CHAPTER 2
THE CULTURAL VALUE OF SCIENCE & ENGINEERING

As well as improving our lives through its practical applications, contributing to the economy and helping government to make the best policies, science is important because it has cultural value. In recognition of this, civilised countries invest in research and teaching, and formulate policies that acknowledge, enhance and exploit the cultural aspects of science.

For many people there is an interest in science that develops when they can see scientific developments affecting their own lives, and want to know more about how they work. A recent survey showed that 74% of the population of the UK agree that 'science is such a big part of our lives that we should take an interest'. Only 9% actively disagreed[1].

But science can also fascinate people whether or not it has a direct effect on their lives. The existence of scientific study is, at least to some extent, a consequence of mankind's fascination with knowing the answers to the fundamental questions about nature. Basic curiosity-driven research develops our understanding of life and of the universe, and impacts on the quality of our lives purely through the insights and inspiration it gives. 72% of the British public agree that 'even if it brings no immediate benefits, scientific research which advances the frontiers of knowledge is necessary and should be supported by the Government'.

In both of these respects, science makes a huge contribution to our culture; but culture also feeds into science. The relationship is complex, but one of the most important facets of it is that culture and society can raise new questions for scientific study and new questions about the way in which science is carried out. Science and engineering put a man on the moon in 1969, but it was society that decided that it would use science in this way rather than in other ways.

This Chapter presents an illustration of the role of science in culture. The specific policies are indicative of the way in which we can reflect and enhance this relationship. They should be taken as examples of the approach needed, and are not intended as a comprehensive manifesto.

"Our most popular community attraction is the evening lecture, which attracts up to 300 people. Titles have included *Fire, flames and explosions*; *Weird Waves* and *The Jurassic Coast.* A stall at the Dorchester Show brought science to over 1000 participants over the course of one weekend."

Julia Harley, Head of Science at a specialist science school

Box 2.1

The myth of widespread 'anti-science' feeling

Individuals and groups that are considered 'anti-science' do not always view themselves as such. The phrase tends to be used as an accusation, rather than a genuine descriptor. It may be perfectly valid for an individual to oppose a particular scientific practice or application, but in most reoprted cases those individuals appear to be supportive of science in general as an endeavour. The quotations below illustrate the way that science-based arguments are frequently used to support opposing sides of an issue.

"Many people are opposed to animals suffering and dying in experiments for trivial products such as beauty cosmetics, but are less sure about research labelled as 'medical'. This is understandable, for we all want to see medical progress. But are experiments on animals really necessary for progress? We think not. In fact the majority of medical research does not use animals, and where animals are used each species responds differently to drugs and chemicals - therefore results from animal tests are unreliable as a means of predicting likely effects in humans."

National Anti-Vivisection Society

"In fact, all mammals have the same basic organs - heart, lungs, kidney, liver etc.- performing the same functions and coordinated in the same way. These major similarities outweigh minor differences, although these minor differences can themselves provide useful information. For example, if we knew why muscular dystrophy in mice caused less muscle wasting than in humans, this might lead to a treatment for the disease."

Seriously Ill for Medical Research

"Are we missing something important in narrowing the debate about education and research to an economic calculus? We could do a lot worse than start by setting out the reasons for research driven by the passion always to know just a little bit more about our world."

Rt Hon Chris Patten

2.1 Improving the public image of science

The Government's current approach to science in the cultural sphere extends to 'taking action to achieve greater public confidence and improved engagement', aiming to ensure that people are 'confident about the governance, regulation and use of science and technology, by both government and business…and to ensure that areas of research that could yield important quality of life and economic benefits are not held back'[2].

Such direct attempts to persuade the public to waive their objections to aspects of science and particular technologies are unlikely to be convincing or effective. It may well not be appropriate for governments to take the role of influencing public opinion in this way. A less direct and more systemic approach is needed, to ensure that existing public interest in science is recognized and accounted for. Survey data show that scepticism about science comes hand in hand with scientific understanding[3].

One example of an indirect method would be to use present more of the results of science in ways that members of the public see as interesting and useful. For example, the Government could use the vast collection of satellite data paid for by taxpayers to provide a website with instant free access to aerial images of the country. The Government could do more to ensure that research funding systems are set up in such a way that research can be judged to be coming from 'neutral' sources[4].

In general, scientists do relatively well in public trust polls. For example, 74% of the UK public trust 'professors' and 65% trust 'scientists'. Scientists working for all types of charities are trusted by 73-88% of the public, but commercially-funded scientists do not fare so well, with scientists working for a particular industry being trusted by 18-68% and government scientists somewhere in between, at 50%[5].

2.2 Heritage, fame and recognition

Culture is dependent on heritage, and a historical approach is one of the best ways in which people can access the human side of science. Indeed, the history of science is a significant and fascinating part of our more general cultural history.

As Table 2.1 shows, of all the 814 blue plaques to be seen on the streets of London, about 11% commemorate scientists.

Scientists	8
Mathematicians	5
Engineers	18
Inventors	12
Actors	24
Writers	59

Table 2.1 Number of blue plaques on buildings in London commemorating the lives of different categories of achievers [Source: www.blueplaques.com; slightly different figures can be found from the list at www.english-heritage.org.uk].

Blue Plaques are placed by English Heritage, following nominations from members of the public. It may be unavoidable that people find it easier give recognition to individuals who carry out activities that are intentionally subjective or characterful, or directly communicative; the lower proportion of scientists in Table 2.1 may be nothing more than a natural reflection of this fact. Nevertheless, a greater emphasis on historical scientific achievement could serve to improve recognition of the current cultural nature of the subject.

Of the many people who have heard of the *Beagle 2* Mars lander, how many of knew that the first *Beagle* was the ship that took Darwin round the world in the nineteenth century? How many people who read about the Huygens mission to Saturn's moons know that Huygens was one of the 17th Century's most outstanding scientists? It is not always easily to relate scientific achievements to the human experience.

2.3 Lottery Grants and Charity

The Department of Culture Media and Sport holds responsibility for overseeing the distribution of National Lottery funds, via awarding bodies, which give grants to to 'good causes'[6]. Table 2.2 shows the current proportions of funding allocated to different areas, and compares this with the proportion of direct charitable donations made in the UK to similar causes.

The category of 'health, education or the environment' was added when National Lottery distribution was redefined in 1998. Arriving five years after the other categories were established, these three hugely important areas (with a relatively high science content) remain under-represented among the 'good causes,' being lumped together and awarded a lower share of the funds than all the other categories.

Of the current 15 distributors for National Lottery funds, five are sports organisations, six are arts-based, one represents heritage, and the remaining three cover more general projects. Awards for All, the only distributor to provide grants purely according to demand from the community, has funded only 26 science, engineering or mathematics projects, out of over 80,000 grants throughout the UK. This low participation at a community level is not necessarily a reflection of the public's opinion. It may generally be more difficult for members of the public to plan a suitable science-based scheme. Table 2.1 indicates a higher opinion of science-related causes.

Category	National Lottery grants	Charitable donations
Sport	16.7%	13%
Arts	16.7%	
Heritage	16.7%	
Charities	16.7%	n/a
Capital Projects	20%	n/a
Health, education or the environment	13.3%	33%

Table 2.2. Percentage of National Lottery Grants and direct charitable donations going to different categories of good causes [Sources: *National Lottery Act 1998* and *Charity Trends Data,* CAF, 2004].

A recent official recommendation for lottery funding was that the public should have more say in where the profits are spent[7]. Perhaps if these recommendations are taken forward, we will see a greater emphasis on science-related activities, mirroring the public's current record of charitable donations.

Science should be treated at least equally with sports, the arts and heritage in the distribution of National Lottery funds.

2.4 Science in the media

Several years ago, the editor of the BBC's flagship *Today* programme was asked if he thought that his presenters ought to be as familiar with scientific and technological issues as they were with other disciplines like sociology, arts and humanities. He said 'no,' reasoning that his presenters should know about 'the things which govern absolutely the way we live our lives day-to-day'[8]. The idea that science is one of those things did not appear to have occurred to him.

When the BBC consulted the public about its future in 2000, its document mentioned the words 'art,' 'arts' and 'artists' almost three times as frequently as the words 'science,' 'sciences' and 'scientists'. It described one new television station as 'the home of culture, the arts, ideas and serious debate' but did not once suggest that it would cover science[9].

Although the science community still frequently bemoans the state of science in the media, there has been a significant improvement in the quality and quantity of science reporting over the past few years.

This has occurred as part of wider trends toward education and information programming, and in many cases can be put down to the development of specialist science sections within media organizations. The main areas for improvement remain outside these specialist departments.

The media is increasingly recognising the public's interest in science. Factual and information programmes are an increasingly important part of both radio and television broadcasting.

For example:
⇒ On BBC 1 and BBC 2 'factual and learning' programmes amount to a larger proportion of output hours than any other type of programme, apart from news and weather[10].
⇒ The Sony Radio Awards included a new category for 'information programmes' for the first time in 2004.
⇒ During 2003/04 science, medical and natural history programmes were shown for half an hour of peak time television in a typical week on BBC1, BBC2, ITV1, Channel 4 and Channel 5 combined. Only quiz shows, sport and current affairs received peak time coverage more consistently across channels[10].
⇒ *Walking with Dinosaurs* is still the only television programme to have consistently displaced the soap operas from the top of the ratings in recent years[11].
⇒ BBC1 and BBC2 doubled output of specialist science programmes during the 1990s[12].
⇒ *The Daily Telegraph* has sponsored the *Visions of Science* photographic awards, and has supported the science writer awards since 1987.

The BBC's own public surveys have shown that the public value learning-based programmes such as nature documentaries. When asked what type of programme viewers would like to see more of, documentaries were the most popular, with 24% choosing them. 47% said that they valued BBC broadcasting as 'educational'[13].

When considering the BBC's Charter, or the more general use of public money for public service broadcasting, the Government should give proper consideration to whether science and engineering are being adequately covered.

2.5 The scientific community

When asked its views about scientists' engagement with the public, a major British publisher reported that its staff has encountered young researchers who had 'received instructions not to write books, and

established professionals who are not willing to risk the department dropping a grade [in the Research Assessment Exercise] if they take time out to write'[14]. This was one manifestation of the widely-acknowledged fact that some parts of the science community do not consistently support scientists who want to carry out communication projects.

Putting high-quality science into the public domain depends as much on the behaviour of research establishments as it does on culture of those working in the media. Alongside the many but disjointed initiatives to improve relations between scientists and the communications sectors, **better funding mechanisms are needed to allow scientists to spend time on communication with a wider audience**.

Box 2.2

Attitudes to courses in communications skills

The following quote describes one individual's experience of a course designed to develop communication skills in scientists while studying for a degree in physics.

"A good number of people immediately disliked the communication skills course before it had even started, but it seemed to me that the most common reason for this feeling was a hope that 'doing physics meant I wouldn't have to write essays'. There were nevertheless a few people that actually looked forward to it.

The first task was to 'write a letter home to someone without a physics background, explaining to them in clear language something that you have recently learnt'. This did feel a little patronising, but the actual task involved useful skills. It was just badly packaged.

It was also badly integrated into the overall curriculum. It involved two lessons a term, one in which we were given a quick briefing, a leaflet of information, and the task to be performed, a second in which our progress was checked. It had no connection to any other course unit and felt a little pointless.

Another task was to write a report on some area of physics that interested us, for presentation to a group with a scientific background, but not in the specialist area you will be discussing. The report needed to be 4000 words long, and we also had to give a presentation of our report, and then field questions.

We never learnt anything about scientific publishing or how to deal with the press. At all."

"At this time when science and technology are making great advances and contributions to society and also when new technologies can have potentially powerful beneficial and disadvantageous effects it is vital that scientists talk directly to the public. The internet enables them for the first time to do this on a large scale. It is a true democratization of the interaction between science and the public."

Sir Harold Kroto, Nobel laureate in chemistry

As outlined in Chapter 6, there should also be an element of communication skills in any higher education science course. This would not only benefit science within the media, but would also provide science students with more valuable qualifications. This is something that science students value, and currently feel is lacking from their formal studies[15]. Where courses are available, they may not be pitched in the most useful way, as the example in Box 2.2 outlines.

The Research Councils currently carry out their own science communication work, as well as promoting such activities among their grant holders. Typically this may include making grants to support communications training for researchers, funds for events and materials, or the possibility to put a proportion of research grants toward communication work. Table 2.3 presents the few data available on the proportion of each Council's budget that is spent on science in society or on communication activities.

Funds should consistently be allocated to the Research Councils so that they can directly fund projects in the public sphere, without cutting into budgets allotted for research activities.

2.6 Museums and science centres

Ecsite UK, representing hands-on science centres, estimates there to be a funding gap of around £35m per year to maintain current activities in the 61 science discovery centres in the UK[16]. Many of these centres were set up using funds from the Millennium Commission or other capital grants, but have no guarantee of support for annual running costs.

Centres in Scotland and Wales are currently in a bet-

ter position than those in England, where annual government payments granted are far lower as a proportion of the annual costs to run the sector, and a significant number of centres are currently without any government support. Grants for the five centres in receipt of government funds are provided by the Office of Science and Technology and Department for Education and Skills, but notably not by Department of Culture Media and Sport.

The Department of Culture Media and Sport should contribute to the ongoing support of science centres; longer- term funds should be made available for all centres.

2.7 Science in Parliament

A fuller discussion of the use of science in government can be found in Chapter 3. The following two examples illustrate some of the 'gaps' in the current cultural environment.

A recent document from the Department for Education and Skills outlined the department's international vision for British education[17]. Whilst sport was held up as an example of the kind of subject that can be used to teach children a global awareness, based around the Olympic Games (and other international events), science and mathematics were only mentioned with respect to the competitiveness of our education system itself.

	Direct expenditure on communication with society	Other information
BBSRC	£388,000 (0.14%)	Separate grants available
CCLRC	Not given	-
EPSRC	£2.1m (0.46%)	Grants available to current and recent grant-holders
MRC	Not given	Grant scheme
NERC	1% of total	Grant scheme
PPARC	Not given	4% of staff work on promotion of science
ESRC	Not given	Up to 5% of any grants is to be spent on communication

Table 2.3. Expenditure by the Research Councils on science communication [Sources: Annual accounts of the Research Councils].

This represents a missed opportunity, since science has been a truly globalized activity for centuries, with roots well beyond Europe and significant links to historic travel and exploration as well as global technologies such as telecommunications. In comparison to the Olympic games, contemporary international science is an example of collaboration as much as of competition; and there are comparable prestigious international competitions in the form of the Nobel Prizes or the Fields Medal.

A second example represents the lack of scientific culture within Parliament. The official guide to the House of Lords says that: 'People who have especially

> "The scheme allows staff time to be devoted to engaging general public audiences, in our case, 11 to 14 year olds. They are an age range where effective and enduring engagement can give long term benefit to pupils (and their teachers alike) in areas of new scientific and technological interest. In addition, such projects greatly assist schools in producing much more challenging and useful artifacts when teaching pupils about enterprise and innovation issues."
>
> *Professor Bill Banks, Strathclyde University on EPSRC's Partnerships for Public Awareness Awards*

Box 2.3
The work of science centres

The UK has many science centres that cover a wide spectrum of fields within the areas of science, technology, engineering and mathematics. Some, however, have a more specialist remit: the National Space Science Centre and the Eden Project are two recent examples, but there are a number of others. Even the 'specialist centres' generally have a wider educational remit.

A number of established museums have 'science centres' within their buildings. Launch Pad and Flight Lab were two early examples at the Science Museum in London, and Xperiment at the Manchester Museum of Science and Industry is another. These facilities are interactive galleries that are more or less integrated with the rest of what is offered at the museum, and have distinctive schools programmes and (in some cases) outreach activities. In a number of cases they operate within an existing funding relationship with the Department of Culture Media and Sport.

distinguished themselves in other parts of public life, such as industry, the trade unions, education, science, the arts and local government, are often brought into the House of Lords'[18].

However, of the current Lords, only around 10% have science, mathematics, medicine or engineering in their educational or professional backgrounds (at least to undergraduate level or equivalent). The majority of these have experience in the engineering sector. About two thirds of Labour members have an undergraduate degree in a non-science subject, most frequently economics, history or law[20].

According to a poll taken in 1998, doctors and scientists are the single most popular group that the public would like to see represented in the Lords. 82% of people suggested that these groups should provide canidates for membership of the upper house. By contrast only 63% wanted to see religious leaders and only 50% wanted any kind of artists[19].

In a recent debate on mathematics teaching, one member of the House of Lords made a point 'that would probably have been made by one of the many distinguished scientists who adorn our benches - if any of them had bothered to turn up for today's debate'[21]. While it is the individual responsibility of members to attend sessions, the timetabling of Parliamentary debates, for example, could be made more compatible with the working lives of practising scientists and medics.