy-makers do not underestimate the public's appetite for knowledge. Liz Morgan-Lewis, Head of Public Communications at the Medical Research Council, cites the example of the Sellafield Visitor Centre:

> I know that some of the people there had to fight very hard to get it to happen. There was a view that the public wasn't very interested. But others thought that if the public knew more, they'd worry less. Some thought the science was too difficult. Yet in the end, it was amazing how easy it was to explain the science in simple terms.

This is an area in which new thinking is clearly needed, with radical solutions like consensus conferences, one-stop shops and helplines increasingly being considered.

Science communicators working with 'want to know' issues have clearly benefited from the freedom to innovate that an enthusiastic audience offers. As a result, some creative and radical solutions have been developed. Jana Bennett's work at the BBC shows how much can be accomplished. When *Horizon* ran its 'Ice Mummies' trilogy, it caused consternation on the majority channel, BBC1, because it was pulling in as many viewers as the *X Files*. The BBC looks for 'compelling tales of science and technology which make for gripping television and radio' and flags a forthcoming documentary called *The Human Body*, which 'will bring back images from the undiscovered country of inner space' and show us 'the impossible – how nails and teeth grow,' as well as 'sometimes bizarre visualisations of what a human body looks like in cross section.'

This is compelling stuff, and is supported by the BBC's own eagerness to adopt new digital technology which is 'flexible, smaller and often more versatile than what preceded it.' This is an area in which museums and science centres also have a role to play. Jane Bevan explains how the Natural History Museum is moving from passive display to active interpretation in planning its Science Forum development. The museum is trying to break down all barriers between professional scientists, exhibits and the paying public. 'We're designing exhibitions that put the scientist on display,' explains Bevan, describing a hybrid performance, lecture, interview and working space, 'a museum without walls, with spaces where people work while the public experiences what's going on.' This approach is very much to the fore at the London Zoo, too, where Paul Pearce-Kelly sees increasing the contact between the paying public and working scientists as one of the most effective routes to communication.

Frank Burnet at the University of West of England, meanwhile, is looking for direct contact with 'the kind of public you meet on the street.' His *On the Buses* project, launched nationally at the 1997 British Association Festival, uses graphics, design and copy – of a standard more usually seen in large private sector advertising – to bring scientific issues onto public transport. And as *Poems on the Underground* demonstrated before him, it works. Not least, perhaps, because people appreciate the effort involved in getting it right, and getting it where they are (as against where they 'ought' to be).

from amateur to professional

> Public communication lags a generation behind the private sector.
>
> Mike O'Connor, Director of Policy and Communications, Millennium Commission

What characterises these initiatives is an unquestioning acceptance that the highest standards are called for when telling science stories. Jane Bevan at the Natural History Museum admits that the move to charging has changed the museum's attitude:

> We tend to look at the visitor as a customer and concentrate on offering them a service. Visitor satisfaction has become more important.

This professional approach is strongly favoured by Frank Burnet who criticises the 'almost religious attachment to the amateur' that characterises the public understanding of science movement. Roger Highfield of The Daily Telegraph believes that 'so much of science is done out of goodwill, sitting on committees, reviewing papers etc., that no wonder it's so amateur – from top to bottom,' while Mark Dyball of OST also recognises that:

> One of the features of PUS is that it's largely dominated by volunteers. And volunteers will generally do what they want to do – or do nothing.

Amateurs do some jobs particularly well. Eric Robinson of the Geologists' Association says 'we use amateurs because enthusiastic amateurs don't speak over the heads of children.' But organisations need sustained communication efforts. As Barney Wyld of HFEA argues, there is 'a steadily increasing recognition across the board that it is worth employing specialist communicators to do your communications.'

Also emerging is the realisation that communication is as much a curate's egg as science. (Ditto communicators and scientists). For example, a professional press officer may not be the best person to deliver a co-ordinated information campaign. If professionalism is called for, then it must extend to all stages of the communication process: conception, research, writing, design, graphics, PR and media work, lobbying – and evaluation. As Jane Bevan says, when talking about the research the Natural History Museum does before each exhibition, 'when you're too close to something, you can assume too much.'

The role of professional communicators can be contentious, however. Nigel Duncan, Head of Communications at the British Medical Association, sees them driving the agenda:

> When scientists in the media attempt to explain what they're doing, a lot of them find it difficult to put across how interesting their area is. You can count the successful ones on the fingers of one hand… They need more media training… Not that I would expect them to be good at it – that's not their job. Professional communicators should be identifying the stories and bringing in the scientists.

Scientists like Walter Bodmer take the opposite view. He believes that professional communicators should be restricted to 'advising and supporting', otherwise 'you get the wrong science' and 'at the least, whatever science is put over must be right.' Barney Wyld sees this as a 'challenge to communicators', but 'by no means an insurmountable one' if they work hard to develop a genuine understanding of the issues.

Some have decisively moved away from the 'scientists first' stance. Helen Gateshead, Editorial Director of Non-fiction at Scholastic Children's Books, and editor of the award-winning *Horrible Science* books, took 'a deliberate decision not to take on a scientist' when choosing author Nick Arnold. He explains:

> I came to science quite late. As a result I have to work hard at my research. But I get excited about the concepts that I've grasped and I think hard about how to explain them. If I had 30 years of scientific training, if I took these concepts for granted, it would be more difficult to explain them to a young audience.

The use of specialist communicators needn't take scientists out of the limelight, however. Stephen White at the BPS suggests 'there are tricks of the trade and, once you know them, its not difficult to place science stories.' His work, in other words, increases the opportunities for scientists to explain their work – and the *quality* of the explanation then becomes the issue.

Roy Porter at the Wellcome Institute rephrases a familiar solution:

> One of the best ways of promoting public understanding of science would be to encourage almost all leading scientists to sit down and explain something to a group of 15 year olds – or my grandmother.

His grandmother may end up very busy, but the belief that scientists should be able to offer a popular explanation of what they do is very common.

Meanwhile, Jane Bevan of the Natural History Museum has detected among some scientists a 'chippiness' about explaining their work. She believes this is often rooted in insecurity:

> Most scientists are under-confident, they need to have their hands held as they learn to translate what they have to say. Once they've learned they can do it themselves, once you get them going – they won't stop.

Others are more critical. One admitted to finding many academic scientists he worked with 'a drab and depressing bunch' and most professionals admit that, at critical junctures, they are only prepared to use scientists with a tried and tested communication pedigree. As Ted Neild explains 'in the past we just had a list of experts which people consulted in desperation when journalists rang up.' Now scientists are more carefully selected:

> I need to know that someone knows his stuff, of course. But also, if he goes on radio, is he scared of microphones? Is he any good?

Sue Allenby, from Hertfordshire SATRO, says that 'a list of lecturers must be squeaky clean as far as quality is concerned' and that once good communicators are identified their names can't get lost – they must be well-publicised.'

trivial pursuit

> Everything should be made as simple as possible, but not simpler.
>
> Albert Einstein

Many scientists share Walter Bodmer's belief that communicators will inevitably trivialise technical issues. Jane Bevan admits that some scientists have accused the Natural History Museum of being 'like a Disney Park.' David Ridley, Marketing and Publicity Manager at the Economic and Social Research Council, points out that the problem is most acute where the media is concerned: 'there's always been difficulties dealing with the situation where the media, looking for headlines, sensationalises the research'. One Press Officer thought that 'all scientists want media coverage – but on their own terms'. Ted Neild at the Geological Society also noted how easily scientists could be 'bruised by a bad initial experience.'

This tension is apparent in the Bodmer Report, which is clear in its belief that a scientist has purer motives than a journalist:

> The main explicit function of a scientist is to generate knowledge about the natural world… Success is judged mainly by the approval of other scientists…The main functions of the media are to entertain and inform. Success is judged primarily by audience ratings.

The Bodmer Report is also critical of popular science books:

> [although] an important source of scientific information for the general public… [they] are sometimes grossly inaccurate, or even deliberately misleading.

Surprisingly, however, many non-scientists have a higher opinion of the level of information the public can take than do scientists. Helen Gateshead points out that the *Horrible Science* series she edits copied the *Horrible History* books in favouring content over style. 'There are lots of beautiful colour books with text that is very bitty with nothing to link it together,' she says. The *Horrible Science* books are 'not trying to be clever in terms of presentation.' Rather, they have 'a narrative that flows through the book. The text must come first. If the readers don't get the idea from the text, they never will from pictures.' The books 'don't shy away from giving children big words.' In fact, that is part of the point, as 'kids love to know something other people don't know.' Author Nick Arnold confirms this: 'children are keen to learn science facts and bring them out to impress their friends.'

At issue is finding the right level at which to communicate. Paul Pearce-Kelly of the Zoological Society of London:

> My experience is that people, of all ages, increasingly expect clear and detailed information in science as in every other area of life. The trick is to strike the right balance between putting information across in as interesting and enthusing a manner as possible without being either patronisingly simplistic or diving in at the technical deep end. It's easy to assume that people are *au fait* with the basics of a subject or issue and consequently kick off at too high a level with the risk of losing people. On the other hand, remaining on the basal level conveys a false sense of simplicity and sells people short. It's all too easy to fall into either of these extremes. Of course, science is a complex beast, but I'm a great fan of the person who asks "Yes Prof, but what exactly is biodiversity?" Given a clear briefing we are all capable of following, discussing and being genuinely interested in the most complex of issues and subject matter.

This sense that the way forward lies in exploring the relationship between the simple ('the answer is…') and the complex ('the caveats are…') locks onto a number of the recurrent themes in this research. Paul Pearce-Kelly again:

> It comes back to getting the balance right – start off simple, yes, but don't underestimate people's ability, or eagerness, to handle the complex.

the who

Even with the right explanation in place, one still has to pick one's audience. Some communicators see the public in the widest possible terms. Peter Cochrane at BT talks about 'the population of the world – any age, any gender, any discipline,' while Phillipa Senior of the Institute of Physics takes the 'general public' to mean 'anyone outside their own area of specialisation.' OST's *Going Public* makes the same point:

> Everyone, then, is a member of the 'public' and an 'amateur' naturalist may well know more about some aspects of modern biology that many a particle physicist or materials engineer.

This realisation is particularly important to organisations such as the Medical Research Council, who inform General Practitioners of medical developments through MRC News. GPs are thus in

a position to provide better information for their patients. As one GP put it, MRC News is 'an essential part of my reading… it helps keeps me up to date with what's happening elsewhere.'

Most organisations, however, concentrate on a narrow audience base – even if only to target limited resources. Gillian Pearson at the Oxford Trust says that working with children, there are problems 'trying to dovetail science for all with helping those who want to study science further.' The Oxford Trust is perhaps unusual in that it favours the latter, motivating pupils who already have a serious interest in science 'using techniques they might not have in school, processes that are more complex than they normally study.' Like many in the field, she believes it may be too late for adults:

> trying to tackle an issue with an adult public is a tough-nut to crack. You need to start with the next lot.

Graham Farmelo at the Science Museum agrees. 'The adult problem represents one of our greatest challenges,' he says. Keith Davies, an electrostatic engineer with long experience running projects in schools, thinks that 'by the time they leave junior school, it's too late. Some of the secondary schools have given up. They're demoralised.'

The interest in schools means that the market is relatively crowded. Barbara Knowles at NERC thinks there is a lot of wastage:

> There are so many resources for schools which are not used. They're targeted badly, or sent to the wrong teacher and just end up in the bin.

Keith Davies again: 'They're wasting their time,' he says. 'Their leaflets go in the bin. Schools haven't got time to do it for themselves. They need someone to go in and do it for them.'

Some communicators admit to 'going for soft targets first.' Others see this as a worrying trend:

> Vast amounts of PUS is aimed at the same old groups. That's what worries me about all the monitoring. Numbers increase. But are they the right people? We get information about quantity, but not about quality. We need research on the quality of the recipients.

This is a concern shared by the Office of Science and Technology. Mark Dyball, Manager of their Public Understanding of Science Programme:

> One more major priority is evaluation of PUS activity – and what it's achieved. By this we mean evaluation at a number of levels – at a project level and at a bigger level, what might be called the backcloth to all this work. We need to know what is the backcloth of understanding we're dealing with?

He sees a related issue as 'inclusivity' – reaching the difficult audiences, particularly in inner city areas. Frank Burnet's *On the Buses* is one example of how this can be achieved.

switch back on

Reaching new audiences is not easy. A senior communicator admits:

> There's more work to be done to break down the *them* and *us* communication dynamic, and to recognise that it's just not enough to communicate to professional groups and the broadsheets. In the public sphere – and we're a public body – there's an increasing duty to take a bit more effort and spend a bit more money to reach these groups.

One popular way is to use the curiosity of children to connect with adults. Sue Allenby of Hertfordshire SATRO Science focuses 'activity on young people in a way that includes adults. They end up learning, though they don't think they are.'

This is a two-way process. One communicator makes the point that 'we cannot change schools, without the wider population changing its priorities,' while Sue Allenby suggests that 'there is a tremendous amount of evidence for the importance of parental influence.'

Nick Arnold also believes that 'adults often become interested through children and their questions':

> I know for a fact that a lot of adults read *Horrible Science* books. Science undergraduates read them as an antidote to their reading list. Practising scientists read them to see how their speciality is being presented. Teachers read them to get a painless introduction to the subject.

Like many, Nick Arnold sees a 'tremendous latent interest in science,' arguing that:

> Science for adults will be the next big thing. The millennium will focus people's minds on the future. And the future is science.

Jane Bevan at the Natural History Museum agrees. They are just starting to design exhibitions that are more focused on adults – telling people that they don't have to come with a child in tow.

sustained communication

When good work is done, the next step is to be sure it is done again – in other words, to make initiatives sustainable. Frank Burnet of the University of West of England thinks a greater effort is needed to bring successful projects to a wider audience. He criticises 'the science raid philosophy where you take over a village hall and bang a drum.' This kind of work hasn't got the right sort of 'roll-out potential.' He sees the British Association's work involving the Women's Institutes as qualitatively quite different:

> There are lots of WIs, so if you get some going, others will follow if they get a taste for it.

The experience of the Chairman of the National Federation of Women's Institutes, Eileen Meadmore, supports this. The WI has a very clear idea of its audience:

> not just our members, but the many women who are burdened by their own jobs and responsibilities and don't have much time for themselves.

The WI adopted a approach based in efficient co-ordination and involving substantial networking expertise – starting with 'things that we know members are interested in.' They worked hard to intrigue people with titles like *Poison for Beginners* or *Science in a Picnic Basket*.

> We're only just starting - we're only 5 years along the line. It's worked by a cascade system. I think we're really open to what members want. In the short term, we want to create so much interest that activities become self-perpetuating. It's certainly a growing area. I can see it moving quite fast. As far as we are concerned, this is an area that we're opening up to the general public…in open meetings.

All of which is helping demonstrate the modern agenda of the WI – not least by contributing to a changing media image.

Sustainable projects need strategic co-ordination – a fact recognised by a large number of our interviewees. One communicator argues that:

> everyone is doing their own thing. There's no strategic congruence of views. Organisations have very little desire to compromise for the greater good.

Further, 'some organisations want to dominate the agenda' and this hinders 'consensus building in the strategic side.' Along a similar vein, Graham Farmelo says 'ask anyone new to the field and they will tell you they find it hard to see the difference between the various organisations' mission statements.'

Walter Bodmer also emphasises strategy:

> There's a much greater awareness in the scientific community that they have to get their act together…It's probably a matter of bringing together and co-ordinating more. For instance, all universities should look closely at their interactions with local communities and museums.

Liz Morgan-Lewis at MRC suggests 'we should be getting together key institutions and organisations and having a brainstorm.' Mark Dyball at the OST has also indicated that he is looking at 'further improving networking and best practice exchange' and asking the question 'how can we get more people interacting?'

The private sector also recognises a need for greater co-ordination, if only to place its efforts in a wider framework. As Francine Rosen of Worldcall says:

> I think the private sector can help because it has to find ways to make a bridge to the public. But educating the people has to come from the government.

finally…

Emerging from this survey of key issues on the science communication agenda is a clear sense that the 'old school' has had its day. If the public – as against narrow segments of the population – is to be genuinely engaged, then a more populist and professional approach is needed. The public is willing – but increasingly wants to be communicated to on its own terms. People want science to wear a human face.

Many recognise that if science and scientists are not to lose credibility as politics and politicians have done, then they need to renew their mandate with the public. They need to set out a more attractive stall, to work hard at building up trust – and to reveal more of the 'backstage operations' (including the politics). In essence, scientists need to look outwards more – to build bridges of understanding. John Locke suggested much the same thing three centuries ago. Experts, he thought, should:

> venture into the great ocean of knowledge, to survey the riches that nature hath stored other parts with, no less genuine, no less solid, no less useful…look abroad beyond the boundaries that chance, conceit, or laziness, has set to their inquiries, [and not] live separate from the notions, discourse, and attainments, of the rest of mankind.[8]

feedback

now for the science bit started out life as background research for a brief presentation at the Science Communicators' Forum, held at the 1997 British Association Festival of Science. Initially intended as a day's work, it mushroomed as one phone interview led logically to the next.

For all that, it is still a partial piece of research, cut short by the holiday season – with a long list of people still to be contacted. The authors are aware that we have only scratched the surface of some complex and difficult issues, and hope to have the opportunity to explore them in more depth in the future. We would like to apologise in advance for the errors and omissions that readers will no doubt detect.

We welcome feedback and will be running a discussion page on our web site. Please visit *www.riverpath.com* to add your comments and see what others have written. Alternatively, you may post or email your views (our contact details are on the back cover).

We would like to thank Jane Mole and Peter Cooper for their help and encouragement in producing this research.

references

All quotes come from telephone interviews, with the exception of the following:

---

[1] Jennifer Anniston, L'Oreal shampoo TV advertisement catch-phrase

[2] Committee to Review the Contribution of Scientists and Engineers to the Public Understanding of Science, Engineering and Technology

[3] *A Place for Critique in the Mass Media,* paper presented to the programme in Science, Society and the Media at the University of West of England, 31st May 1995

[4] *Public Understanding of Science*, The Seventh J.D. Bernal lecture, 30th April 1986

[5] This and subsequent quotes from *A New Agenda for the Public Understanding of Science*, Inaugural Lecture, 28th November 1995, Imperial College, London

[6] *Secrets of the Psychics,* Equinox, Channel 4, 24th August 1997

[7] *Future Fantastic, BBC Science and the Digital Age*, speech on behalf of COPUS to the British Association, 3rd July 1997

[8] *Causes of Weakness in Men's Understanding* from: The Conduct of the Understanding

biographical notes

John Pollock was a research associate at Manchester University before joining the Department of the Environment as a senior social policy researcher. His research concentrates on the public understanding of complex issues. After the DoE, he worked in an innovative community care project for adults with learning difficulties and for the environmental education foundation, Living Earth. He is a co-founder of River Path Associates.

David Steven has a widely-based publishing, editorial and policy background in the arts. He has run training workshops in schools, prisons and special needs centres in Britain and Europe with the theatre group Word and Action. After working as commissioning editor for an independent publisher, he acted as a policy consultant, advising the Lottery Promotion Company on the National Lottery and South West Arts on publishing policy. He is a co-founder of River Path Associates.

River Path Associates was set up in February 1997 to provide fresh thinking on the complex issues of our time – and to deliver effective solutions. Its work is an eclectic blend – ranging from global issues (for the Department for International Development and the World Bank), through penal affairs (for HMP Wandsworth and *The New Statesman*), to football (for *When Saturday Comes*). Its network of associates are active in areas from politics, finance and geotechnology to advertising, business and criminology (via multimedia and PR).

River Path Associates

61a West Borough, Wimborne, Dorset, BH21 1LX

T 01202 849993 · **F** 01202 843911 · **E** Pathfinders@riverpath.com **W** www.riverpath.com