ScoPE

Scientists on public engagement:
from communication to deliberation

PUBLIC CULTURE AS PROFESSIONAL SCIENCE

Final report of the ScoPE project (Scientists on public engagement: from communication to deliberation?)

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SCOPE – SCIENTISTS ON PUBLIC ENGAGEMENT: FROM COMMUNICATION TO DELIBERATION?

This report is the outcome of a three-year research project conducted from September 2006 to August 2009 in the BIOS Centre for the Study of Bioscience, Biomedicine, Biotechnology and Society at the London School of Economics and Political Science. The project was funded by the Wellcome Trust (*Society Awards: Research* stream, *Engaging Science* public engagement grants programme: award number 080201). The research objective was to provide a data-led, sociological analysis of the understandings, views, perspectives, judgements and experiences of scientists working in the life sciences with respect to public engagement and public dialogue.

BIOS is an internationally recognised centre for research on social, political and economic aspects of the life sciences and biomedicine. The Centre is at the forefront of contemporary sociological debate concerning cultural change in 'the age of biology'. BIOS conducts empirically led, conceptually innovative research projects on a wide range of topics, from the new brain sciences to stem cell research and regenerative medicine. This research is conducted in close collaboration with life scientists, clinicians, policy-makers and other partners in the social sciences and the humanities.

The Wellcome Trust is the largest charity in the UK. The Trust funds innovative biomedical research in the UK and internationally, spending over £600 million each year to support the brightest scientists with the best ideas. The Trust also seeks to improve understanding of the ways in which science and medicine have developed and how biomedical research affects people and society today. The Trust's public engagement funding promotes interest, excitement and debate around science and society.

ScoPE: http://www.lse.ac.uk/collections/BIOS/scope/scope.htm
BIOS: http://www.lse.ac.uk/collections/BIOS/
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EXECUTIVE SUMMARY

Background

Scientists on public engagement: from communication to deliberation? (ScoPE), funded by the Wellcome Trust (award number 080201), was a three year social science research project, conducted in the BIOS Centre for the Study of Bioscience, Biomedicine, Biotechnology and Society at the London School of Economics and Political Science by Sarah Franklin, Kevin Burchell and Kerry Holden. The project was inspired by three observations regarding developments in official and institutional approaches to the relationships between science and the public. First, that attention to the relationships between science and the public remains a strong governmental and scientific commitment, particularly in the UK. Indeed, Science Minister Lord Drayson's statement in July 2009, that the UK higher education funding councils will include public engagement in the 2015 Research Excellence Framework (REF)[1], represents perhaps the most significant step yet in the ongoing institutionalisation of this agenda. Second, that policy approaches to these issues are in the process of reconfiguration, as evolving understandings of interactive, two-way public engagement and policy-oriented public dialogue increasingly complement pre-existing one-way models of science communication and public understanding of science. Third, that while the official, institutional elements of these developments have been the subject of considerable sociological attention, a sociological study of scientists' perceptions of these developments represents a noticeable gap in the research literature.

The ScoPE project

With these observations in mind, the research objective of ScoPE was to provide a data-led sociological analysis of the understandings, views, perspectives, judgements and experiences of scientists – particularly those working in the life sciences – concerning recent developments in the ways in which relationships between science and the public are understood and managed, with particular reference to public engagement and public dialogue. This analysis was pursued through 30 semi-structured interviews with biological scientists, most of whom have considerable experience of public engagement, and some of whom have experience of public dialogue. The interviews were analysed according to well-established qualitative and interpretative methods, and were complemented by an extensive review of the academic, policy and practitioner literature. These efforts were punctuated by regular meetings and workshops involving a wide range of professionals active in the dialogue and engagement fields.

Public culture as professional science

The findings of the ScoPE project confirm the significance of a major shift or 'sea change' in professional scientific culture toward an endorsement of, and participation in, public engagement as a key component of scientific research and innovation. More firmly than in the past, public engagement emerges from the interview data as a matter of professional scientific commitment and as a valuable part of the everyday practice of professional science. Indeed, on the basis of the ScoPE interviews, public engagement skills are increasingly seen by scientists to be as important to a successful scientific career as scientific, clinical and teaching skills.

From deficit to dialogue, from communication to deliberation

Interviewees' accounts of relationships between science, the public and public engagement were reflective, sophisticated, layered and nuanced. Paralleling the recent trend toward more positive official and institutional descriptions of science-society relations, interviewees' understandings of the public and of the purposes of public engagement proved more generous, confident and enthusiastic than has been reported in the past. The ScoPE study found that models of unsupportive and 'deficient' publics are increasingly complemented and/or replaced by representations of intelligent, supportive and scientifically capable publics, particularly in relation to biology and medicine. Further, science's varied publics were often seen by ScoPE interviewees to be in

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[1] In the UK, until recently, the quality of the research outputs of university departments has been assessed every seven years through the Research Assessment Exercise (RAE). This has been used to determine the future core funding levels of all UK universities from government. Following the 2008 RAE, the existing system of assessment is set to be replaced by the Research Excellence Framework (REF). Following Lord Drayson's announcement, in a development that is likely to affect the incentive structures for scientists and other academics, it now appears the 2015 REF will include some form of assessment of both public engagement and policy impact in addition to the existing evaluation of scholarly impact.

possession of a broad-based social knowledge that is valuable because it is distinct from the more narrowly specialised and technical knowledge of scientific experts.

Notably, lapses in public support for developments in science and medicine (GM crops, the MMR vaccine and stem cell research were often mentioned in this regard) were less often attributed to characteristics of the public itself than to the negative influence of mediating social actors (most prominently the media, but also activist groups, corporations, religious opponents of approaches such as human embryo research, and errant scientists). A measure of the complexity of the science and society relationship perceived by many interviewees was also reflected in their tendency to express empathy with – and even to share – some of the negative public responses to certain aspects of scientific research and its dissemination, particularly in the specific contexts with which they were professionally or personally familiar.

On this basis, 'lay' publics emerged from the interview data less as social actors in need of reassurance about science through science education, but increasingly as legitimate and capable stakeholders or citizen-partners in the effort to determine the most appropriate courses for and modes of scientific and medical innovation in a shift we characterised as *moving from deficit to dialogue*. Thus, earlier one-way or communication-based models of appropriate science-society interactions aimed at improving public understandings of science are increasingly replaced by two-way models based upon dialogue, deliberation, partnership reciprocation and exchange. In such a model, public engagement is understood by interviewees to fulfil multiple and more complex objectives, often simultaneously. It is often viewed as a means of democratically addressing publicly-defined priorities and improving the ways in which scientific research and clinical activities are undertaken, as well as helping to define the questions that scientific researchers might address. It is also viewed as a crucial means of counteracting the negative perceptions of science that are seen to be caused by malign social actors such as the media, and of addressing areas of particular concern, such as those raised by novel areas of scientific innovation. Some scientists described the value of public engagement exercises as a means of promoting science, and confirming the intrinsic excitement and value of scientific discovery, while others emphasised the importance of being seen to provide a return for public and

charitable funding. Notably, the project also found these perceptions among scientists are positively reinforced by participation in a range of public events

Interviewees with direct experience of policy-oriented public dialogue described largely positive experiences, and reported improved perceptions of the capabilities of non-scientists to understand and discuss scientific matters. At the same time, concerns were also expressed about the limits to public involvement in decision-making with respect to science, the representativeness of the qualitative methods of public dialogue, public expectations of scientific expertise in public dialogue, and the appropriate roles of scientists in public dialogue.

Public engagement as a professional anomaly and a vocation

A major concern of interviewees, and thus a significant finding of this study, is the contrast between the generally positive view within the scientific community of the benefits of public engagement, and the difficulty of accommodating such activities within the already-overstretched job descriptions of most working scientists. Thus, while strongly endorsed as valuable and worthwhile, the means to facilitate new public–science partnerships were widely acknowledged to be challenging, time-consuming, and potentially hazardous. In sum, public engagement emerged from the accounts provided by the scientists interviewed for this study, as a professional anomaly. Public engagement is acknowledged to be an increasingly important aspect of the scientific profession, yet – at the same time, and in contrast to other core scientific activities such as doing science, teaching and clinical work – it is universally seen to be under-incentivised and under-rewarded, potentially detrimental to research, and professionally stigmatising. Paradoxically, although it is increasingly recognised as valuable to science in general, and as individually rewarding, public engagement activity is also seen to be potentially detrimental to a professional scientific career.

At the same time, interviewees observed that because public engagement is not more fully incentivised and rewarded they currently have a great deal of autonomy with respect to their public engagement activities. The ability of teams and groups of scientists are able to manage their public engagement commitments according to their individual strengths, weaknesses,

preferences and schedules could be undermined by more explicit formal measures to require such activities. From the perspective of the ScoPE interviewees, a barrier to a more explicit reward structure is the extent to which public engagement is most successful when it is positively infused with the sincerity, commitment and goodwill that are in part the consequence of its current status as a voluntary, vocational, and somewhat exceptional activity.

Institutionalising public engagement?

Although the prospect of greater institutional commitment to more meaningful and formal incentives and rewards for public engagement (such as the measures recently proposed by Lord Drayson) was widely and sincerely shared by the interviewees, such changes were also viewed with some ambivalence, and some interviewees questioned this agenda. Interviewees expressed both a general concern about the value of the voluntary nature of current participation in public engagement and dialogue activities, and more specific practical questions about how to evaluate or 'measure' scientists' contributions to such activities. Others expressed concern that the introduction of further systems of incentives and rewards might lead to obligatory targets and quotas that would undermine the current autonomous, voluntary and flexible characteristics of public engagement. As a consequence, interviewees expressed uncertainty about the extent to which existing and future incentives for public engagement, such as rewards through the REF or promotion structures, might prompt a more cynical instrumentalism, manifested as an effort to be seen to be engaged rather than to be engaged for its own sake. They also expressed a reluctance to see public engagement activities bureaucratised as 'more box-ticking' (as might be argued has adversely affected perceptions of research and clinical ethics guidelines). In addition, all of the interviewees described science as an already overloaded profession. In this context, some interviewees questioned the extent to which scientific and governmental institutions concerned with the promotion of research excellence would be motivated to encourage leading scientists to pursue public engagement activities in the time that they would otherwise commit to scientific research.

Shared concerns

One of the main challenges to emerge from the ScoPE study is thus the question of how policy-makers might resolve these emerging and potentially conflicting aspects of public engagement – or, indeed, whether it is realistic to expect to do so. In June 2009, fifteen stakeholders in the public engagement agenda (the ScoPE researchers, ScoPE interviewees, public engagement and public dialogue practitioners, policy actors and other social scientists) met to discuss an early draft of the ScoPE report. This workshop served to illustrate the ability of sociologically-led, qualitatively-based research to identify a number of core concerns that are shared among a range of stakeholders, and its utility as a means of deliberating them (although it also illustrated the extent to which sociological research may be better at identifying key questions than answering them!). In the workshop, discussion focussed almost exclusively on the desirability, feasibility and practicality of both 'measuring' scientists' public engagement efforts, and employing these measures to meaningfully and fairly incentivise and reward public engagement. This discussion, like the data on which it was based, fore-grounded the challenge of more formally incentivising and rewarding public engagement without introducing new forms of compulsion and bureaucratisation that undermine its current characteristics of autonomy, vocation and voluntarism. To meet this challenge, it was agreed that it will be necessary to better characterise the ways in which institutionalised public engagement affects the working lives of scientists, shapes choices about the science that does and does not get done, and contributes to the ways in which science, medical research and clinical practice are governed within an increasingly scientifically engaged society.

CHAPTER 1 INTRODUCTION

Lord Drayson, UK Science Minister (July 2009): We believe that scientists have a duty – particularly when they are funded by taxpayers – to engage in the public arena, to engage in communication of the challenges and the potential ethical concerns about their science, and that will be included in the REF.

Lord Professor Robert Winston (website, 2009): Public engagement with science is vital. Scientific knowledge has huge promise but its possible misuse means that it is important that society has adequate control of what is done in its name.

The set of questions and concerns that formed the basis for the ScoPE project arose from three key observations concerning the roles of scientists in public engagement activities in the UK. These are discussed in the three sections below.

Renewed official emphasis on relationships between science and the public

The first observation is that the principle by which scientists should play active and wide-ranging roles in relationships between science and the public is now an increasingly established component of mainstream scientific culture in the UK[2]. As the pair of statements above illustrate, far from a passing phase or empty promise, the commitment of both government and senior members of the scientific community to real, active, meaningful and consequential public engagement and dialogue has become an increasingly prominent and important feature of what might be called the culture of scientific innovation.

Examples of such activities and programmes can be found throughout the 20th century and, arguably, earlier (Gregory and Miller 1989). However, contemporary 'official' attention to the relationships between science and the public in the UK is widely held to have begun with the Royal Society (1985) *Public Understanding of Science* report (also often referred to as the Bodmer report, after its lead author, Professor Sir Walter Bodmer).

The most significant change augured by this publication was the advent of a more concerted institutional effort to coordinate, promote and improve communication between science and its publics. The report also introduced a powerful new equation that has since proven to be a driving force in policy. The central thesis of the Bodmer report is that better public understanding of science promotes greater public support for science which contributes directly not only to successful scientific innovation but, as a consequence, to improved national prosperity. A kind of national moral purpose was seen to be served by improving the quality of public and private decision-making, which would thus enrich the life of the individual as well as the nation. To realise these gains, however, scientists would need to learn to communicate with the public, be willing to do so and indeed consider it part of their calling to do so effectively.

During the late 1980s and early 1990s, largely under the rubrics of public understanding of science and science communication, Bodmer's agenda began to become more institutionalised. Central to this effort was the science communication grants scheme run by the government-funded Committee on the Public Understanding of Science (see the COPUS website, COPUS 2009). At the heart of this initiative were scientists and the institutions in which they worked (as well as a burgeoning group of science communication professionals). Increasingly, scientists were required to describe their proposed public understanding of science activities in scientific funding bids and were encouraged to take advantage of targeted funding streams such as COPUS. In addition, public understanding of science activities were incentivised – and, for some scientists, rewarded – through prize and award schemes. The range of programmes and activities instigated under the banner of public understanding of science succeeded in encouraging scientists to undertake more such activities and, in providing a wealth of informative and often innovative sites, to promote public interaction with scientific topics. Evidence of the impact of these activities, for instance in increased levels of public understanding of science or the envisaged ensuing enthusiasm for science and technology, remains elusive. However, the general pattern of an increasing and sustained commitment to such activities during this period is striking.

Attention to the relations between science and the public was both reinvigorated and extended in the House of Lords Science and

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[2] While the UK tends to be regarded as being at the vanguard of these developments, similar initiatives exist in Europe and elsewhere (EC 2001, 2005).

Technology Select Committee's *Science and Society* report, published in 2000 and led by Lord Jenkin of Roding. Like the Bodmer report, it claimed that the understanding and application of science are fundamental to the fortunes of modern nations and that science, technology and engineering are intimately linked with progress across the whole range of human endeavour (House of Lords 2000). It similarly claimed that the applications of science raise, or feed into, complex ethical and social questions, which government and industry must handle in ways that command public confidence, and that many of these questions arise in the biosciences (for example, cited in the report are the issues raised by cloning, genetic testing, gene patents, assisted reproduction and xenotransplantation).

The *Science and Society* report thus echoed the earlier *Public Understanding of Science* report in noting the potential for a lack of public confidence or public resistance to jeopardise or inhibit realisation of the benefits of scientific and technological progress. Thus, the report makes a pressing case for reinvigorating scientists' attention to and interventions in the relationships between science and the public (or 'society', as the public now starts to be referred to). Further, the report identifies the period following the *Public Understanding of Science* report as one in which scientists have taken on board the need for activities concerning the public understanding of science, or 'outreach activities', particularly in potentially troubling areas such as bioscientific innovation. Together, these reports bookmark a process of change from a generally aspirational discourse – or even plea – for improved scientific communication to the beginnings of its successful institutionalisation. While precise quantitative measures for evaluating the impact of this change are unavailable, more general aspects of it are amenable to qualitative study, and in particular the ScoPE project focuses on the significance of this change within the scientific profession itself.

From communication to deliberation?: the 'new mood for dialogue'

The reinvigoration of governmental and scientific attention to relationships between science and the public provides the primary context for the ScoPE project. However, the *Science and Society* report also sought to reframe the nature of the challenges that characterise these relations and, thus, the ways in which they

should be managed. For instance, in the *Science and Society* report, pre-existing concerns regarding a lack of public knowledge about science are complemented by attention to a perceived lack of public confidence in scientific advice to government, and a growing recognition of the importance of acknowledging the impact on society of developments in science and technology. The later report consequently argues that public *understanding* of science should be complemented by *engagement* activities, in which dialogue between the public and science is emphasised. This shift can be summarised as a move away from a one-way, top–down, 'empty bucket' model of 'topping up' public understandings of science in an essentially pedagogical fashion toward a two-way exchange model of engagement of which the primary idiom, and method, is dialogue. It introduced a new, post-Bodmer equation, according to which the public instructions to science mattered as much as science's instruction of the public. Correspondingly, the *Science and Society* report issued the institutions that govern and regulate science with a direct challenge to develop more sophisticated approaches to public engagement – a challenge that is reflected in the 'from communication to deliberation?' question of the ScoPE project's subtitle – by instigating a fundamental reconfiguration of institutional terms of reference and procedures in order to become more responsive to input from the diverse publics they serve.

The UK institutions of science and of the governance of science have responded to the *Science and Society* report with an alacrity which suggests that Lord Jenkin's widely read and influential report was not only persuasive but perfectly timed. Since 2000, developing discussions of what are now known as Science and Society issues have been presented in official documents and reports by a range of relevant institutions[3] and in a succession of speeches by government ministers as well as prime ministers Tony Blair and Gordon Brown.

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[3] Among others, see: Parliamentary Office of Science and Technology (POST) (2002, 2006); Royal Society (2001, 2004); The British Association for the Advancement of Science (The BA; now the British Science Association) (2002, 2005); HM Treasury *et al* (2004); Office of Science and Technology (2004); Royal Society and Royal Academy of Engineering (2004); Council for Science and Technology (2005); UK Government (2005); Office of Science and Innovation (2006); DIUS (2008); BIS (2009).

Following the report's publication, almost every leading UK scientific body – both governmental and non-governmental – has expanded its range of programmes, funding streams, awards and training, and these are increasingly oriented around the terms 'Science and Society', 'Science in Society', 'public engagement' and 'public dialogue'.[4] Indeed, these initiatives are evidence of what Lord Winston (recently appointed Professor of Science and Society at Imperial College in London) has described as a 'sea change' in the relationship between science and its publics.[5]

In the period since the mid 2000s, four prominent government initiatives have played a leading role in bringing about, and furthering, the 'sea change' described by Lord Winston. The Sciencewise-Expert Resource Centre (S-ERC), established in 2005 and with a budget of over £2 million from May 2008 to April 2009, promotes and funds policy-oriented public dialogue by government departments and intermediaries (http://www.sciencewise-erc.org.uk/cms/). S-ERC is funded by the Department for Business, Innovation and Skills (BIS), is managed by the consultancy AEA Technology and draws upon the services of a varied network of commercial and non-commercial individuals and organisations (such as Ipsos MORI). S-ERC is perhaps complemented by the People and Participation.net (2009) website

resource (managed by Involve and Headshift and funded by the Department for Communities and Local Government, the Ministry for Justice and the Sustainable Development Commission), which promotes and supports public participation across public policy realms.

With a budget of £9.2 million over four years, the National Co-ordinating Centre for Public Engagement and six regional university-based Beacons for Public Engagement were established in 2008 (http://www.publicengagement.ac.uk/). Funded by the UK higher education funding councils, Research Councils UK and the Wellcome Trust, these initiatives are designed to promote, develop and support broad-based public engagement across the UK higher education sector, including among academic scientists.

Moreover, as previewed at the outset of this chapter, in July 2009, Science Minister Lord Drayson committed the UK higher education funding councils to including public engagement in the 2015 Research Excellence Framework (REF) (Drayson 2009). Finally, a revised Science and Society strategy – in which public engagement and public dialogue feature strongly – has been the topic of a consultation and ongoing further development since 2008 (DIUS 2008; BIS 2009).

Each of these wide-ranging and varied initiatives and programmes provides the institutional context within which the scientific community conceives and undertakes public engagement. Predictably, both the scale and speed of change affecting the scientific community have engendered both dialogue and reflection within its own ranks. From the perspective of professional scientists, the science and society agenda can be readily seen to raise new questions about their public, scientific and professional roles. For example, how should scientists consider, understand and respond to the impacts of their work on society and on public opinion? What are these 'impacts', and how are they defined? How should they communicate their science to the public, with attendant time pressures and potential misgivings about activities such as working with the news media? How should they engage in dialogue with the public? What input should the scientific community have into government initiatives to promote public dialogue, such as public consultation exercises or citizens' juries? Does scientific expertise now require public communication skills? How have scientists responded to growing pressures to perform

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[4] Conspicuous among these are the Wellcome Trust's public engagement programme and media fellowships; the Royal Society's Kohn Award for Excellence in Engaging the Public with Science, Michael Faraday Award for Science Communication, education programme and public engagement programme; all of the British Science Association's work, including the Science in Society programme, communication award, British Science Festival, National Science and Engineering Week and Creativity in Science and Technology award; the Department for Business, Innovation and Skills' Science and Society programme; NESTA's FameLab competition; the Cheltenham Science Festival; the Sciencewise-Expert Resource Centre public dialogue programme and awards; the research council's Science in Society programmes; a range of activities funded by the six Beacons for Public Engagement and the National Co-ordinating Centre for Public Engagement; and the programmes of the Royal Institution.

[5] For an example of the science and society coalition envisaged in Lord Jenkin's report in action, see the account of the successful passage of the revised Human Fertilisation and Embryology Bill produced by the Academy of Medical Sciences in collaboration with the Science Media Centre, the MRC and the Wellcome Trust (Watts 2009). For a possibly contrasting example of the policy-oriented aspects of the Science and Society agenda, see the government-funded *GM Nation?* initiative. Although considered to be flawed in a variety of ways, *GM Nation?* has nonetheless become an internationally totemic attempt to implement some of the ideas about policy-oriented public participation in science and technology that were contained in the *Science and Society* report (Irwin 2006; Horlick-Jones *et al* 2007; Lezaun and Soneryd 2007; Levidow 2007. See also Irwin (2001) on the earlier Public Consultation on the Biosciences).

new tasks in what are often experimental social contexts in which they may find themselves under unfamiliar scrutiny, and to perform new roles for which they have little or no formal training?

A gap in the literature

These were some of the key questions that informed the development of the ScoPE project, which is the first study to begin to evaluate the emergence of a new 'two-way' model of public engagement and dialogue with science from the perspective of scientists. The developments in the governance of relationships between science and the public that are discussed above have been accompanied by wide-ranging academic debate among sociologists and science studies scholars. Studies of scientists' perspectives toward science communication and public engagement have been undertaken by or on behalf of national science institutions.[6] Work in both of these areas is discussed in Chapter 2. However, a sociological study of scientists' understandings of, motivations for and experiences of public engagement has represented a notable lacuna in the research literature. Indeed, while scholars are now beginning to address scientists' understandings of public engagement in broad terms, no work has addressed these issues within the specific context of policy-oriented public dialogue.

Building on a research strategy that has become increasingly widely used within the BIOS Centre at LSE, the institutional home of the ScoPE project, this study was designed to collect and analyse scientists' evaluations of science communication and public engagement activities in a manner that exploits their proximity to, and close engagement with, such activities. These 'embedded' understandings derived from direct experience comprise a valuable, but arguably under-utilised, resource for the evaluation of the putative shift 'from deficit to dialogue'. We also used this data to inform a broader sociological analysis of changes in the professional culture of science, the social character of scientific innovation and the 'science and society' relation.

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[6] See Wellcome Trust (2000) and Royal Society (2006).

Defining public engagement and public dialogue

The increasingly wide range of public-facing activities that have become prominent in the UK Science and Society approach are most often referred to by governmental and other institutions as 'public engagement' and 'public dialogue'. However, the imperatives, objectives, meanings and practices covered by these labels are characterised by a considerable degree of under-definition, fluidity, parochialism, contention and overlap.[7] As mentioned earlier, quantitative means of evaluating the efficacy of such initiatives remain elusive. In addition, the field is populated by similar terms whose meanings are subject to the same challenges.[8] With these vagaries in mind, it is helpful to review briefly how these terms are understood and employed within two of the institutions at the centre of Science and Society efforts: the Department for Business, Innovation and Skills (BIS)[9] and the National Co-ordinating Centre for Public Engagement. Both public engagement and public dialogue are loosely defined in DIUS' updated Science and Society strategy consultation document:

Public engagement: an umbrella term that encompasses many kinds of activity including science festivals, centres, museums, and cafes, media, consultations, feedback techniques, and public dialogue. Any good engagement activity should involve aspects of listening and interaction (DIUS 2008 p. 20).

Notable in this definition is the designation of public engagement as an umbrella category for a wide range of communication, engagement and dialogue activities – in effect defining it as a collective noun. This is followed in the current definition of

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[7] For instance, see the definitional endeavours of Rowe and Frewer (2005) and the work on the imperatives of public participation by Stirling (2008).

[8] For example, science communication, public understanding of science, outreach, public participation, public consultation, public involvement, social appraisal, patient and public involvement, patient forums and participatory technology appraisal.

[9] BIS was formed from the erstwhile Department for Innovation, Universities and Skills (DIUS) and Department for Business, Enterprise and Regulatory Reform (BERR), in June 2009.

DIUS/BIS terminology by a refinement of this 'umbrella' category to emphasise the importance of 'listening and interaction' as key characteristics of public engagement. This definition, then, designates public dialogue as a sub-category of public engagement. The National Co-ordinating Centre for Public Engagement (NCCPE) offers a draft definition of public engagement that it applies across academia or higher education.

Public engagement brings research and higher education institutions together with the public. It generates mutual benefit – with all parties learning from each other through sharing knowledge, expertise and skills. Done well, it builds trust, understanding and collaboration, and increases the institution's relevance to, and impact on, civil society (NCCPE 2009).

While acknowledging elsewhere the fluidity of the notion of public engagement, in its definition of the term, the NCCPE also hints at listening and interaction through its emphasis on learning and sharing. At the same time, this definition also more firmly emphasises some of the potential institutional objectives of public engagement that pertain in this context: to generate mutual benefit, trust, understanding and relevance.

Public Dialogue: a form of deliberative participatory engagement where the outcomes are used to inform decision making, is just one important kind of public engagement activity (DIUS 2008 p. 20).

The DIUS/BIS definition of public dialogue highlights two specific characteristics that set it apart from other forms of public engagement. First, debate and deliberation are emphasised (usually between specific categories of public participants and experts of various kinds). Second, this definition of public dialogue emphasises a link with policy- or decision-making that is absent within other forms of public engagement.

As the data presented later demonstrates in more detail, the ScoPE research suggests that scientists increasingly share the emphasis on a *two-way dialogue or exchange* model of engagement that is featured in the DIUS/BIS and NCCPE definitions (and, indeed, in Lord Jenkin's *Science and Society* report). From the perspective of the scientists who were interviewed for the project, the two-way model can be the measure of a successful public engagement event. In this sense it has become a dominant engagement paradigm or category, and is also the aspect of engagement events that scientists described as most personally rewarding. Thus, possibly in contrast to the view – reflected in the DIUS/BIS definition of public dialogue – that public dialogue is 'just one important kind of public engagement', the ScoPE study found evidence to suggest that engagement activities in general are not uncommonly assessed by scientists in terms of how successfully they achieve the desired goal of two-way dialogue. The ScoPE data also shows – somewhat similarly to the NCCPE's draft definition of the objective of public engagement – that scientists increasingly view the two-way dialogue model of engagement to be an essential route to productive and mutually beneficial coalitions and relationships between science and the public.

Research objective and questions

In conclusion, the research objective of the ScoPE project was to provide a sociological analysis of the understandings, views, perspectives, judgements and experiences of scientists – in particular scientists working in the life sciences – with respect to recent developments in the relations between science and the public, particularly how these are manifest in public engagement and public dialogue activities.

Within the context of this broad research objective, four more specific research questions or themes can be identified:

- Research question 1: How did interviewees characterise the relationships between science and the public, including the roles of other social actors and institutional bodies (media, government, activists, patients, professional organisations, academics, etc)?

- Research question 2: How did interviewees understand the activities and objectives of public engagement and public dialogue, especially within the context of a putative shift 'from deficit to dialogue'?

- Research question 3: What were interviewees' reflections on the challenges of public engagement in their working lives as

professional scientists and their changing professional role to encompass these activities?

- Research question 4: What were the lessons learned from interviewees' direct experiences of public dialogue?

Structure of the report

Chapter 2 provides a brief review of the scholarly and institutional research that is of relevance to the ScoPE project. In Chapter 3, the ScoPE research objectives are described in more detail, as is the research methodology that was employed in the study. Chapters 4 to 7 present the results of the research and discuss these findings. Chapter 4 focuses on interviewees' discussions of the relationships between science and the public (Research question 1). In Chapter 5, interviewees' perspectives on the activities and objectives of public engagement are examined (Research question 2). Chapter 6 is concerned with interviewees' reflections on the place of public engagement within the working life, reward structures and career structures of the professional scientist (Research question 3). Chapter 7 focuses on direct experiences of public dialogue and interviewees' reflections on public involvement in policy- and decision-making (Research question 4). In Chapter 8, a range of further issues that emerge from the data chapters are discussed, followed by a conclusion and summary of the major findings.

CHAPTER 2 RESEARCHING SCIENCE AND THE PUBLIC

This chapter reviews some of the main reasons why social scientists have focused on relationships between science and the public, some of the main approaches to the relationships they have developed, and the ways in which questions about the field are seen to have changed. The chapter thus provides an academic background to the emerging shift from deficit to dialogue, which has become something of a cottage industry in its own right over the past 10 to 15 years both within and outside the UK.

Science and technology as novel sites of contestation

For some social theorists, scientific, technological and medical innovation comprise definitive spheres of social change because of the extent to which they elicit cultural, moral and political contestation (Nelkin 1992; Lindenbaum and Lock 1993; Wynne 1996; Brown and Webster 2004). For others, these are sites of distinctive uncertainties that challenge conventional structural models of contemporary modernity by making explicit an altered 'order of things' underlying social organisation (Latour 2004; Law 1991; Callon 1987; Haraway 1997; Lock 2002; Rabinow 1996; Rose 2001, 2006). In his influential theory of the Risk Society, sociologist Ulrich Beck argues that, while late modern societies are increasingly dependent on science and technology, they are also, paradoxically, increasingly subject to the unpredictable and uncontrollable environmental and health risks that scientific and technological progress bring with them (Beck 1992, 1994). Here, Beck focuses particularly on various forms of pollution and contamination (chemical, nuclear, biological) of the natural environment and food systems, and climate change. At the same time, drawing on Anthony Giddens (1994), Beck also argues that, in late modernity, issues that were previously important sites of top–down, organised social and political action – such as left–right, socialism–capitalism, conservatism–liberalism and class – become less important in favour of what Bauman (2000) has described as a more 'liquid', or de-institutionalised, social fabric. The kinds of contestations that characterise debate over health and illness, new reproductive technologies, genetically engineered organisms, cloning, stem cells or the like are described by political theorists such as Sheila Jasanoff as essentially cultural – and thus less subject to the traditional orders of authority that allowed science to

remain more independent of state politics (and vice versa) in the past. As she notes:

> *Science and technology have been regarded for centuries as instruments of social progress and personal liberation. Yet, as scientific knowledge becomes more closely aligned with economic and political power, producing new expert elites…we can reasonably wonder whether science will lose its ability to serve either state or society as a source of impartial critical authority (Jasanoff 2005 p. 6).*

The contestations described by Jasanoff and others have direct implications for the meaning of democracy in 'knowledge-led' societies, in no small part because contestations over issues such as the MMR vaccine, GMOs, 'designer babies' and nanotechnology often directly revolve around the appropriate relationship between state governance and authoritative scientific claims. Thus it is often new sites of autonomous, bottom–up social and political action – which Beck calls 'sub politics' – that are increasingly the drivers in an ongoing reformulation of the 'science and society' relation (Beck 1992, 1994).

While Beck largely concentrates on the ecological crisis in the late 1980s and early 1990s, other sociologists have identified human biology, medical research practices, healthcare systems, human reproduction, disease and illness and developments in bioscience and biomedicine as similarly novel sites of autonomous, bottom–up social and political action in the early 21st century – which some have called the 'age of biology', or what Ian Wilmut dubbed 'the age of biological control' (Wilmut, Campbell and Tudge 2000). To encapsulate the notion of social and political change in the context of the new biology, the anthropologist Paul Rabinow has coined the term biosociality (Rabinow 1992). 'Biosociality' offers a foil to the earlier concept of 'sociobiology' by proposing that, instead of 'natural facts' offering a template on which human action can be based, modelled or understood, it is instead the process of technological innovation itself that is the source of new analogies for the human, or what some have dubbed the 'posthuman' (Hayles 1999; Fukuyama 2002). Building on the model provided by Rabinow, many social theorists have attempted to develop accounts of new social groupings based on the ability to alter biology. These include patient groups (Epstein 1996; Ginsburg and Rapp 2002), consumers of innovative biomedicine such as IVF

and organ transplant (Franklin and Lock 2003) and new forms of 'biological citizenship' (Petryna 2002; Rose and Novas 2005).

Social theorists have also investigated changes within the 'cultures of science' where scientific innovation takes place, offering accounts of the emergence of 'biological control' (Franklin 2007), the circulation of 'bio-information' (Parry 2004), the production of 'bio-value' (Waldby and Mitchell 2006) and the emergence of 'biocapitalism' (Sunder Rajan 2006) and 'bio-prospecting'. While much of this work has been developed in the context of the 'new genetics', it responds to a wider set of processes through which the capacity of nature, biology or inheritance to limit human action is seen to have been superseded by technological capacities to alter, manipulate and redesign biological 'facts' (Strathern 1992a/b). More widely, these changes associated with 'biology's big bang' can be understood to reconstitute basic questions of scientific progress and technological innovation for the social sciences .

Means of analysing these shifts vary. Quantitative researchers from a range of social scientific disciplines have been drawn to the task of attempting to measure or quantify relationships between science and the public as part of a long-standing research agenda that has become known as public understanding of science (PUS) research. Within the large-scale, quantitative, survey-based PUS research agenda, the contemporary emphasis is increasingly on long-term and internationally comparative analyses of public interest in science, public understanding of the facts and practices of science, public attitudes toward general and specific projects in science and technology, media coverage of science issues, and science communication activities (see the review by Miller 2004). By necessity, such studies rely upon well-developed variables and measurable phenomena and are hypothesis-driven research exercises.

Qualitative studies, in contrast, have sought to embed the PUS agenda both within more specific case studies and within the broader social and cultural contexts that are implied in the foregoing material (Irwin 1995; Irwin and Wynne 1996), often by identifying new drivers and factors, and often by 'discovering' new hypotheses, rather than testing the validity of existing models. Work in this genre proposes that relationships between science and the lay public, including those of interest to researchers in

PUS, are highly varied and highly dependent on the social and cultural contexts in which they emerge, as well as being more 'liquid' and unpredictable, as depicted in the work of Beck, Bauman, Jasanoff and Rabinow cited earlier. Thus, these interpretative approaches seek to understand 'science and society' relationships through small-scale, interpretative case studies that often focus on contexts of uncertainty or contestation (Irwin 1995; Irwin and Wynne 1996; Mulkay 1997; Franklin and Roberts 2006; Lock 2002).

As in any field, questions of method and evidence remain highly contested in the effort to understand both scientific innovation as a source of social change and social change as a source of scientific innovation. It is nonetheless the case that the social study of scientific innovation has become one of the most important new areas of contemporary British sociology, as noted in the recent RAE. Increasingly, many of the approaches to the production and consumption of scientific knowledge developed by social scientists rely on the analysis of qualitative data to generate new models and concepts, that can then be quantitatively tested (for an example that is also usefully comparative, see Gaskell and Bauer 2001 and Bauer and Gaskell 2002). At the outset, such analyses are by definition essentially interpretive and investigate, for example, what Ian Hacking calls 'styles of reasoning' as well as its content. These approaches represent something of a departure from a previous emphasis on scientific objectivity, neutrality and authority, favouring instead models of scientific knowledge and practice that are 'situational' (Haraway 1991), 'co-produced' (Jasanoff 2004), plural (Strathern 1992a/b), 'multiple' (Mol 2003) or 'intersectional' (Lock *et al* 2000). In such approaches the 'reasoning' that informs scientific practice does not derive from a single logic, but from many. A key aim of this report is to demonstrate this intersectionality in practice. Using an interrogative approach with scientists in semi-structured interviews, an archive of embedded knowledge was produced, within which intersecting logics and 'styles of reasoning' or 'styles of thought' are found to be operating that demonstrate the importance of an ability to shift across multiple frames of reference in order to adjust to the varied meanings of authoritative scientific knowledge in different social contexts.

The governance of science

As noted above, social theorists, sociologists and political theorists have been drawn to the study of science and technology based upon the observation that this is a key sector driving the emergence of novel modes of governance and regulation. For some, such as in the work of Ulrich Beck mentioned earlier, this shift is driven by the uncontrollable nature of contemporary science and technology, and the new forms of risk with which its uncertainty is associated. For others, changes in governance are rooted in new forms of social identity and affiliation that derive from the classificatory and disciplining effects of science, technology and medicine. Nikolas Rose (2001, 2006) emphasises the profound social and ethical implications of contemporary developments in bioscience and biomedicine – in genomics, synthetic biology, stem cell research, neuroscience and so on – and the extent to which these potentialities require novel forms of governance that he describes as part of a new 'vital politics' or 'a politics of life itself'. Finally, for some scholars and public policy commentators, new modes of governance in science and technology are demanded by an axiomatic, democratic need for the governance of science to draw upon and reflect the wider views of the public and society, as well as those of scientific experts and policy imperatives (Wilsdon and Willis 2004; Stilgoe 2007; Gavelin and Wilson 2007).

As John Durant, George Gaskell and Martin Bauer argued in one of the first major comparative studies in Europe of biotechnology and the public sphere, 'the biotechnological complex' produces competing discourses and representations from distinct sectors of society (economic, political, mass media, etc) in which there is 'no unified public discourse' about bioscientific innovation, but instead an enormous diversity of public opinion both within and across European nations. The result has been a change in the process of industrialisation, in which public discourse has played a larger role, earlier on, in the processes of innovation – a shift that has involved significant 'institutional learning' as a result (Durant, Gaskell and Bauer 1998 p. 226).

In this context, social scientists note that, in recent years, expert advisory institutions and systems have been increasingly complemented by a novel breed of advisory and regulatory bodies. These institutions have specific remits to consider the social and ethical implications of scientific practices and emerging technologies alongside matters of science, and to draw upon expert advice from ethicists, social scientists and other experts as well as scientists.[10] Similar developments can also be observed within the context of already-existing institutions, such as the scientific research councils, the Royal Society and other learned institutions. Other social scientists have studied the inclusion of lay members on scientific expert panels (Stilgoe *et al* 2008). However, of more relevance here is the attention that social scientists have paid to the public engagement agenda that has emerged from the *Science and Society* report (House of Lords 2000).

Contextualising policy-oriented public participation

As indicated above, specific-issue, policy-oriented public participation exercises are increasingly seen to offer the possibility of rendering the governance of science more democratically accountable by delivering socially and technically robust decisions (indeed, this is how the DIUS defined public dialogue exercises earlier). However, these possibilities are also recognised to be limited and, at times, significantly flawed. For instance, government commitments to funding specific innovation strategies that are accompanied by high-profile commitments to dialogue and participation may not be enhanced by the impression of disingenuousness that they sometimes foster – essentially opening the barn door to public opinion after the horse has already bolted (Irwin 2006). Similarly, an institutional emphasis on 'downstream' impacts and the regulation of specific technologies neglect the 'upstream' processes through which strategic decisions are initially made (Wilsdon and Willis 2004), reinforcing the views of critics who argue that the outcomes of public participation depend upon the institutional framing and timing of the issues and processes (Stirling 2008). In this regard, it has been noted that institutional public participation projects tend to seek out – and construct as

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[10] These include the Human Fertilisation and Embryology Authority (Franklin and Roberts 2006), the Human Genetics Commission, the short-lived Agricultural Environmental Biotechnology Commission (Grove-White 2001; Horlick-Jones *et al* 2007) and the Food Standards Agency.

legitimate publics – public participants who have no preconceived views about the issue at hand, while participants with preconceived views are construed as representing entrenched interests (Reynolds and Szerszynski 2007; Schultz *et al* 2007). In addition, the extent to which such processes 'close down' the range of technological and social choices rather than 'opening up' choices and options has been noted (Stirling 2008). The resulting danger that institutionally led, policy-oriented public participation exercises may have a *fait accompli* flavour is one of the key obstacles to their success and, as a consequence, is a driver of consultation processes that move increasingly further 'upstream' in the process.

Scientists' understandings of the public

This wide range of studies, along with the policy developments described in Chapter 1, provides the broad context for the ScoPE project and its objective to better understand the ways in which scientists talk about the public, as well as their perspectives and experiences with respect to public engagement. While these more specific issues have received less attention than many in the field, some studies have been undertaken into scientists' views of these matters, which are worth mentioning briefly at the close of this review. Scientists have been invited to discuss the relationships between their science and the public in a number of small-scale studies similar to ScoPE, including those of Michael and Birke (1994a/b, 1995) on animal experimenters, Michael and Brown (2000, 2001, 2005) on xenotransplantation researchers, Cook *et al* (2004) and Burchell (2007a/b) on crop biotechnologists, and Davies (2008) on scientists from a range of disciplines. While it is not possible to draw any confident generalisations from these preliminary studies, some key themes to emerge are further developed in the ScoPE report. The first of these is the finding from all of the above studies that scientists readily identify different categories of the public and understand these sociologically as groups of social actors who operate in specific contexts and use distinct types of language and modus operandi (eg media and civil society groups of various types, such as NGOs or activists). Second, this work suggests that scientists often categorise the public and other social actors according to the extent to which they criticise or support their science. In addition, the work indicates

that, on the basis of this distinction, scientists may rhetorically demarcate or separate themselves and their science from their critics. Here, some studies draw on Thomas Gieryn's (1983, 1995) boundary work concept

Finally, these studies most often frame scientists' discussions of the public and other social actors in terms of the intent that this process of rhetorical demarcation and alliance-forming serves. More specifically, it is suggested that these rhetorical strategies form part of the public or political debate about science and technology, that they seek to create the political and social conditions within which authority, legitimacy, resources and autonomy are attracted to general scientific and medical projects such as xenotransplantation or agricultural biotechnology and to medical research approaches such as animal experimentation. Within this context, Michael and Brown (2000) discuss these rhetorical strategies of scientists and scientific institutions as a form of sophisticated 'lay political science' that both analyses and participates in social and political action.

Scientists' understandings and experiences of public engagement

As an emerging topic of research, this issue has received only limited attention. Two categories of materials can be identified here. First, studies within which scientists have been specifically asked about science communication and public engagement (though not policy-oriented public dialogue) outside the context of specific processes or events: see the largely quantitative institutional studies by Wellcome Trust (2000), Royal Society (2006), the emerging qualitative institutional work associated with the Beacons for Public Engagement (McDaid 2008), and the more sociological qualitative studies by Sheppard (2007) and Parry *et al* (draft).[11] This set of materials emphasises the multiple objectives that scientists ascribe to public engagement. For instance, the

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[11] While McDaid (2008) studied attitudes toward public engagement across academic disciplines, from natural science to the humanities, Royal Society (2006) focuses on scientists and engineers, and Wellcome Trust (2000) on life scientists. Parry *et al*'s (draft) work is on stem cell scientists, and Sheppard's (2007) MSc dissertation is on nanotechnologists.

stem cell scientists whom Parry *et al* (draft) interviewed spoke about public engagement in terms of educating the public in a variety of ways, securing public support for stem cell research, learning about public views of such research and providing space for debate about this research. These materials also emphasise the time-management challenges that public engagement presents, as well as the risk of professional stigma that public engagement can carry for scientists. In addition, the institutional work on this topic also raises issues that are of particular relevance within the context of the ScoPE project's focus on life scientists. Perhaps owing to the historical relevance of science communication to scientists, the natural scientists in McDaid's (2008) study expressed greater familiarity with the notion of public engagement than did academics working in the social sciences or humanities. In addition, the Royal Society (2006) suggests that scientists working in the life sciences are more involved in public engagement than scientists working in other scientific disciplines. This is perhaps due to the proximity of scientists working in the biological sciences to the human subject (for example as research subjects, in the clinic or as representatives of patient groups or medical research charities) or due to the extent to which developments in the life sciences are perceived to present social and ethical challenges.

Second, there are reports by social scientists and others, who are often the event organisers, of a variety of specific public engagement events in which dialogue and deliberation between scientists, other experts and public participants are particularly emphasised (Kearnes *et al* 2006; Gavelin and Wilson 2007; Kerr *et al* 2007; Felt *et al* 2009). These materials consistently refer to the capacity of scientists to deliberate successfully on scientific issues with public participants. For instance, Kearnes *et al* (2006 p. 58) report that:

A common set of understandings – even at times, a consensual language – emerged over the course of the afternoon, as members of the public developed a better sense of life in the laboratory and scientists grew to appreciate the legitimacy of public concern.

However, in a variety of ways, it is also frequently lamented – from the perspective of these commentators, at least – that these 'public concerns' and values are easily trumped by scientific 'facts' within

the context of such deliberative events; it is notable that lay participants are said to participate in these moves as much as scientist participants are (Kerr *et al* 2007; Felt *et al* 2009). In addition, Kearnes *et al* (2006) note the transformative effect that such events and processes can have on scientists' views of public capability in discussions of complex scientific and technological issues.

CHAPTER 3 METHODS AND MATERIALS

Qualitative and interpretative research

The qualitative and interpretative tradition in social science research is characterised by its reliance upon a wide and rich variety of disciplinary backgrounds, philosophical approaches and practical research methods, as well as its understanding of social meanings as relational, contextual and, thus, contingent. While social science research is aimed primarily at the elucidation, characterisation and analysis of sociological mechanisms, causes and forms, it relies on the premise that all social facts are, at some level, interpretations. The use of social facts in social science is also distinctive in often yielding better questions or revised hypotheses rather than 'answers'. The effect of accumulated sociological knowledge is thus often the depiction of change. The primary methods chosen for the ScoPE project – open-ended, semi-structured interviews, combined with an extensive review of relevant policy documents – represent widely used and well-established social science approaches to contemporary social phenomena. The outcome of such research is often the identification of key themes and factors that enable nuanced, insightful and substantial engagement with the research topic.

Research design and recruitment

The ScoPE research design relies upon semi-structured, open-ended interviews and a lengthy period of data analysis interpolated by workshops with relevant specialist professionals as well as the scientific community itself. The data collection process used for the ScoPE project differed from a survey or questionnaire-based study by combining predetermined topics and questions with spontaneous issues that emerged in the interview, or 'conversational interview' as this approach is sometimes called. Thus, the order and manner in which research themes are addressed, and the attention that each theme receives, are determined by both the interviewee and the interviewer. In addition, interviewees are able to raise issues for discussion that are outside or complementary to the research themes conceived by the researchers.

Two key criteria were used to define the research population. First, because the research was sponsored by the Wellcome Trust and carried out within BIOS, the research population was restricted to scientists working in the biosciences and biomedicine. Second, to ensure that interviewees would be able to comprehensively discuss their first-hand experiences of public engagement and the ways in which these inform their understandings, the research population was limited to scientists with experience of public engagement and, in some cases, experience of public dialogue.

Thirty scientists were interviewed, over the period from March 2007 to June 2008. A list of the interviewees is provided in Table 1. Interviewees with experience of public engagement were purposively selected using a variety of methods. Some had participated in high-profile projects with a strong public dialogue or deliberative component (such as the Royal Society's pharmacogenetics project and the Meeting of Minds project on developments in neuroscience[12]), others held advisory positions relating to science and society issues in governmental intermediaries (such as the Human Genetics Commission, the Human Fertilisation and Embryology Authority, the Biotechnology and Biology Sciences Research Council and the Medical Research Council). Some were associated with the Human Genetics Knowledge Parks, some were already known to members of the research team through previous research, while a number had been involved in the parliamentary lobbying, media and public debate activities associated with the passage of the revised Human Embryology and Fertilisation Act through parliament. Some interviewees were identified through general web-based investigations. Potential interviewees were invited by email to be interviewed, and interview locations and times were also agreed by email.

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[12] The Royal Society pharmacogenetics public dialogue took place in 2005 and involved two-and-a-half-hour sessions of discussion and debate between 76 members of the public and 12 experts of various kinds (in three groups) (http://royalsociety.org/page.asp?id=3779). Meeting of Minds 'European Citizens' Deliberation on Brain Science' also took place in 2005 and involved 126 European citizens in very extensive debate with a range of experts on recent developments in the brain sciences (http://www.meetingmindseurope.org/uk_site.aspx?SGREF=207).

Name	Institution
Dr Lyle Armstrong	Institute of Human Genetics, University of Newcastle
Professor Clive Ballard	Wolfson Centre for Age Related Disease, KCL
Dr Sarah-Jayne Blakemore	Institute of Cognitive Science, University College London
Professor Sir Walter Bodmer	Weatherall Institute of Molecular Medicine, University of Oxford
Dr Chris Boyd	Medical Genetics Section, University of Edinburgh
Professor John Burn	Institute of Human Genetics, University of Newcastle
Dr Hilary Burton	Public Health Genetics Foundation, Cambridge
Professor Ian Craig	Institute of Psychiatry, KCL
Professor Dame Kay Davies	MRC Functional Genomics Unit, University of Oxford
Professor Dian Donnai	School of Medicine, University of Manchester
Professor Dylan Edwards	School of Biological Sciences, University of East Anglia
Professor Chris Frith	Wellcome Trust Centre for Neuroimaging, UCL
Dr Stephen Gentleman	Division of Neurosciences and Mental Health, Imperial College London
Dr Robin Lovell-Badge	Division Developmental Genetics, National Institute for Medical Research
Dr Stephen Minger	Wolfson Centre for Age Related Diseases, KCL
Dr Catriona Morrison	Institute of Psychological Sciences, University of Leeds
Dr Bill Newman	School of Medicine, University of Manchester
Dr Jenny Nichols	Wellcome Trust Centre for Stem Cell Research, University of Cambridge
Dr Jolanta Opacka-Juffry	School of Human and Life Sciences, Roehampton University
Dr Caroline Pennington	School of Biological Sciences, University of East Anglia
Professor Dame Julia Polak	Division of Investigative Science, Imperial College London
Professor David Porteous	Medical Genetics Section, University of Edinburgh
Professor Geraint Rees	Institute of Cognitive Neuroscience, UCL
Professor Christopher Shaw	Institute of Psychiatry, KCL
Professor Austin Smith	Wellcome Trust Centre for Stem Cell Research, University of Cambridge
Dr Glyn Stacey	UK Stem Cell Bank
Dr Alison Stewart	Public Health Genetics Foundation, Cambridge
Professor David White	Institute for Food Research (now retired)
Professor Andy Young	Department of Psychology, University of York

Table 1. The ScoPE interviewees. (The name of one interviewee who preferred to remain anonymous is omitted from this list.)

Gathering and analysing data

Most of the interviews took place at the interviewee's place of work and lasted around one hour. The interviews were preceded by a discussion of confidentiality and consent, and the interviewees and interviewers signed a consent form. The interviews were digitally recorded for professional transcription. The following themes were employed as a framework for the interviews:

- Context
  o Relationships between the public and developments in science and technology
  o The value of scientific and public knowledge in policy-making
- Public engagement
  o The activities and objectives of public engagement
  o The challenges of public engagement
- Public dialogue (where and as appropriate)
  o The activities and objectives of public dialogue
  o Experiences of public dialogue (motivations, roles, attitudes)
  o The challenges of public dialogue

Following professional transcription, the interview transcripts were corrected where necessary and formatted by the research team. Final transcripts were provided to the interviewees so that they too could make corrections as appropriate. The analysis of the ScoPE interviews was undertaken via a lengthy and iterative process of reading and notation of the interview transcripts, listening to the interview voice files, identifying predetermined and emergent themes in the data, writing short commentaries on individual interviews or themes across the interviews, reorganising the data around themes, further close reading of the thematically organised data, developing ways of encapsulating the themes within the data, and writing. In analysing the data, emphasis is placed on identifying and interpreting the range of ideas, perspectives, images, metaphors and idioms that interviewees employed when discussing particular themes.

The interpretative process described above was complemented by ongoing formal and informal discussions of the data and its analysis among the project team through the data-gathering, data-analysis and report-writing period. In addition, the data analysis was shared with outside experts on two occasions. In September 2007, after five interviews had been conducted, early thoughts and impressions were shared with and guidance was sought from two social science colleagues, Robert Doubleday of Cambridge University and Stephen Wainwright of KCL. In June 2009, a preliminary draft report was discussed at an immensely valuable workshop at LSE. This workshop was attended by 15 stakeholders, including Sara Candy from the Wellcome Trust, the ScoPE team, scientist interviewees, actors from policy and practitioner institutions, and social scientists (see Table 2), and was designed to provide guidance and feedback – and, indeed, data – for inclusion in the final report.

The ScoPE project was launched to academic social scientists at an international event entitled *Constructions of Public Engagement with Science and Technology*, as part of the BIOS Vital Politics III conference at London School of Economics, on Friday, 18 September 2009. The project was launched to broader scientific, policy and practitioner audiences at a major event at the Royal Society on Wednesday, 14 October 2009.

The ScoPE team is very grateful for all of the invaluable support and input that the project received from a range of individuals and institutions within the context of these events. Further information about these events can be found on the project website:

http://www.lse.ac.uk/collections/BIOS/scope/scope.htm

Name	Role on ScoPE	Institution
Dr Joelle Abi-Rachid		BIOS, LSE
Dr Peter Border		Parliamentary Office of Science and Technology
Dr Kevin Burchell	ScoPE team	BIOS, LSE
Sara Candy	Funder	The Wellcome Trust
Caitlin Cockerton		BIOS, LSE
Alison Crowther		Sciencewise-Expert Resource Centre
Dr Sarah Davies		Institute of Hazard and Risk Research, University of Durham
Dr Robert Doubleday	Advisory board	Department of Geography, University of Cambridge
Sophie Duncan		National Co-ordinating Centre for Public Engagement
Professor Sarah Franklin	Principle Investigator	BIOS, LSE
Kerry Holden	ScoPE team	BIOS, LSE
Sue Hordijenko		British Science Association
Lord Jenkin of Roding		House of Lords
Dr Robin Lovell-Badge	Interviewee	National Institute for Medical Research
Professor Geraint Rees	Interviewee	Wellcome Trust Centre for Neuroimaging, UCL
Professor Brian Wynne	Advisory board	CESAGen, Lancaster University

Table 2. Attendees of ScoPE workshop at LSE on 19 June 2009.

CHAPTER 4 SCIENTISTS ON: RELATIONSHIPS BETWEEN SCIENCE AND THE PUBLIC

Beyond science alone

Among the most striking findings to emerge from the interview data is the strength of awareness within the scientific community of the need for various forms of public engagement due to the open-ended and often profound issues raised by scientific innovation – issues that might be described as being 'beyond science alone'.

Chris Frith: I think some of the things we've been doing recently … have implications that everybody needs to think about and not just the scientists. … I'm looking at the relationship between the mind and the brain. What determines why people choose one thing rather than another and then you get into deep philosophical questions about do we have free will. And then some neuroscientists take that into the judicial realm and say is anybody responsible for their actions, should the whole criminal justice system be altered because of what recently neuroscientists have found? … Well, I guess it's the public in general that has to decide what the rules are.

Professor Frith's research concerns the neural basis of social interaction, and in this passage he describes how novel scientific and technological developments raise broader social challenges that go beyond science – 'implications that everybody needs to think about'. He notes that developments in neuroscience concerning 'the relationship between the mind and the brain' raise profound philosophical questions, eg 'do we have free will'. Frith describes an explicit transfer of scientific ideas from one social context to another when he refers to scientific colleagues who have taken findings from experimental science into the courtroom, where they have the capacity to affect 'the whole criminal justice system' because they could be seen to limit the possibility of criminal responsibility. Frith concludes that it is 'the public in general' who should 'decide what the rules are' about how the findings of neuroscientists should be interpreted in this broader social context.

Frith's view of scientific findings that are made in the lab and then travel to other sectors of society can be described as a 'downstream' model of 'impact'. In this view, science remains a separate, enclaved, specialist activity until it is 'taken' into another sector of society, such as the legal system. A different, more 'upstream' model – not of 'impact', but of dependence – is often expressed by scientists working in sensitive or controversial areas

such as stem cell research. In the following interview extract, Dr Stephen Minger, also a neuroscientist, articulates the view that public input should affect the forms and trajectories of his own research with human embryos.

Stephen Minger: I think we are heavily dependent on interacting with the public and being responsive to what the public thinks about the kind of research that we do. You know, in every facet I think the research we do has big ethical issues associated with it: the use of human embryos for research, the creation of hybrid embryos, even our in vivo *work gaining access to tissue samples from living human brains.*

For Minger, the novelty of the research practices and materials employed in stem cell research ('the use of human embryos, the creation of hybrid embryos, even our *in vivo* work') raise ethical dilemmas that are relevant to 'the public' beyond – or even before – what occurs in the scientific laboratory. Like Frith, he notes that these conditions require 'interacting with the public and being responsive to what the public thinks'. Not unusually, but tellingly, Minger describes the relationship between scientists and the public as one of dependency – indeed, Minger describes his work as being 'heavily dependent' on public responses. As a consequence, he describes interaction with the public as being integral to 'every facet' of the work he does.

A public that is generally supportive of science

To the extent that scientists' views of the relevance of public opinion appear to have become more prominent and explicit, so too do their comments frequently convey a general sense of confidence, and often optimism, about public support for science. It is even possible these two views comprise the 'core' or 'general' stance of many scientists toward public attitudes – much as there are well-known cases in which the reverse assumption (of presumed public hostility) prevails (perhaps most notably, GM in Europe).

Many interviewees, including Walter Bodmer, expressed the view that the public is, in general, very supportive of developments in science, technology and medicine.

Walter Bodmer: I mean my general stand has been that, by and large, the public is extremely interested in science, particularly in medical science areas. And the notion that there's a disaffection with science and things like that I think is largely wrong, … there isn't this sort of extreme disaffection that sometimes even some of my colleagues talk about, but there are obvious concerns and that's not unnatural.

As the main author of the *Public Understanding of Science* report (Royal Society 1985), Professor Sir Walter Bodmer has played a pivotal role in the initiation of contemporary efforts to manage relationships between science and the public. Bodmer's comments offer an important additional dimension to our assessment of the 'beyond science alone' paradigm, or what we call the shift from deficit to dialogue. In referring to the 'extreme disaffection that sometimes even some of my colleagues talk about' as being 'largely wrong', Bodmer draws a key distinction between representations of public views that emerge, perhaps in the media or simply in 'talk' among colleagues, and his own direct experience of public views, perhaps gained through his extensive work with medical research charities and at public events. Alongside the finding that scientists are strongly supportive of public engagement activities, the importance of scientists' first-hand accounts of these activities stands out as a dominant source of their views. Bodmer reproduces this general pattern succinctly in his comment describing his opposition to the view (or 'notion') that there is widespread public 'disaffection with science', instead stating that this view is 'largely wrong' and identifying a generalised public support for and interest in science. At the same time, Bodmer identifies with the 'naturalness' of public concerns about science, which he further describes as 'obvious'.

Dian Donnai: I think it's sometimes not as bad as people think it is, the things that grab the headlines are the things like GM-foods or Frankenstein science and animal-human hybrids, and all of that. And that grabs the press, but the press isn't the public, and, in many ways, the public that I interact with, those attending hospitals, those attending scientific events, and those that were involved within the course of our research, actually, on the whole, are very pro-science and pro-progress where there are benefits that can be seen.

Bodmer's scepticism about the notion of widespread public concern about science and, in particular, his observations regarding the malign influence of the media ('things that grab the headlines'), is similarly described by Professor Dian Donnai, a geneticist and clinician. Donnai shares Bodmer's view that 'the press is not the public' in a manner that underscores another important dimension to scientists' awareness of 'the public' confirmed in this study; notably, that the 'science and society' relation is mediated. From her point of view (and with striking regularity in the interviews), this mediation is comprised both of actual media outlets, such as newspapers and television, but also of particular 'mediagenic' topics, most notably the GM and MMR debates. Like Bodmer, and in contrast to the picture that she says is painted by the media, Donnai describes the public *she* interacts with in the clinic, at public engagement events and in medical research programmes as 'on the whole, very pro-science and pro-progress'. At the same time, perhaps like many interviewees with GM in mind, Donnai adds the caveat that public support for developments in science are dependent on the presence of clearly observable benefits.

In the same way that Stephen Minger describes his research as 'heavily dependent' not only upon public responses but also upon *his personal interaction with the public*, Donnai makes a crucial distinction here – common to many of the ScoPE interviewees – between the public represented in the media and the public she interacts with personally. Dr Robin Lovell-Badge, a stem cell biologist and developmental geneticist, reiterates the points made by Bodmer and Donnai, while developing further analytical distinctions.

Robin Lovell-Badge: …part of society seems to be rather anti-science and they're the easiest to talk about in a way, and that worries me. But then I think most of society is generally supportive of science, but it depends on which branch of science you're talking about, which aspects of science. And of course, people seem to be very happy to use technologies that come from science. And they often don't question where they come from, but where, you know, like your recording devices or MP3 players or whatever. And of course, they're all a product of science, initially basic research which has then been applied. And they're quite happy to use all these things. So there seems to be quite good acceptance

of machines and computers, phones, whatever, but when it comes to biology and its applications, there seems to be more worry, more concern, I think I would say.

Lovell-Badge agrees with Donnai's and Bodmer's view that there is considerable public support for developments in science, but is concerned that this may be overshadowed by a broadly held perception that the opposite is the case. It worries him that the anti-science view of the public is 'easier to talk about' – in part because it has become a familiar cliché. In addition, similarly to Donnai, though drawing on his broad-based observations rather than specific experiences, Lovell-Badge distinguishes between public acceptance of some technologies (for instance, consumer electronics such as MP3 players, computers and telephones) and public concerns about others (such as 'biology and its applications'). Thus, and as has been noted in other studies of scientists' views of the public, Lovell-Badge draws analytical distinctions within the public sphere, referring to anti-science sections of the public and to supportive sections of the public. This parsing of public debate is another feature of the interview set that emerges as prominent, and is discussed at greater length below.

A public that is increasingly knowledgeable

In contrast to earlier 'deficit models' of the public as generally lacking adequate knowledge about science, many interviewees emphasised more positive relationships between the 'public' and scientific knowledge, often expressing enthusiasm about an increasingly scientifically literate public. Dian Donnai offered a view of a situation that is 'changing' and of a public that is increasingly knowledgeable about science, in part due to the internet.

Dian Donnai: Well, I do think [the situation] is changing and I do think most people are getting a much better concept of how their bodies work,. …. and people, actually, feel much more empowered now than they did before. And this is partly because the medical profession has changed and is much more willing to share information and healthcare knowledge. And this stems from primary care where there's endless information resources …and professionals have got very expanded health promotion role, as well as dealing with illness role. In hospitals people are, you know, one sees one's

colleagues, who are consultants, much more involved in giving information to patients in a way that they can understand, but then, of course, there's a huge group of media, multi-media, not just television and newspapers, of course, the internet now is people's first place they turn when anything happens in their family.

In this extract, Donnai offers a model of interactive communication based on her observations of how information is shared in the clinic. She notes that the public has greater access to information and is more empowered to use it, while also emphasising the greater willingness within the medical profession to share information and the promotion of such exchanges within the healthcare sector. Implicit in her description is a sense of momentum: that interaction is productive of more interaction in a virtuous circle in the context of healthcare and also, more widely, is a potential model for science communication and dialogue.

Dr Bill Newman, like Donnai a consultant clinician and researcher in medical genetics, and a colleague of Donnai, similarly describes a process whereby access to more information builds patients' confidence, enabling them to interact more knowledgeably with health professionals and to take more responsibility for their own health. On the basis of his own clinical experience, he notes that patients and the public are 'becoming more sophisticated' and 'much better informed' about their conditions and about the ways in which they might be treated.

Bill Newman: I think they are becoming more sophisticated, I think people are seeking more information and that there are wider sources of information clearly available to them. And certainly from my own clinical experience in seeing that patients are much better informed about their conditions, about the risks in the potential clinical management. … People will come in with cuttings from newspapers or bits off the internet. And so to be able to turn around and say I'm not aware of that or I don't know anything about that particular piece of work I think is important. … I suppose I'm a little bit different in some ways is that I do have quite close weekly contact with patients and so rather than being a scientist, so I don't necessarily have to go and seek that I'm sort of getting that through my professional role anyway. … mine's much

more at that sort of clinical interface where I can have that dialogue within the context of a clinical consultation.

Noting the importance of dialogue and the value of the clinical interface that keeps him in constant contact with patients, Newman reflects upon the ways in which these newly informed patients have changed his own practice, in particular the ways in which he conducts consultations. For example, he notes that informed patients prompt a more modest approach from him and that the admission of ignorance can be positively productive in the clinical encounter – precisely by enabling a shift from a more traditional model of knowledge as authority to a model of knowledge as a shared, plural resource that is not so much *transmitted* as *exchanged*. His comment that he thinks it is important to be able to say 'I'm not aware of that or I don't know anything about that particular piece of work' implies that such openings enable him to acquire more information from patients in the pursuit of better clinical outcomes. Thus the exchange of knowledge – dialogue – becomes part of his normal practice and is mutually productive ('I don't necessarily have to go and seek that I'm sort of getting that through my professional role anyway') in an important development of the traditional model of medical professional authority.

The importance of dialogue as a context of knowledge exchange is complemented by its importance for knowledge translation – also a process many scientists and clinicians referred to as a key component of successful science communication. In this context, Dian Donnai describes a case involving a 17-year-old girl, who acted as her mother's interlocutor by explaining quite complex medical information relating to one of the daughter's younger siblings:

Dian Donnai: We'd found a little bit of chromosome missing that we'd picked up with this new technology called Array CGH and I was explaining the very basics of what we'd found. We'd found a variation in the chromosome pattern too small to be seen down the microscope, so we had to use another method in the laboratory, but we picked this up and we didn't really know whether it meant anything or not. We needed blood from the parents to try and interpret whether it meant anything or not and the daughter, who, I have to say, wasn't that scientifically literate, was saying things to her mum that

showed she understood what I was saying…She was explaining, trying to explain things to her mum, which I thought was quite good, and this is not uncommon.

Here, Donnai again points to a changing or improving situation through dialogue, in this case where the explanation of technical information is mediated by the personal relationship of mother and daughter. Here again the anecdote works as a model of communication, in which Donnai implies that public understanding of scientific or medical information is a translational exercise. This is exemplified by the daughter's understanding of the technical language of Donnai's explanation – the language of CGH arrays and chromosome patterns – and by the daughter's translation of this technical information into another language that is understandable to her mother. Donnai is impressed by the daughter's ability to do this, observing that this is rooted in the daughter's capacity – interestingly, despite not being 'that scientifically literate' – to understand and convey complex ideas about genetics, and she says that this is a 'not uncommon' feature of her clinical experience.

While Donnai and Newman provide positive descriptions, embedded in clinical experiences, of the public as newly endowed with knowledge about their bodies based upon specialised information, Professor David Porteous – a leading medical geneticist, though not a clinician – places value on the public's broad-based experiential knowledge.

David Porteous: Lay publics are certainly intelligent and interested and informed publics. They haven't been obviously exposed to the detail, the comprehensive detail, the breadth and depth of the experience of the expert, but, you know, if you go down to the pub and you ask, how do you think the economy's running, well, you'll get a strong opinion from every Tom, Dick and Harry and they're not economists, but they, they understand ultimately, well, you know, our mortgage rate's gone up. … And if you look at anything to do with medical advances and you forget for a moment that most people have got a personal history of watching an elder relative suffering from a degenerative disorder, and the effectiveness or otherwise of medical treatment.

Porteous refers here to a high level of lay intelligence, interest and capability 'across topics or issues, from the economy, to health

and medical advances' that is generally observable, as he puts it, in the pub or among 'every Tom, Dick or Harry'. He further describes this knowledge as being different to expertise because it is not underpinned by expert or professional education or training. Instead, for Porteous, this general public intelligence is experiential, subjective and personal. In sum, he suggests that it may be all too easy to underestimate common sense.

A public that is understandably unsupportive in specific instances

A public that lacks knowledge about science and scientists

Alongside instances in which an increasingly knowledgeable public is identified by interviewees, occasions where a lack of public knowledge was evident were also noted. A lack of public knowledge was often identified by interviewees as a factor in instances of public concern and suspicion about technological developments. As the comments below illustrate, these depictions of the public as lacking in knowledge can be divided into three categories of 'understandable' confusion about scientific knowledge itself, the way that science works and the nature of scientists themselves.

Robin Lovell-Badge: I guess, when you don't know enough about a particular subject, then you can get very suspicious about the motives behind it, that subject, whether it's research or selling something. You can be suspicious and you can be a little frightened of it. And that's quite understandable.

In his empathetic description of public suspicion of science, Robin Lovell-Badge identifies a link between insufficient knowledge about a particular issue and fear, for example concerning the underlying motives of the protagonists. Using an analogy between 'research' and 'selling something', Lovell-Badge suggests that similar responses occur in a range of social contexts and are 'understandable' in the sense of being common, normal and predictable. Through use of the second-person 'you', he emphasises the everyday nature of this phenomena, suggesting that it is easily recognisable for what it is, namely ordinary. The implication here is that suspicion toward science is not necessarily a distinct category of fear, but is one that may exist in relation to a wide range of social phenomena.

In a more complicated example of what is, or is not, 'understandable', Dr Sarah-Jayne Blakemore, a researcher in social cognitive processes in people with autism, draws upon her own research expertise and her experiences as a parent to comment upon the public furore that was caused by Dr Andrew Wakefield's controversial speculation regarding a possible link between the MMR vaccine and autism. In the comments below, Blakemore moves the discussion from public knowledge of the content of science to public knowledge about the methods of scientific and medical research, and clinical trials. In the central section of these comments, she emphasises the difficulties of understanding the 'seeming contradictions in scientific fact' that result from the potentially counterintuitive appearance of scientific methods, such as replication, to 'people who do not really understand the scientific process'.

Sarah-Jayne Blakemore: There's not a very good understanding of what science involves, the classic things like replication, the fact that things aren't necessarily replicable and so you can get these seeming contradictions in scientific fact, and that's very difficult to understand if you're not a scientist because people think of science as producing facts. But of course it doesn't. It's all wrapped up in statistics and probability and replicability. So that makes it inherently a bit untrustworthy. You shouldn't trust a scientific fact until it's replicated many, many, many times and even then it's never a fact. It's just a hypothesis being supported. … I suppose the one I'm most interested in is, or know most about, is the MMR and autism idea and controversy. Basically that was defined by the fact that people don't really understand the scientific process. And I say this as someone who, because I've got two small children, had to think hard about the MMR vaccine. So even as a scientist, I still am affected by reading those front page news stories about science. So basically the whole MMR story, one person, one paper reports a link between MMR and autism in a very, very small number of children. And even then, a link is just a correlation. You can't say anything about causality with no mechanism or no idea of how the MMR can cause autism. But obviously this is a big deal and it comes at a time when people think that autism is really on the increase. Even that's very questionable, probably the prevalence for autism has increased, ie the awareness of it,

but maybe not the incidence, the actual rate of autism. The incidence has not increased that much, that's what the latest evidence suggests. But anyway, people want to explain this apparent increase in autism. So the MMR is a nice theory, they want something like that. If there has been an increase, then presumably that's environmentally caused and they want something in the environment that is tangible and that you can kind of imagine causing autism, and the MMR played that role for a lot of people.

Here, Blakemore's emphasis on method suggests a model of contextual 'understanding'. A 'link' or 'correlation' in one context may not be relevant in another – indeed, it may be the opposite – which inevitably generates misunderstanding. Based upon her expertise as a scientist specialising in autism, while also a mother of young children and familiar with the concerns of other mothers, Blakemore can readily identify a range of scientific, medical and clinical research practices and principles that she and other interviewees believe are particularly poorly understood by the public because their interpretation requires switching between very different contexts of interpretation – eg childcare and laboratory science. From a scientists' point of view, she points out, scientific facts should always be treated with scepticism – indeed as 'inherently untrustworthy' – which is exactly the opposite of how they are interpreted by the media. It is easily understandable why this discrepancy is difficult to manage: as Blakemore notes, 'even as a scientist I still am affected by reading those front page news stories about science'. Moreover, the range of basic concepts and methods in science that mean different – or opposite – things outside of science is numerous. In addition to 'fact', these include replication, the associated difference between single studies and scientific consensus, the difference between small- and large-scale research designs, issues of increased diagnosis versus increased prevalence, and the difference between correlation and causality, sampling and representation, and statistical probability and significance. Significantly, the source of misunderstanding is also precisely identified not only at the level of method rather than knowledge, but at the level of very specific methods that lie at the heart of risk calculation. From this perspective, although public misunderstandings of science may be problematic, they are not seen to be a distinct category of illiteracy or 'deficit'. Indeed, as Wynne (2006) has argued, public misunderstandings of science in

the description offered by Blakemore are depicted as part of the ordinary struggle any intelligent person would have in making sense of a specialist professional language.

Blakemore's comments are also notable because they illustrate the view, expressed by a number of interviewees, that scientists are themselves members of the public and experience science as members of the public. Thus, as a mother of two young children – and despite her expertise with respect to autism and the scientific method, and notwithstanding her evident investigations of the scientific literature relating to the MMR vaccine – Blakemore reports that she was affected by the media coverage of the controversy and had to think carefully about the MMR vaccine with respect to her own children. Here, Blakemore echoes Lovell-Badge's earlier assertion that scientists are prone to respond in similar ways to other members of society, for example as worried parents, and that to this extent public responses are not a separate category of social experience.

In other comments on public misunderstandings with respect to science, some interviewees expressed concern about negative and inaccurate public perceptions of scientists themselves, most often associated with the cultural stereotype of the scientific boffin (also expressed as the hare-brained or absent-minded professor) who responds to motivations and acts in ways that are outside social norms. Although explicit and direct links between these perceptions and lack of support for science were not drawn by the interviewees, some did appear to feel that public responses to certain scientific projects are often framed by these negative public perceptions of scientists. In addition, these comments reveal scientists' discomfort concerning their own identity, status or role within society. Notably, positive cultural stereotypes of scientists and clinicians – perhaps as being dedicated to science, medicine, patients or progress – are largely absent from interviewees' discussions of their perceptions of public perceptions of themselves.

Catriona Morrison: I think the public perceives scientists as being these kind of crazy boffins who dream up experiments and aren't working for the public good.

In this comment, Dr Catriona Morrison, an experimental psychologist, associates the boffin stereotype with acting outside of the public good. She invokes a public perception that scientists

are perhaps working on projects that are not prioritised by the public, that might even harm the public or that are driven by other interests, perhaps scientists' self-interests or obsessions. The theme of separateness in scientists' perceptions of public perceptions of scientists is also emphasised by a stem cell scientist (who wishes to remain anonymous).

Interviewer: You mentioned misconceptions of science and I just wondered, can you characterise those misconceptions?

Interviewee: Well, boffins and scientists with their wild hair and their lab coats, and just sort of being obsessed by doing science and not understanding that they have to fit into the community. And being something separate, a separate breed almost. ... I suppose they have seen on the telly, there've been some quite strange scientists and kids will look at them and think, well, I don't want to turn out like that, maybe, I don't know.

For this interviewee, along with visual cues – such as wild hair and lab coats (others referred to white coats, high foreheads and social awkwardness) – the perceived public stereotype of the scientific boffin raises issues of strangeness and isolation from society, 'a separate breed almost'. More notably, perhaps, in direct contradiction of the views expressed by Chris Frith and Stephen Minger at the outset of this chapter that matters of science are now 'beyond science alone', the interviewee suggests that the public may perceive that scientists do not understand the extent to which they have to operate within the norms, expectations and permissions of society or the community. In addition, in common with other interviewees, this scientist comments on the roots of such public misperceptions in popular culture such as television.

Drawing on his own familial experience, Dr Stephen Minger, also a stem cell scientist, also describes the discomforting sense that the public perceives that scientists behave in ways that transgress social norms and permissions.

Stephen Minger: So, for example, my own family for years has been saying, you really just want to clone people, don't you? And no matter how hard I try to convince them that that's not really what we want to do, I think they're, kind of, convinced deep down inside that I'm probably doing something I shouldn't be.

For Minger, the suspicion that his family believes that he wishes to transgress social – and, quite possibly, Minger family – norms by cloning people appears intractable: 'no matter how hard I try to convince them'. Thus, the sense that the public has suspicions about *who scientists really are* and *what they are really doing* struck some interviewees as deeply held and widespread sources of potential distancing between 'science and society'. As Minger notes, this suspicion may even include the possibility that scientists are unwilling to admit even to themselves the full implications of their work.

A public that is negatively mediated by the media

Prominent in many interviewees' comments are a range of malign social actors who mediate relationships between science and the public in ways that may – intentionally or unintentionally – disrupt the more generally observable public support for scientific, technological and medical developments that was discussed earlier. This point is succinctly made by David Porteous.

Interviewer: It sounds as if you're describing a generally positive relationship, yet one that on occasions becomes a little bit problematic and that's often to do with media, pressure groups.

David Porteous: Yes, the intermediaries, it's the intermediaries.

In many instances, interviewees identified very direct relationships between the representation of science by intermediaries and the public. In others, more complex relationships are described in which the culture of science is sometimes implicated.

Without doubt, and despite the widely well-regarded efforts of the Science Media Centre that were discussed earlier, the most prominent of these malign mediating actors in the interviewees' minds is the news media. All interviewees portrayed a news media that misrepresents science in a range of ways – from exaggeration, sensationalisation and dramatisation to hype, oversimplification (dumbing-down) and distortion. In some cases, interviewees even responded to a question about relationships between science and the public entirely in terms of the press corps.

Interviewer: The first issue that we wanted to unravel a little bit is your views about the state of relationships between science and technology, and the public, in quite general terms.

Andy Young: We do think it's a huge issue. I think the mass media represents science very badly. Most journalists are technically illiterate, and they don't seem to understand the difference between good science and rubbish. … Especially on the BBC, the dumbing-down of their science programmes has been appalling.

Interviewer: Okay. And on the public side, or societal side, what do you think the results of this issue are?

Andy Young: The results are that people believe things that are factually not true. They won't have their kids immunised, etc. There clearly is a lot of scaremongering going on.

Although invited to respond in 'general terms', Professor Andy Young, a neuropsychologist and experimental psychologist, answered a question about science and its publics with a specific attack on the media, in which he describes 'a lot of scaremongering', 'dumbing-down' and technical illiteracy or incompetence on the part of journalists, which inevitably leads to the misrepresentation of science. In a familiar perception that is common among the interviewees, Young draws a direct link between misrepresentations in the media and what the public believes, with perceived costly results in terms of public behaviour, for example with respect to vaccination and other unstated matters.

Other interviewees drew attention to the ways in which the media sensationalises scientific and medical issues. For instance, Dr Stephen Gentleman, an experimental neuropathologist specialising in Alzheimer's disease, drew attention to the relationship between sensationalising hype in the media about scientific discoveries and medical breakthroughs and 'disaffection with science' among patients and the general public as a result of its perceived unreliability:

Stephen Gentleman: I think one of the big problems is the press portrayal of science, it tends to be very sensationalised. In my own field, Alzheimer's disease, unfortunately there's a new cure every week in one or the other of the newspapers,

which really just causes a lot of grief and I think people who are affected by these diseases just become disaffected and causes general disaffection with science.

Other interviewees focused on the media tendency to exaggerate any problems that are produced by scientific, technological and medical research and developments.

Sarah-Jayne Blakemore: Do you remember those six people who had a really bad reaction in that clinical trial? There are millions of people who go through clinical trials each year who don't have any effects. But when they do have a bad effect, it makes front page news for many, many weeks, not surprisingly. But that over-represents what can go wrong in science. I think it's very tied up in the media representation as well. But I'm not blaming the media. I mean the media just publish what we want to read, [laughs] what sells papers. But you can get the impression that a lot goes wrong in science, there's a lot of dodgy stuff. But that's just because that's what makes the news [laughs].

Thus, Sarah-Jayne Blakemore employs the case of a disastrous clinical trial at Northwick Park Hospital, north-west London, in 2006 to illustrate her view that negative stories are disproportionately emphasised in the media. However, while she suggests that this phenomena creates a public impression that 'a lot goes wrong in science', she also suggests that the behaviour of the media is not surprising and therefore the media should not be blamed. While not necessarily implying empathy toward such media strategies, Blakemore's comments illustrate an understanding of media culture, its specific demands and an appreciation that what is 'newsworthy' is not necessarily either representative or accurate (perhaps also implying that this is common knowledge and that people do not always believe what they read in the papers). Such examples of scientists' understanding of the ways in which the media works are widespread in the data. Other aspects of media culture which – while not necessarily celebrated – were recognised by many interviewees were the media's desire for balance within the reporting of a story even when considerable scientific consensus exists, and the ever-present potential for science stories to be reported or edited by non-science journalists.

While interviewees recognised the obligation of the media to achieve balance between competing perspectives, Dr Glyn Stacey,

the Director of the UK Stem Cell Bank also noted some significant disadvantages to scientists of this tendency to equate certainty based on religious conviction with the inevitable uncertainties of technically complex areas of scientific research.

Glyn Stacey: Very often you'll see, arguments from both sides but the thing is that the argument from say a pro-life perspective is very clear, ideological and that's just, this is just the position, this is what I believe, it's a belief. Whereas the balance to that is the scientists who are saying, well you never know, this could be right and that could be right, maybe this could happen and maybe not. … They will qualify because that is the nature of their work, they will qualify whatever they say. So you've got someone who's very clear and knows exactly what they think and, because it's a belief, whereas somebody who's dealing with technical issues and science, and knows that you can't say this is definite and nothing is 100 per cent. And so I've always perceived that the public are going to get a view on what's going on there but it may be not quite correct because you're comparing apples and pears in the arguments that are being made.

In discussing the question of balance, Stacey contrasts the unequivocal manner in which pro-life commentators present their arguments, which are rooted in religious conviction, and the more equivocal or qualified communication style of scientists, which is rooted in the scepticism integral and doubt integral to their scientific training. From Stacey's perspective, this contrast in styles – unequivocal versus equivocal – has the potential to create a false impression in the minds of the public, and indeed to undermine the ability of scientific fact to be considered reliable, stable or factual. This is one of a number of ways in which scientists' awareness of the extent to which, while compelling in scientific contexts, scientific ways of knowing and communicating are easily rendered less adequate in mainstream public culture.

In many interviewees' observations, such understandings were reflected in discussions of particular strategies developed through experience or training for coping with the demands of the media.

Clive Ballard: When you're sort of working through the medium with journalists, they're trying to make the story interesting or exciting, and once you've done that work for a while, you realise that you've got to give them something that's a story, otherwise it's not going to work. So I think the challenge is often to try and sort of make a story that's not scientifically inaccurate, and is interesting, but conveys a reasonable amount of the factual material that you want to convey.

In this comment, for instance, Professor Clive Ballard, who specialises in dementia, underscores the value of his long-standing experience of working with the media in achieving desirable outcomes. In addition, he emphasises the importance of understanding the needs of the journalist (an 'interesting or exciting' story) and meeting these in conjunction with the objectives of the scientist (to not be 'scientifically inaccurate' and to convey 'factual material').

A public that is negatively mediated by other malign social actors

Alongside the media, interviewees mentioned three other categories of prominent social actors that negatively mediate in relationships between science and the public. As illustrated by the comments of David Porteous, prominent among these is a range of civil society groups, variously described by interviewees as activists, lobbyists and pressure groups that are opposed to specific scientific projects or practices such as animal research, stem cell research or agricultural biotechnology. In common with previous research, such groups were described by some interviewees as representing an anti-science, anti-rational or emotional perspective, often rooted in religious or political ideology.

David Porteous: I am conscious of the fact that the power of lobby groups has also increased dramatically; they're very vocal, committed lobbyists. Usually, although broadly speaking, of a Luddite nature and anti-science nature, are able to halt the progress of research in a way which I don't think matches or adequately reflects true public opinion.

Like other interviewees, Porteous here expresses a partially negative, ambivalent view of activist groups who, while vocal and committed, may be able to restrict scientific progress in a manner that is not strictly representative of the views of the wider public ('true public opinion'). Mixed together in this view of so-called 'anti-

science' lobbyists is the recognition that such groups comprise one of science's most vocal public audiences and are part of the dialogue, but with a worrying power to halt the progress of research in a manner that has 'increased dramatically'.

Other interviewees emphasised the malign influence of corporations as mediators between science and the public – most notably Monsanto, the agricultural biotechnology firm – and a range of pharmaceutical companies that were repeatedly cited in this regard. However, while most interviewees understood the malign mediation of civil society groups as deliberate and did not share the positive perceptions of these groups that the interviewees attributed to the public, the negative impacts of corporations were seen as inadvertent, and interviewees largely shared the apparently negative public perceptions of these corporations.

> *Robin Lovell-Badge: Monsanto started damaging the whole field by marketing things in an aggressive way without telling people that it was genetically modified. And then this whole complex issue of, for example, they were selling seeds which were, you could grow whatever crop from, but then the farmers couldn't take seeds from those because, essentially, they were sterile – yeah, terminator gene and all that.*

Like many scientists and politicians, particularly in the UK, Lovell-Badge views the actions of Monsanto as having had a direct negative impact on public perceptions not only of agricultural biotechnology but the 'whole field' of biomedicine and bioscience. Like many scientists, he also draws a distinction between the antagonism directed at Monsanto for its marketing strategy (selling products to people without telling them they were GM) and its science (genetically engineered crops), which was confused by association with terminology such as 'terminator gene' and its link to intellectual property protection.

The final prominent category of malign actors that interviewees cited as negatively mediating in relationships between science and the public is that of scientists and clinicians who commit conspicuous acts of malpractice or error. The well-known incidents relating to Alder Hey Children's Hospital, Bristol Royal Infirmary, Northwick Park Hospital, Hwang Woo-Suk, Arpad Putzai and Andrew Wakefield were variously mentioned by interviewees as causes of lapses in public support for projects in science,

technology and medicine. In this context, drawing on cases within his own field, Dr Stephen Gentleman laments the impacts of two specific sites of controversy – in this case, regarding the retention of human materials by pathologists – on public perceptions of pathology.

> *Stephen Gentleman: Sure, I mean there are cases, obviously, in the recent past of bad eggs in the scientific field. We've had, again in my own field, there's been various pathological problems in terms of Alder Hay, Bristol, and that has put an unfortunate slant on pathology which is a vital discipline but perhaps is seen as something a little bit unnatural, so we have to redress that in terms of the PR for pathology.*

In this case the combination of a specific field's 'unnaturalness' with the inappropriate conduct of specific individuals is seen to have created a situation in need of redress. Here, the malign intermediaries disrupting public confidence in science may originate within its own ranks. Other interviewees also described the possibility that negative public perceptions of science, technology and medicine may be partly rooted in aspects of scientific culture or in individual scientists.

> *Hilary Burton: I think there's a danger of too much hype. … I think a lot of it comes from the scientists and then I think a lot of it actually comes possibly from the media as well … It's stated quite often really that in some ways scientists have to hype the potential advantages that are going to come from their work, in order to get them funded. And so then that gets, I think, picked up by the media, and by the public.*

Dr Hilary Burton, a consultant in public health medicine, identifies a process of exaggeration or hype of the promise of medical research that is both familiar to scientists and recognised as a source of potential 'danger'. This process begins with the requirement by funders of medical and scientific research that researchers identify potential benefits of their research, an incentive to which researchers inevitably respond in a future-oriented bidding war in which the currency is therapeutic promise. Dr Stephen Gentleman identifies a different aspect of this network of hype that appears to have its source in established aspects of scientific culture.

Stephen Gentleman: And, of course, in the science press, all breakthroughs are trumpeted and one of the big ones in stem cells was the South Korean scientist who claimed to have cloned human cells and it turned out he'd falsified the results. Sadly, you can see to some extent what might have pushed him towards that, in no way excusing it, but the pressure to publish within the scientific community, to maintain a profile, to maintain your job, is quite strong, and, as I say, while I can see why it might have happened, I don't condone it, it is a problem. The expectations are there to produce all the time in a society that's going faster and faster.

Here, Gentleman refers to the famous falsification of scientific research results by the South Korean stem cell scientist, Hwang Woo-Suk, through the early 2000s. While merely implying the impact of public views in this comment, like Burton, Gentleman identifies a link between the trumpeting of scientific results in the media and the exaggeration – and, in this case, wholesale falsification – of results by Hwang. More notably, Gentleman explicitly links Hwang's actions to pressure from within the culture of science, or the scientific community, to publish and produce in order to maintain and advance a scientific career.

medicine. Interviewees often evoked an increasingly knowledgeable and capable public, in both specific and general contexts, and were depicted as active knowledge-seekers who could improve the professional practice of medical scientists through dialogue such as that undertaken at the clinical interface. However, the interviewees also provided a range of accounts of why lapses in public support for scientific and technological projects continue to occur and cause damage to both science and society. While inadequate public understandings of science and scientists were often mentioned in this regard, interviewees also often emphasised the roles of a range of other malign mediating social actors (including the media, civil society groups, corporations and errant scientists, clinicians or researchers). It is highly notable that scientists often understood – and sometimes even empathised with – the reasons behind these perceived misunderstandings of the public and misrepresentations of science. In some cases, the roots of such misunderstandings and misrepresentations were sometimes traced to roots within the culture of science itself.

Summary

The study found that interviewees provided largely positive, complex and nuanced accounts of relationships between science and the public, from a wide range of perspectives and across many different contexts. These accounts were replete with analytical distinctions between different manifestations of science, different categories of publics, different categories of actors within society, different categories of actors within these categories, and scientists' own experience-based understandings of relationships between science and the public.

In examining scientist interviewees' discussions of the relationships between science and the public, a noticeable theme is the extent to which scientific, technological and medical issues are now considered to be subject to public opinion, debate, scrutiny and permission. In addition, although contrary cases are readily identified by scientists, the public is described as being generally supportive of developments in science, technology and

CHAPTER 5 SCIENTISTS ON: THE ACTIVITIES AND OBJECTIVES OF PUBLIC ENGAGEMENT

The activities of public engagement and public dialogue

As illustrated in the three comments below, 'public engagement' is generally understood by interviewees as an umbrella term for a wide variety of activities that are undertaken by scientists. This is reflected in the extent to which some interviewees employed the term 'public engagement' interchangeably or synonymously with other terms such as 'public understanding of science', 'science communication', 'science education' and 'outreach'. As the following extracts demonstrate, the findings of this study confirmed a simultaneously wider and more nuanced view of public engagement, accompanied by sensitivity in some cases about the use of the term.

As Sarah-Jayne Blakemore indicated in response to a request by the interviewer to list her public engagement activities, these vary widely and require several different types of communication skills.

Sarah-Jayne Blakemore: So, any kind of media work, but also giving public lectures. … Ah, writing a book that's accessible to non-specialists, giving talks in schools, working with policy makers, also with people in parliament or whatever.

In common with most interviewees, the first activity that Blakemore mentions as a public engagement activity is media work. This was frequently described by interviewees as an important reactive and proactive activity, including news and documentary work with newspapers, magazines, radio and TV at local and national levels. Most interviewees also cited participation events at which public speaking is emphasised as an important part of their public engagement activities. This category of public engagement activity includes events described as public talks or lectures, which might be understood to consist of relatively little interaction. However, it also includes public debates, discussions, Question Time scenarios or Café Scientifiques, in which actual interaction, or dialogue, with members of the public play a larger role. Many such engagements are one-offs, while others are part of larger events, such as science festivals. Public engagement work in schools, and with children and young people, was also regularly cited by interviewees, including work with teachers and pupils in schools and colleges or with parents and parent groups.

Kay Davies: Public engagement might include visiting schools, talking at science festivals, going to parent groups and try to understand what medical advances can do for their particular genetic conditions, going on the radio.

Since many of the interviewees are funded by medical research charities and patient groups, work with these organisations comprises a key area of public engagement and outreach for many of them. Thus, as indicated in the above comment by Kay Davies, who works on the genetic bases of Duchenne muscular dystrophy, speaking at events organised by patient and carer groups and medical research charities is an important form of public engagement both for scientists and their funders.

Dylan Edwards: We also have a local cancer charity that works very closely with us. So, they and ourselves want to get exposure to the public, so they know that there is work going on here, it helps with fund raisings and things. The last Tuesday of every month, we have an open day and, and the public comes in usually in groups of about a dozen or so, and we show them what's going on in the afternoon. And both Caroline and I go off and make talks.

Public engagement links with medical research charities are also stressed in this extract from an interview with Professor Dylan Edwards, a geneticist working on cancer. In common with many interviewees, Edwards also cites 'open lab' events, in which both adults and children are invited to visit a scientific laboratory, as an important aspect of public engagement. Other activities less frequently described by interviewees as forms of public engagement include work with politicians, civil servants, lobbyists, regulators, policy-makers and government officials; sci-art collaborations and other cultural events such as museum exhibits, film festivals and book fairs; and work with science centres and science festivals, such as those mentioned above. Finally, some interviewees discussed their clinical and research activities (as well as their teaching, which might be applicable in broader areas of science) as forms of public engagement.[13]

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[13] Notably, although some interviewees included references to their teaching and other academic work, such as public lectures, in lists of their public engagement activities, none cited their involvement in social science

While interviewees' understandings of the activities of public engagement include participation in a wide range of events and interactions, these also remain limited to relatively formal contexts, almost all of which are planned in advance and occur outside scientists' normal working environments. Scientists' interactions with the media are the major exception to this, and it is notable that interviewees expressed more concern about the media than any other area of public outreach (see the discussion in Chapter 6).

In somewhat paradoxical contrast to the increasingly varied types of activities described under the public engagement umbrella, this study also found evidence of awareness of a need for increased precision in the use of the terms 'public engagement' or 'dialogue' as opposed to previously popular terms. As Professor Austin Smith, a stem cell scientist, noted in his interview, 'public engagement' has the additional significance of being an alternative to, or successor version of, 'public education', the use of which has become indexical of a now outdated and stigmatised category.

Austin Smith: Now it seems to be considered politically incorrect to talk about public education.

Smith's observation that it is now politically incorrect to refer to 'public education' not only confirms that this has become a negatively charged term of reference, but also signifies a broader shift. A more succinct summation of the 'sea change' encompassed by the shift from deficit to dialogue would be difficult to find. Through such comments, public engagement emerges as an activity that not only complements but replaces a former paradigm. His observation is consistent with the wider findings of the ScoPE project that 'public engagement' has undergone a transformation as part of an evolving value system within the scientific community, in which a breach has opened up between former deficit models and emerging dialogue paradigms. This is precisely the shift at the policy-level discussed in Chapter 1 – from the model of communication and education as one-way 'input' to the model of engagement and dialogue, alongside communication and education, as a two-way system of exchange and reciprocity.

research, despite the fact that a good deal of such research involving scientists, such as the ScoPE study, is directly concerned with public engagement and often funded under public engagement rubrics.

While explicit reference to this policy trajectory by interviewees was rare in the interviews (and the topic was not raised by the interviewers), David Porteous offered the following account of where science 'went badly wrong in the early days of so-called public understanding of science':

David Porteous: Where I think we went badly wrong was in the early days of so-called public understanding of science in the 80s, when there was a strong feeling that there was a revolution taking place in the biosciences, and particularly in relation to genetics and medicine. And there was this sense that if only we taught the public how to understand science, they would appreciate what we were doing. Personally, I think that that was such a misguided approach to take; what we want to do is to find ways in which we can engage with the public and really they're multiple publics. And, I think, that recognising that and knowing you need to be available to answer questions, as opposed to answer the questions you think the public might be interested in.

Porteous's observations, like those of Smith previously, helpfully condense some of the key components of the shift from deficit to dialogue among scientists that we attempt to characterise more fully in this report. Among the many important features of Porteous's observations are the relationships he establishes between the sense of revolutionary zeal among scientists about the promises of biomedicine, the 'misguided' effort to teach the public to understand its importance, and the subsequent failure to comprehend the social character of interaction not with 'the' public, but with many publics. Essentially a corrective observation, Porteous's brief account of what went 'badly wrong…in the 80s' directly pinpoints a failure to appreciate the two-way nature of relationships between science and public, and a subsequent learning process here marked by a distinctive before and after.

This view, however, was not universally shared, and despite awareness of the deficits of the so-called deficit model, some scientists were equally wary of 'throwing it out completely'.

Alison Stewart: I suppose the only thing that immediately comes to mind is the discussion about what people call the knowledge deficit model of public engagement or involvement or whatever. The idea that if only people knew more about it, all these worries would go away. I don't really know how that

debate is developing at the moment. I haven't read a lot about it in recent years but it seemed to me that that went way out fashion, we weren't allowed to think that way. But I don't think you can throw it out completely, I really don't. … I think that you can't get anywhere having a sensible discussion unless people are up to speed, at least to some extent, about the science. And I just think it's going to be a big problem. How are people going to evaluate things, critically, if they just don't know enough science to be able to do that. You have to understand a bit of basic cell biology to understand, for example, what cloning is. And I think very few people have that.

Like Smith and Porteous, Dr Alison Stewart, a specialist in public health genetics, suggests that certain modes of thinking about or acting on relationships between science and the public, such the deficit model, have become unfashionable or even unacceptable. Perhaps less explicitly than Porteous, Stewart also illustrates that she supports the development of novel modes of public engagement in which discussion and critical evaluation are emphasised. However, Stewart also suggests that, while remaining sceptical of the deficit model assumption that greater public understanding will necessarily deliver fewer public concerns, it is a mistake to reject the idea that enhanced public understanding of science – getting people 'up to speed' -- is not part of a 'sensible' discussion about science, nor that the absence of adequate scientific literacy is not still 'a big problem' .

Although explicit comments such as those by Porteous, Smith and Stewart were rare, interviewees' awareness of the issues raised in policy circles by the ongoing emergence of public engagement as an important and increasingly widespread institutional and policy commitment is frequently evident in less direct comments throughout the data. Indeed, this sense of shared concerns among policy actors and scientists – for instance with respect to evaluation and reward – was palpable at the ScoPE workshop in June 2009, at which policy actors and interviewees met with social scientists and ScoPE researchers to discuss a preliminary draft of this final report.

In contrast to the familiarity of the term 'public engagement', interviewees were relatively unfamiliar with 'public dialogue', the expression that is most often used within UK institutions of science

governance to denote structured deliberative discussions between scientists and members of the public with specific policy contexts in mind. Indeed, although approximately half of the interviewees had participated in such processes, these events were not always instinctively categorised by those interviewees under a separate category of 'public dialogue'. Instead, the term 'public dialogue' was understood by interviewees in the ordinary sense of 'dialogue', as in conversation or discussion, involving a 'two-way' process, exchange or interaction.

> **Interviewer:** *What does public dialogue mean then, for you, Catriona?*

> **Catriona Morrison:** *That suggests some kind of discussion about what scientists might engage in, research-wise. I'm just thinking that public dialogue is more about a sort of two way process. Actually, Meeting of Minds is public dialogue.*

The experimental psychologist Dr Catriona Morrison was interviewed for the ScoPE project because she had participated in the Meeting of Minds project, subtitled 'European Citizens' Deliberation on Brain Science'. In her initial thoughts, Morrison illustrates several aspects of many similar comments by other interviewees, or even a more general process of social evolution from engagement to engagement-as-dialogue. Initially, Morrison engages with the term 'public dialogue' on the basis of the meaning of the word 'dialogue', as opposed to a specific type of engagement activity (eg a Public Dialogue event). She suggests that this might be a discussion in which scientists learn about the public's views, 'research-wise'. Latterly – as her thoughts develop – Morrison emphasises that public dialogue is distinguished by a 'two way process'. Considering the matter still further, Morrison defines public dialogue in terms of her own experience of a specific activity, the Meeting of Minds project. Her third sentence – 'Actually, Meeting of Minds is a public dialogue' – concretises the meanings of the first two parts of her definition – 'some kind of discussion...scientists engage in' that is also a 'two way process' – that, in any event, she has herself participated in. Here again, the importance of first-hand experiences of engagement activities is shown not only to *reinforce their value*, but to *reshape their definition* in the minds of individual scientists.

The objectives of public engagement and public dialogue: getting science done

While important in their own right, many interviewees described the value of public engagement and public dialogue activities as part of the more generalised goal of promoting scientific progress. In this sense, the importance of such activities could be seen as part of the broader sense of science as a vocation often driven by a strong sense of moral purpose and obligation.[14] In accounts of their reasons for participating in such activities, interviewees typically described a range of interwoven objectives, imperatives or interests embedded in an ethos of promoting science, and the benefits of scientific research.

Kay Davies: The pharmacogenetics dialogue had two purposes. It served to educate that small section of people in pharmacogenetics. It was also a survey to see how acceptable that type of technology was likely to be, so it was a consultation if you like. … In addition, it served to promote science in the public eye because we're making policy in partnership rather than on our own.

This multiplicity of objectives is reflected in the above comment by Kay Davies, who participated in the Royal Society pharmacogenetics public dialogue project. Here, Davies responds to a query about the objective of that project. Although she suggests the project had a 'dual purpose', Davies here identifies five separate objectives. First, she identifies a communication or education objective, albeit among a 'small section of people', with respect to pharmacogenetics. Second, she suggests that the project was designed to test-drive the public 'acceptability' of pharmacogenetics, and, third, through use of the term 'consultation', she implies that public views may be taken into account in the development of pharmacogenetics technologies. Notably, through use of the word 'really' here, Davies indicates that these are perhaps the stated institutional objectives of the exercise, while the other objectives are perhaps tacit, unstated or personal. Outside of the specifics of pharmacogenetics, Davies

then identifies one or two further objectives that serve science more broadly. Thus, as her fourth objective, Davies suggests that public dialogue helps to promote science 'in the public eye'. Finally, through her observation that this is the case because 'we're making policy in partnership rather than on our own', Davies evokes a fifth objective related to the ideals of participatory democracy.

Notably, and in common with many of the interviewees' comments on this issue, Davies' understands the objectives of public engagement to be embedded within the context both of a specific area of scientific research and the promotion of science in general. Thus, within the context of pharmacogenetics, a therapeutic approach still in its infancy and not widely known among the general public, public engagement is used for educative, test-driving and consultative purposes as part of a wider process of innovation in the governance of science. In the sections that follow, these objectives and others are examined in more detail.

Putting the record straight

It will be recalled from Chapter 4 that many interviewees perceive a social terrain that is to some extent populated by individuals who do not understand scientific and medical issues or the way science works, often because of the intentional or unintentional dissemination of misinformation by a range of social actors (such as the media or certain activist groups). With these social conditions in their minds, many interviewees spoke about public engagement and public dialogue in terms of improving public understanding with respect to a wide range of issues relating to science, technology and medicine. The notion of putting the record straight emerges for interviewees as an important objective of both public engagement and public dialogue.

Chris Frith: First of all, I think it's very important that people like me, who are actually doing the experiments, should interact with the public. … Because if I don't tell them what I'm doing, somebody else will. … And may not get it quite right.

Here, Frith suggests that it is 'very important' for scientists – or 'people like me, who are actually doing the experiments', as he puts it – to 'interact with the public' with the explicit objective of pre-empting the dissemination of misinformation by other social

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[14] As Max Weber famously argued in his influential essay, 'Science as Vocation', the distinguishing fate of science, and thus scientific work, is that it is 'chained to the course of progress', thus also stating the progress is its central *value*, as well as its instrumental purpose (Weber 1968:137).

actors. Dian Donnai describes this 'bit of work that needs doing' as the management of public expectation.

Dian Donnai: So the actual clinical utility of that sort of knowledge is probably going to take awhile to actually come through, and yet the announcements are there: a gene for Alzheimer's, a gene for diabetes, a gene for this, a gene for that, and, actually, that's another bit of work that needs doing, is managing the public, whatever the public is, managing the public expectation.

In this comment on her general objectives in public engagement, Donnai again draws upon her experience as a clinical geneticist to focus on the problem of hype, often associated with genetics research, that was discussed in the previous chapter. In particular, she draws attention to the unrealistic public expectations that are created by the lengthy time lag between public 'announcements' of the identification of specific genes and the realisation of the 'clinical utility of that sort of knowledge'. In the following interview extract, Robin Lovell-Badge similarly draws attention to the use of public engagement to counter public misunderstandings of controversial research areas, such as stem cell science, and contentious medical interventions, such as the MMR vaccine.

Robin Lovell-Badge: Again to, just to try and make them appreciate what science is about. Why scientists will never say, this is impossible, this is absolutely going to work, because we can't. We can't, science never deals in absolutes in that way. We always have to be a little hesitant, which can be misinterpreted. We'll never say something's impossible, even if we think it's very, very, very difficult. We can't say it's impossible because we are always being surprised by new things. And that itself is something that, so, if you ask a scientist, is MMR dangerous or is it perfectly safe? Well, we'll say, it's probably not dangerous, and yes, we think it's very safe. But they're never going to say, yes it's absolutely 100 per cent safe, because you never know, right? But the risks are incredibly minute that it's going to be unsafe. So [public engagement] is getting across things like that, how scientists think and work. It's getting across why, some might say, we have adult stem cells; why aren't you doing this work on adults? Why do you want to work on embryonic stem cells, which means destroying embryos, and why can't you do it on

adult stem cells? It's because often they have picked up half-truths on what's possible with adult cells, and so again, they can't make up their minds about technology if they don't understand it. Now, we are, so we're trying to be proactive in making sure that they understand particular areas of science.

In this comment, in which he responds to a question about his objectives at public meetings, Lovell-Badge (like Blakemore earlier) first cites a number of misconceptions that he feels the public may have with respect to 'what science is about' or 'how scientists think and work'. To make these points, and reiterating upon themes that have already been discussed, Lovell-Badge draws upon the contemporary scientific and medical controversy relating to the MMR vaccine, arguing that part of the explanation for the controversy lies in the public misinterpretation that arises when scientists are 'hesitant' rather than speaking in 'absolutes'. With these concerns in mind, Lovell-Badge then states that one of his objectives at public meetings 'is getting across things like that, how scientists think and work'. Drawing upon his own experience in the context of public understanding of stem cell research, he focuses on public misunderstandings relating to 'half truths on what's possible with adult cells', indicating that his objective in public meetings is to respond to and correct such misunderstandings. As he puts it, 'we're trying to be proactive in making sure that they understand particular areas of science'.

Other interviewees discussed public engagement in terms of responding to the potential for the public to have faith in therapies that they themselves consider to be dubious.

Stephen Minger: You know, they'll call me up and say, I just saw this clinic in Barbados, it's doing X, Y, and Z. Should I go there? And it's, like, no, of course not, you know. Why do you think it's in Barbados or in Tijuana or in India and not here. So, I mean, I think they are susceptible to hype in many respects, and also susceptible to people who sell snake oil. But I think [public engagement] is one thing I do that I think is really crucial, and I do it as often as I can.

Here, Stephen Minger discusses a particular objective of his public engagement work with patient groups. More specifically, he notes that the individuals that he meets in such interactions can be 'susceptible to hype' and to 'people who sell snake oil', in the form of dubious therapies that are not available in the UK, thus

reinforcing his view that public engagement 'is really crucial' and that he does it as often as he can. Dr Caroline Pennington, a researcher specialising in the genetics of cancer, makes a similar point in the extract below about the value of the 'open lab' events that she and her colleagues undertake, and also raises the issue of 'alternative medicine'. She describes the value of 'open lab' visits in direct proportion to her annoyance about 'bad science, and the bad way it's reported', noting that 'taking people around the lab' provides her with the opportunity to put the record straight, or to 'redress that a little bit' by emphasising the untested claims about alternative medicine.

Caroline Pennington: The other reason I think that I enjoy doing that is because it does really annoy me about the bad science, and the bad way it's reported. And taking people around and explaining things is a way to redress that a little bit. So, you know, the alternative medicine side of things, when things haven't been rigorously tested, and people ask us about that a lot when they come and look around the lab. And then I can explain why we wouldn't have faith in it, and why it hasn't been tested, and the scientific experiments you might have to do to test these things.

Chris Frith also makes this point within the context of his experience of the Meeting of Minds deliberative event on brain science.

Interviewer: Why did you get involved? Why did you say yes?

Chris Frith: I'm more and more interested in talking about my work to more general audiences. And also, in this particular case, I thought it was important, as I was saying before, that there are a lot of misapprehensions about what brain imaging can actually do and I wanted to find out whether people really did have funny ideas and try and correct them.

In response to a question about his motivations for participating in the Meeting of Minds event, Frith describes multiple goals, including the correction of 'misapprehensions about what brain imaging can actually do'. However, in the two-way spirit of dialogue and deliberation, Frith also confirms that, at the same time, he hopes to learn something himself, in this case 'whether people really did have funny ideas' about brain science. Thus, in

what emerges as a pattern of responses in the data set, an important source of the two-way value of public dialogue and engagement is not only to provide a context to apply pre-emptive corrective strategies, but to check – or test – if these are indeed necessary.

Finally, a number of interviewees' accounts of the imperatives of public engagement are embedded within their sense, as discussed in the previous chapter, that the public often has misconceptions of the value of science and scientists. Thus, many scientist interviewees described part of the value of public engagement events in terms of the opportunity to convey the sheer excitement and satisfaction that can be derived from scientific enquiry. Thus, for example, Stephen Minger emphasises the importance of providing inspiration to students as part of the effort to increase the public appreciation of science as a vocation, through public outreach to schools:

Stephen Minger: It's, A) I want the students to understand what we do scientifically. But, B) I also want them to see that science is, is great. You know, that it's exciting, it's challenging, it's fun, it's cool. It's not geeky. You know, you can be a geek and be cool. You know, you're trying to inspire the next group of scientists.

In his comment, Minger asserts that understanding science is about not just understanding how science is done, or the social value of science, but also the pleasure and pride scientists' take in their activities, and their sense of pursuing a career that is fun, exciting, challenging and even 'cool'. Reversing the stereotype of science as 'geeky' to celebrate science as 'cool' both acknowledges its negative perception as 'uncool' and seeks to challenge this.

Building public support and securing funding

As noted earlier, many of the interviewees identified the objective of public engagement as instrumental in building public support for – and public appreciation of the value of – specific and general scientific and medical projects.

John Burn: So basically, I think the message is, if you meet the public in an intelligent and sensible way, tell them what you are doing and why you are doing it, and as long as what you are doing is reasonable, then the British public is supportive.

Professor John Burn is a senior clinical geneticist at the Centre for Life in Newcastle. In this comment, he provides a succinct rationale for public engagement activities that also describes an underlying principle of exchange: in exchange for meeting the public in an intelligent and sensible way and providing a reasonable explanation of what you are doing, the British public will support your research. Notably, although this explanation turns on the provision of a 'reasonable' account of a scientist's activity, it also relies on basic social models of courtesy and politeness. Implied in his comment are three primary deficiencies that can lead this exchange to fail, namely treating the public as unintelligent, not meeting with the public, or failing to provide a reasonable explanation of one's research. Also noticeable in what is clearly a two-way model is its symmetry, summarised by the word 'sensible': if one party is sensible, the other is likely to be also.

For Dr Lyle Armstrong, a colleague of Burn, and one of the two UK scientists to be granted a licence to conduct hybrid embryo research, due emphasis must also be placed on explanations of what scientists are not doing. As Armstrong's account illustrates below, the sense for interviewees that public engagement is as much about explaining what scientists are 'not trying to' do as it is about explaining what scientists 'are actually trying to do' is particularly relevant in some areas. Once again, Armstrong draws a direct link between scientists taking time to meet with the public and give reasonable explanations of their science, and the public support that is needed to pursue their research.

Lyle Armstrong: Once we explain to people what we are actually trying to do, and that we're not trying to make some kind of weird chimera animal, which is half cow and half human, then people, once they have understood the concepts behind it, are often very supportive.

Evident in such comments are not only the social logics of exchange (in exchange for courtesy, good reason and good sense, the public will show goodwill), but an explicit recognition of science as being, in some respects, the subordinate partner in a

relationship often characterised as the opposite (in which science is the more powerful of the 'Science and Society' pair). As Austin Smith's comments below also indicate, this evolved understanding of the need for continuous interaction with the public acknowledges a recognition of indebtedness (science is dependent on the public) and that of an animated and contested social context in which scientists cannot afford to take public support for granted.

Austin Smith: But I think the thing that really makes a difference for, at least for myself, and I think it's true for many scientists, is that we are aware now that we are dependent on public funding whether that's from the government or from charities, and that that makes us vulnerable to public opinion. The public opinion is volatile, easily misled; we've seen that with views about animal research and we've seen that with views about genetic modification. Which is not to say the public don't have legitimate concerns, just as with embryo research, but scientists have to get out and articulate what we're trying to do, and why it's good and why it's for the benefit of society, because it's clear if we don't, there's plenty of other people who'll stand up and say this is evil, monster-creating stuff.

Significantly, like Burn and Armstrong, Smith conducts research with embryonic stem cells. In his comment, Smith argues that 'scientists have to get out and articulate' the benefits of embryonic stem cell research so that misleading information about the research is not left to occupy centre stage and so that the legitimate concerns of the public can be addressed by the scientific community itself.

Other interviewees discussed the relationship between public engagement and funding within the context of their work on specific diseases and conditions, and their resulting relationships with medical research charities and patient groups.

Clive Ballard: But I suppose doing that work for the Alzheimer's Society, it's not just about public information, a lot of it's about promoting awareness of Alzheimer's disease specifically, and also of the organisation specifically. As a charity, they're clearly reliant on public interest, public support, public donations, so it's important that the public are aware of the organisation and what they do.

Clive Ballard holds a university post and is Director of Research of the medical research charity and patients' organisation, the Alzheimer's Society. Initially, once again, Ballard alludes to the core objective of public engagement as a means of conveying information about the work done by the Alzheimer's Society. He then describes public engagement as a means of raising awareness of the disease and the organisation with the objective of securing the 'public interest, public support, public donations' that support his research and the other activities of the organisation. This therefore positions his scientific activity not only as part of society but as part of a social fabric in which patient groups and charities play a beneficial mediating role in the promotion of scientific progress.[15]

Here, Stephen Gentleman, who also works on dementia and has strong links to the Alzheimer's Society, discusses the relationship between public engagement and funding in slightly different terms.

> *Interviewer: Is this an aspect of developing programmes that are funded?*
>
> *Stephen Gentleman: Yes, obviously funding is part of what you're at in trying to raise the profile and if you put in the grant application that you've been part of these consultation bodies or whatever, that you have some insight into the real problems. You've engaged, you've found out that there's a problem, and you've had some public engagement. I think that really helps.*

Here, Gentleman states that he conducts public engagement partly to 'raise the profile' of his work among funders, adding that his public engagement activities are helpful in preparing grant proposals (the rising importance of public engagement activities in grant applications is discussed in more detail in the following chapter). At the same time, however, he stresses the importance of public engagement work to the scientific quality of his grant proposals, emphasising that it gives him 'insight into the real

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[15] The charitable organisation working in support of reproductive biomedicine and embryo research, the Progress Educational Trust, both provides a good example of the type of 'mediating constellation' of social actors that can be highly effective in promoting scientific research, and embodies in its name what Max Weber (1968) described as the defining social value of scientific activity.

problems' that people experience. It is worth adding here in relation to many of the comments presented above that several different senses of 'translation' can be seen to be at work in this and other similar contexts mentioned by interviewees. The translation by the scientist of his or her work serves to facilitate its progress, while the translation by patients to researchers of their needs may improve the design of scientific research. Both of these translation processes, in turn, may contribute to the current sense of scientific translation as the process whereby basic scientific discovery is 'translated' into applications that directly benefit patients and other users. Indeed, at the heart of the translational promise (for example from the perspective of HM Treasury) is a two-way, or reciprocal, 'virtuous circle', in which public support for, and investment in, basic science research will provide a 'return' of health and wealth benefits for all.

The suggestion that something like a model of this type is in the minds of many of the interviewees, according to their descriptions of engagement, is supported both directly and indirectly from the ScoPE data. Approximately three-quarters of the interviewees explicitly described a sense of reciprocal obligation for the funding that they receive, be it from medical research charities, patient groups, private philanthropy or public funds. As is discussed in more detail in the following sections, consequently, many of the interviewees also viewed public engagement as a means of reciprocation to these funding organisations and to the individuals who contribute to these funds, as well as to the general public.

Reciprocating to patients and carers: the 'virtuous circle' model

> *Chris Boyd: It's a kind of virtuous circle, in our case, in that we are funded directly by the CF [cystic fibrosis] Trust, and so it's our obligation I believe, particularly to engage with CF patients and their families, and other supporters of the CF Trust. … So, that the virtuous circle is the fact that, that by doing that, we hopefully encourage people to continue donating to the CF Trust, which funds our work, so it's, not a completely selfless exercise.*

Dr Chris Boyd leads a group working on cystic fibrosis (CF), and much of his work is funded by the national charity the CF Trust. In

his comment, Boyd uses the expression 'virtuous circle' to describe the reciprocal nature of his and his colleagues' relationship with the CF Trust: since the CF Trust provides research funding, the researchers who benefit from this funding have a reciprocal 'obligation' 'to engage' with a range of actors associated with the CF Trust, including those directly affected by the disease, and individuals who have raised money for the Trust. At the same time – and, here, Boyd's comment resembles some of those discussed in the previous section – he notes that this public engagement work serves the simultaneous purpose of 'encouraging people' to donate to the CF Trust. Thus, Boyd's 'virtuous circle' is completed: he works to enhance the efforts of the CF Trust, which in turn works to support his research on behalf of its members and all those who might benefit from improved treatments or even a partial cure. Importantly, Boyd acknowledges the benefits that accrue to him directly as a result of his involvement, noting that 'it's not a completely selfless exercise'.

Many interviewees' reflections on their funding relationships are suffused with the language of obligation, duty or responsibility. Professor Dylan Edwards receives funding from a local cancer research charity called The Big C. In the following extract, Edwards makes a similar point to Boyd, explicitly stating that he and his colleagues have 'a duty and a responsibility' to The Big C because it generously provides research funding. As Professor Edwards goes on to say, part of this duty or responsibility takes the form of providing feedback through public engagement.

Dylan Edwards: Yes, I think we do have a duty and a responsibility to [The Big C]. We certainly get some funding from them. They've been generous in supporting us, and I think, we have a responsibility, and that relates also into giving them feedback when a project is completed.

Here, as in a number of the examples provided in this and other chapters, what is noticeable from a sociological point of view is that the sense of duty as an individual or team to pursue research is embedded within a larger sense of producing social benefits for others – and indeed the frequency of explicit descriptions of a sense of duty to do so. Such comments strongly underscore the proximity of scientists' commitments to public engagement work as an expression of their vocation, or 'calling', as scientists.

In her comments on this issue, Professor Kay Davies, who works on Duchenne muscular dystrophy (DMD) and spinal muscular atrophy (SMA), explicitly extends this sense of 'duty' to informing the larger community of patients and carers affected by these conditions about relevant scientific progress in her field.

Kay Davies: I go to the Parent Project UK for DMD every year and tell them what I perceive to be the scientific progress. Internationally, I go to the Parent Project of the Spinal Muscular Atrophy Group in the USA in two weeks time.

Interviewer: And why do you do that?

Kay Davies: Because the parents provide some of the funding, but not all of it, and I just feel that we have a duty to tell them what's going on.

Interviewer: Right, do you find that it helps your work?

Kay Davies: Not necessarily, I think it helps them so I've always done it.

Initially, Davies mentions that she attends the annual Parent Project meetings of the medical research charities and groups that relate to her areas of research, and she specifically states that she does this to inform parents about the relevant scientific progress. In response to the interviewer's question about why she does this, Davies then explains that, since 'the parents provide some of the funding', she feels that she has a reciprocal 'duty to tell them what's going on'. Thereafter, in response to the interviewer's question about whether this benefits her own work, Davies responds that it does not 'necessarily' (perhaps suggesting the benefits are not direct), noting instead that she undertakes this form of public engagement because it helps the parents.

Reciprocating to society: being democratic

Other interviewees discussed the objectives of public engagement, and particularly public dialogue, as part of a wider set of reciprocal and democratic relationships with society within which decision-making is shared or undertaken in partnership with the public – again, as in the following comment, using the idiom of a circle to convey a two-way process.

Jolanta Opacka-Juffry: So, this is a full circle. So, our first interest is to inform the public for the public's sake because they deserve it, they need it, they want it, they are interested. They pay their taxes. They should know what happens with the money. And additionally, being well informed, they may play a better role when it comes to these kinds of contributions.

In this account, Dr Jolanta Opacka-Juffry, a neurobiologist, speaks of the multiple and interwoven objectives that emerge in many interviewees' descriptions of public engagement and public dialogue. Initially, within the context of funding from public taxation, Opacka-Juffry employs the same 'circle' metaphor as Boyd to evoke a reciprocal relationship with the public and the obligations that this places on both institutions and scientists. More specifically, Opacka-Juffry asserts that public engagement, or informing the public, is the right thing to do because the public provides funding for science through taxation; as she puts it, 'they deserve it…They pay their taxes. They should know what happens with the money'. Here, however, Opacka-Juffry also evokes two further linked objectives. First, she asserts that public engagement also has the objective of creating scientifically 'well informed' individuals and, second, as a result of this, that public engagement has the objective of creating individuals who are better able to substantively contribute to decisions about science – in sum to 'play a better role'.

Like Opacka-Juffry, Professor Geraint Rees, a cognitive neuroscientist who participated in one of the Meeting of Minds events, comments on the notion of an obligation to reciprocate the benefits of receiving public funding. Like other interviewees, and as we have seen earlier, Rees also explicitly extends this model of reciprocity beyond an individual set of obligations on the part of scientists to a broader, more inclusive obligation on the part of institutions (to which scientists might also contribute), all within the context of Western liberal democracy.

Geraint Rees: Most research is publicly funded, there is a public responsibility therefore to at least take into account, or feed into the processes, the views of those people who are doing the funding. I think that's just part of the political compact of Western society. …that's how society works. … political representatives are elected…to make decisions which include decisions about how much funding to give the MRC, how much funding to give the NHS, how much funding to give BBSRC, and so on. So, I think it's axiomatic to have public involvement in that kind of case. … The public has a right, and there is a need for the public to be involved in decision making, whether it's about GM foods or stem cell research or in vitro fertilisation.

Rees's starting point in this comment is his assertion that most scientific research is publicly funded. He then places this belief within readily available conceptions of Western, liberal democracy in which institutional 'responsibilities', 'public rights' and pluralism are emphasised. This, according to Rees, confers a very obvious ('it is axiomatic') 'right' on the 'the public' 'to be involved in decision-making' concerning funding priorities, as well as a 'responsibility' on the institutions of scientific governance to respond to broadly defined social or public priorities. This, Rees argues, is 'part of the political compact of Western society', it is 'how society works'.

However, although such reciprocal, democratic intents for public engagement and, particularly, public dialogue were identified by many interviewees, these comments were also in tension with a number of concerns about involving the public in policy- and decision-making. Here, Rees continues his comment on public involvement in policy- and decision-making.

Geraint Rees: The problems, of course, come about because the public are, by definition, not a professional body and don't necessarily make decisions about prioritisation on the basis of the same types of information as professionals would be making. …There's a hospital just down the street called Great Ormond Street which, of course, is incredibly well funded by charities…because children who are vulnerable and on intensive care units, everyone, of course, naturally wants to give money. But, old ladies with mental health problems living in a community, weeing on their beds, are not such a popular topic and schizophrenics living rough on the streets of London are even less vulnerable. Now, their healthcare priority on needs may or may not be equal, it's obviously a contentious issue how to measure them, but the point is obvious that sentimentality in that case, if you like, would vastly swing public priorities in favour of premature babies over vulnerable

young schizophrenics living rough. …And, also, of course, there's different time scales. You know public opinions like that can change quite rapidly over short time scales, whereas often research takes place over much longer time scales, you know, 50-year time scales. So, there are all these kind of tensions that, I guess, you've got to devise a system that provides checks and balances.

As part of this sophisticated account of what might be described as the politics of social reciprocity (or some problems with the virtuous circle), Rees raises two concerns about public involvement in decision-making with respect to healthcare issues. First, he points out that the priorities of the general public may be driven by sentimentality, and that this may lead the public to prioritise and support certain groups, such as children, over others, such as the elderly or homeless people with mental health problems. Second, he adds that the public can be fickle and that its priorities can change rapidly in ways that are incompatible with the timeframes of scientific research. Like many of the interviewees, Rees is reflective here, to the point of thinking in explicitly sociological terms about the paradoxical manner in which inequality and social exclusion can be reinforced by patterns of charitable giving. He recognises that these concerns are inherent to the democratic ideals that he earlier elucidates, and he argues that these tensions need to be managed through 'checks and balances' that require professional oversight.

Such tensions and intense reflection are very differently evident in the comments of Dr Catriona Morrison, an experimental psychologist who participated in another of the Meeting of Minds events, as she makes a slightly different point about the ambiguities of public involvement in decisions about the future directions of scientific research.

Interviewer: You mentioned that one objective of the public dialogue might be to gather public views about what research should be done. How does that strike you?

Catriona Morrison: I don't really like to think about that. I think the public are so ill-informed. I would be very frightened that the public really have much kind of involvement. …It's incredibly arrogant to say, but I just think that they wouldn't understand the value of a lot of what we do. It's a terrible thing to say, actually; I'm just kind of thinking, what on earth am I

saying here? The public didn't understand my science and therefore they've got no entitlement to comment on it, almost. It's not really what I think, but I don't really know what I think about it. I just think they just don't understand enough to comment.

The substantive question in Morrison's highly self-reflective comment is, if the public are 'ill-informed' and 'don't understand enough' about the value of the science that she and her colleagues do to meaningfully contribute to decisions about the research, what are the implications of this? Does this mean, perhaps, that upstream public engagement would necessarily involve ill-informed public vetoes of valuable scientific projects? These tensions are very evident in the spoken form of Morrison's comment, which is also notable for the extent to which she actively reflects on, and twice rescinds, her own comments as she is making them. Describing her own perspective as 'incredibly arrogant' and 'terrible', she asks herself 'what on earth am I saying here?' and then restates her view in order to examine it again. Her recognition of, and attempts to reconcile, the tension between her obvious commitment to public involvement in scientific decision-making and her concerns about public ignorance are palpable in both her self-interrupted speech and her conclusion that 'It's not really what I think, but I don't really know what I think about it. I just think they just don't understand enough to comment'. As a spoken response, this is literally equivocal – speaking in more than one voice. Morrison's ambivalence – one of the modern hallmarks of professional decision-making in contexts of uncertainty – is nonetheless an eloquent articulation of tensions that are clearly widely shared and, arguably, highly 'sensible'.

Improving science, improving scientists: 'a vision of a bigger picture'

Whereas the previous two sections have explored the many reasons for public engagement and public dialogue being the subject of both praise and critical reflection by scientists, the following section focuses on scientists' discussions of how public perspectives might contribute to an altered definition of polity in the form of public science.

Interviewer: I'm wondering, what does the public bring to policy?

Jolanta Opacka-Juffry: Well, the public brings a vision of a bigger picture. The public, as I understand it, sees the landscape maybe without the details on it. Details are below their resolution level but they see the bigger landscape. Whereas the research community very often sees the details very sharply, has a focus on the details and often forgets about the landscape. That's how I see it and that's why public input is needed to keep that large landscape in mind.

In her response to a question concerning the value of public views or perspectives with respect to the governance of science, technology and medicine, Jolanta Opacka-Juffry uses the terms 'the bigger picture' and 'the bigger landscape' to describe public views as knowledge. At the heart of her claim, and in common with the aforementioned views of sociologists such as Brian Wynne and Alan Irwin, is the assertion that the public offers a distinctive and valuable vision from which scientists, clinicians and institutions can learn. In her legitimisation of public knowledge, Opacka-Juffry emphasises that science is *one* – but not the *only* – way of knowing or seeing and thus must be complemented by *other* ways of knowing, 'maybe without the details on it'. Indeed, from this perspective, the micro-resolution of scientific knowing renders it somewhat narrow and parochial, and the very distinctive ability to see detail is seen to blinker its gaze. Thus, Opacka-Juffry argues that, for both scientists and the general public, what they know is related to what they do not know. Because scientists, or 'the research community', focus on the details, the bigger picture or the landscape can be obscured or 'forgotten'.

The idiom of 'adjusting focus' is similarly used by David Porteous in his comments on the value of public perspectives within the context of scientific projects.

Interviewer: Does it improve the science?

David Porteous: I think it improves the science in the sense that it adjusts the focus of the science. … So that has unquestionably been the case in our Generation of Scotland population study where we involved ourselves in a series of public engagements and MORI polls and questionnaires and set ourselves up to be questioned and queried about the

whole idea and to tease out all of the possible ethical issues. And that certainly informed the study design … our sort of fundamental approaches and context. … We're absolutely convinced that the project is stronger and better for having done that serious public engagement early on in the process. And not as a sop to funders or to the publics but as a fundamental component part, and that was something I was very firmly of the opinion should be built in right at the beginning.

The Generation Scotland study has the aim of understanding the genetic component of diseases among the Scottish population (http://www.generationscotland.org/). Here, Porteous comments on the extent to which he believes that an early series of public engagement activities made the 'fundamental' scientific aspects of this project 'stronger and better'. For example, he suggests that public engagement was able to adjust 'the focus of the science', informing the design and 'fundamental approaches' of a scientific study and 'teas[ing] out all of the possible ethical issues'. Once again, scientists' knowledge or perspectives alone emerge as potentially narrow and parochial, while the public is the site of meaningful ethical insights that have fundamental scientific relevance. Notably, at the end of his comment, Porteous distinguishes between doing public engagement as a 'sop to the funders or to the publics' and as a 'fundamental component' of a scientific project. Implicit in Porteous's comment is an acknowledgement of, and a scepticism toward, the idea that public engagement is merely a tick-box exercise for scientists that is undertaken without sincerity. This issue is discussed in greater detail in the next chapter.

For her part, an interviewee who wished to remain anonymous turned her attention to the value of public perspectives and knowledge within the context of the determination of national science-funding priorities.

Well, I don't know, but maybe they bring some kind of balanced perspective from a standing back point of view. So, whereas scientists have become very involved in their research, and it's the be all and end all, and they can see, because they've worked on it for many years, the potential benefit, let's say, or advances that could be made in that field. The public can give a more balanced view of whether the

advances in that field are actually what the country needs at this time. Or, whether it would be better to put our resource into funding something else like, for example, an alternative to carbon fossil fuels or something like that.

In this comment, the interviewee echoes Opacka-Juffry's emphasis on the highly detailed and expert knowledge of scientists; as the above interviewee puts it, scientists 'become very involved in their research', 'it's the be all and end all' and 'they've worked on it for many years'. She goes on to imply that with this expertise comes a potential 'lack of balance' – a narrowed subjectivity or a bias with respect to the broader social or national desirability, necessity and efficacy of their own research. She thus invokes a model of objectivity comprised not of one specialist perspective, but of a civic polity, in which diverse perspectives are mixed together to produce a more carefully evaluated outcome. This stands in contrast to the objectivity and neutrality with which scientists are commonly imbued, which, in this view, is reversed to alignment with a single perspective, and is thus diminished in power. Here again, as in Opacka-Juffry's comment, the public is able to take this balanced view precisely because they have *not* 'worked on it for many years'. This positive role of the public as both different from scientists and broader in outlook has a corollary in the view of the public as being more grounded or 'down to earth'.

Stephen Gentleman: They do tend to bring some scientists down to earth, to a more basic level, where they may have got a little bit esoteric and blue sky, and they bring it right back down to earth like what's this going to do for my husband, etc. … I think the lay voice is the voice of reason in some ways. I mean you can get carried away with your own research and not be able to apply it to the real world particularly. … Actually it really helps when you go back to the lab and realise there's a real reason for doing this that may not always be apparent when you're just stuck in the lab.

Stephen Gentleman is a laboratory-based pathologist with no clinical responsibilities; as he put it in interview, he 'looks at brains all day but not people'. In the above comment, Gentleman compellingly explains the value of patient and carer input in his work, through the lens of his experience of working with lay members on Alzheimer's Society panels. Notably, Gentleman draws a strong distinction – or, to put this another way, identifies a

significant gap – between patient and clinician, or lay concerns and those of scientists. For Gentleman, again in contrast to a view of the public as lacking knowledge or as having less knowledge, lay concerns articulate 'the voice of reason' precisely because they are at 'a more basic level' and more personal ('what's it going to do for my husband'), reflecting the 'real world'. By contrast, Gentleman suggests that the concerns of scientists have the potential to become 'esoteric and blue sky', 'carried away' and, by implication, detached from the 'real world'. Thus, for Gentleman, scientific perspectives on their own are valuable, but are insufficient in and of themselves to the task of enabling science to respond to the 'real lives' of patients and their carers. Thus, returning to the theme of translation mentioned earlier, the objective of public engagement is to close the gap between basic scientific research and the concerns that emerge from patients' lived experiences in pursuit of an improved, more patient-focused science. Thus, in Gentleman's case, it is his interactions with patients and carers that have served to remind him of the 'real reason for doing' his research, leading to changes in his research goals and the design of his experiments. Indeed, many scientists gave 'upstream' examples of this kind, often based on a sense of personal conversion.

The final remark in this section does not represent a broadly observable theme in the data. Nonetheless while it is a further example of the ways in which public engagement might improve science, it is also a striking endorsement of the emerging significance of public engagement to notions of what it means to be a professional scientist (discussed in greater detail in the following chapter):

Geraint Rees: One way in which I sometimes see public engagement is as an extension of communication skills of science in general. I see writing a paper as a continuum with all the public engagement activities. Science doesn't exist unless it's published, that's my personal viewpoint, and so to that extent, I see public engagement as part of the professional development activity. You need to learn to be a more effective communicator that feeds back into professional communication. I'm not sure that's always picked up on as either a promoter or a positive reason to do public engagement for scientists. … I mean, writing papers is a fundamental skill. There are different sorts of papers you

write, and high impact papers, such as published in journals like Nature *and* Science *are shorter, more condensed, more abbreviated versions of the longer papers. Generally speaking, it's relatively easy to construct a long paper, which has a very stereotype format, and you just transit through the findings, and transit through the discussion and say, that's fine and off we go. Short format papers, which I guess some of us around the table have been lucky enough to be involved in writing, are a harder sell. They're harder to construct. It's not just the quality of the science and the scientific findings, it's how you communicate them and put together a coherent and straightforward argument that can be understood by a general audience, because these journals are not specialist journals in the jargon. They're generalist journals appealing to a wide variety of readers, and so some of the skills, I think, that you need to construct that kind of argument, logic, the language you need to deploy are not dissimilar to the way in which I certainly think about preparing the public nature, how to employ and simplify and omit unimportant details to the main scientific story, to communicate to the masses.*

Here, in a comment made at the ScoPE workshop on 19 June 2009, Rees makes a strong case for the role of public engagement in enhancing his professional abilities as a scientist, strongly echoing the translational motif evoked earlier. Thus, translating scientific and technical forms of language and argument into forms that are understandable to the public also has relevance to his own professional scientific communication and his professional advancement, and vice versa. In describing argument and the use of language and logic, as well as emphasising the importance of incorporating feedback as an essential skill, he depicts a continuum of communication in which listening is as important as speaking or writing.

Inspiring and delivering the future scientific labour force

As discussed earlier in this chapter, activities with children and young people – whether in the lab, at schools and colleges, in museums or at science festivals – are central to the interviewees' understandings of public engagement. While these specific activities have a variety of objectives for the interviewees, they are always related to inspiring and exciting young people and somehow contributing to the delivery of the future scientific labour force.

David White: At one level, it's the excitement of science. Let's take one thing we did, this was part of a wider range of activities in a large public area in Norwich called The Forum. We ran something which was, how tall can you build a jelly? Now, it turns out that you can't build a jelly more than about four inches tall however you try. And so, who was going to build the tallest jelly? So, what has that got to do with food? Well, it had a little bit to do with food structure. But it had quite a lot to do with getting people interested and asking questions that were related to science. Now was that information, or was that excitement? I would say that the information content was little, four inches of jelly. But getting people to think about why, and getting people to think of the science is another way, is another thing.

Many of the interviewees spoke of the importance of enthusing, exciting and inspiring young people (and adults) with respect to science, technology and medicine. Although he has now retired, at the time of the interview, Professor David White was Director of the Institute of Food Research. In this comment, White again speaks to the multiple objectives that scientists evoke in the context of public engagement. Using the example of his 'how tall can you build a jelly' event, White's question 'was that information, or was that excitement?' points to the often indistinguishable nature of these imperatives in the minds of scientists and their own awareness of this multiplicity. In the specific context of school children and young people, such desires to enthuse, excite and inspire were very often associated with the objective of delivering the future scientific labour force.

Lyle Armstrong: I mean our university tries to get us involved in these things, because they want to recruit new potential students, in the future. They want children in schools these days, to look upon science as a worthy pursuit, something that's interesting and is a lot better than doing media studies, or sport, or something, and Britain certainly needs more scientists.

Here, Dr Lyle Armstrong discusses this objective within the context of visits to local schools. At the end of his comment, Armstrong

defines the problem: 'Britain certainly needs more scientists'. Within this context, then, for Armstrong, activities with children and young people serve the larger scientific goal because they are designed to 'recruit new potential students, in the future'. As Armstrong and other interviewees suggest, this is generally seen to be achieved by encouraging children to view science as a pursuit that is both 'worthy' and 'interesting'. In addition, Armstrong evokes an image of an open and competitive study and labour market in which science must compete with other study and career options such as media or sport.

Pushing science through parliament

Working with parliamentarians and policy-makers was not among the activities that were most often cited by interviewees as a form of public engagement. However, among those who did, this dimension of public engagement was vitally important. Lyle Armstrong, Robin Lovell-Badge, Stephen Minger, Chris Shaw and Austin Smith were among those who had contributed to scientists' considerable efforts in the years leading up to the successful passage through the UK parliament of the revised Human Fertilisation and Embryology Act in 2008–9. Although the range of relevant issues broadened as the bill passed through parliament, these scientists' efforts were focused on ensuring that scientific research using stem cells derived from a particular form of human/animal hybrid embryo was permitted under the terms of the Act. As one of the two UK scientists to have been granted a licence to undertake such research, Dr Stephen Minger took a prominent role in scientists' activities in this regard. Minger offers this account of the parliamentary work after the successful passage of the bill:

Stephen Minger: So I think my involvement with parliament, which I also view as public engagement has been really important. You know, at this reception last evening, basically I was told by several members of parliament that 'if you guys hadn't fought for the issue, you wouldn't have gotten it'. You know, that the government was determined at that time, and 18 months ago, to ban this research. … And, I mean, it was a tremendous thing that collectively we did together with other scientists and with patient charity organisations and with the media to push this through. So I think going in and briefing

ministers and MPs is really crucial, particularly when the science is pretty tough, as this was.

As Minger states, scientists worked on this issue in collaboration with patient groups, science journalists, press relations experts, social scientists, lawyers and members of parliament (MPs). They devoted considerable amounts of time to briefing ministers, MPs, civil servants and the media, as well as meeting with opponents of stem cell research and conducting public engagement activities. Indeed, the night before Lovell-Badge was interviewed for the ScoPE project, he had been at Westminster until midnight drafting the proposed legislation with government lawyers. As Minger noted, 'the government was determined…to ban this research' and it was necessary to 'push this [science] through' parliament. The successful outcome, he emphasised, was 'a tremendous thing that collectively we did together' (for other perspectives on this coalition, see Watts 2009). For many scientists, such collective efforts, through which a political battle will be won or lost, with the result that particular lines of research may be banned, are reminders that public engagement can make a dramatic difference.

Lyle Armstrong: It was an interesting exercise, that's certainly true, and it took me to areas of British society that I would never have ordinarily expected to have gone, not as a scientist. But I think it was a very valuable exercise, because essentially the government seems to have changed its mind.

Dr Lyle Armstrong is the other scientist to have been granted a licence to conduct hybrid embryo research in the UK, and here he reflects on his experiences of what he describes as a novel and unexpected set of activities that took scientists into a range of novel social contexts or 'areas of British society'. Through this novel form of public engagement, scientists become overt advocates and lobbyists on behalf of their science, and in doing so must become hybrids themselves – part politician, part advocate, part sociologist and part biologist.

'Knowledge is power': enabling the public

Earlier in this chapter, scientists' desire to educate the public or put the record straight through public engagement was discussed. For many of the interviewees, this objective is seen as a route to the

subsidiary objective of enabling the public or facilitating action by the public.

Interviewer: So pushing that a bit further, why is it important for the public to know the value?

Catriona Morrison: Because, well, knowledge is power. Knowledge is, you know, a good thing. It has to be good to be aware; knowledge gives you choices and opportunities.

In her emphasis on the enabling potential of knowledge in general, Catriona Morrison restates the Baconian maxim that 'knowledge is power' and suggests that the public is enabled by knowledge or awareness because it brings with it 'choices and opportunities'. Science becomes knowledge and thus a means to an end, or a route to action, for a public that is envisaged here as an active user of scientific knowledge. For her part, Dr Sarah-Jayne Blakemore identifies two specific ways in which scientific understanding empowers the public.

Sarah-Jayne Blakemore: Another reason why public engagement in science is important is so that people have more understanding on which to base decisions like, do I give my child the MMR? It's just really crucial that they understand. … And also to have a say in science itself. To have a say in what science is done.

As previously mentioned, Blakemore works on social cognitive development and processes, and specialises in autism. Here, as in her earlier comments, her description of public engagement is embedded in concrete examples drawn from her first-hand experience; as an example of the kinds of decisions she is talking about, Blakemore draws upon her own work on autism through her reference to enabling the public to make decisions regarding the much-discussed MMR vaccine. In these comments, she further illustrates the ready manner in which interviewees ascribed multiple interwoven objectives to public engagement. Initially, she emphasises the value of enhancing the public's understanding of science so that they can 'base decisions' on this knowledge – decisions such as whether or not to vaccinate their children. In the second form of public action envisaged by Blakemore, like Opacka-Juffry, she connects this understanding of science to a wider vision of polity – in which it is scientific understanding that enables citizens 'to have a say in what science is done'. Here,

Blakemore evokes a model of what might be described as scientific citizenship, in which parenting decisions are linked to scientific understanding in a manner that also enables greater civic participation in decisions about scientific research. Underlying this model is the basic equation of scientific understanding with empowerment articulated above by Morrison.

Testing science and gauging public opinion: 'the vibe coming back'

At the outset of this chapter, the range of objectives that Kay Davies ascribed to the Royal Society pharmacogenetics public dialogue project were discussed, including her suggestion that such events offered the opportunity to test the public acceptability of pharmacogenetics technologies and to learn from public responses. This theme was also mentioned by other interviewees who had similarly experienced public engagement and public dialogue as a valuable means to gauge public responses to science – what John Burn referred to as 'the vibe coming back'.

John Burn: The value [of the vibe coming back] is that when you end up in those three-minute debates on News at Ten, *and [a prominent spokesperson against stem cell research] says that what I am doing is immoral and illegal, as (s)he did on one evening occasion, I simply said, it's not illegal, it's not immoral, it is perfectly reasonable, and people support it … I was confident because I had tested it in conversations with real people.*

In this account, Burn reflects on the value of testing the public acceptability of stem cell research through public engagement or, as he puts it, 'conversations with real people'. For Burn, such conversations increase his confidence that 'people support' stem cell research, and thus aid him in fending off challenging opponents in the context of interviews on national television. For Burn, the truths – or the 'vibes coming back' – that emerge from first-hand experience of public engagement reinforce his maxim, described earlier, that if scientists take the time to meet with the public, to answer their questions, to acknowledge their concerns and to give a reasonable explanation of what they are doing and why, the British public will be supportive in return. Here, he amplifies this maxim by adding that the close proximity of a

conversational engagement has an added bonus of boosting his confidence and resolve to defend science against opponents. Again demonstrating the two-way model that in so many of the interviewees' comments emerges as paradigmatic, he is able to respond succinctly and confidently to an opponent of his work who accuses him on *News at Ten* of conducting research that is immoral and illegal: 'I simply said, it's not illegal, it's not immoral, it is perfectly reasonable, and people support it … I was confident because I had tested it in conversations with real people'.

That the value of being in touch with public concerns about controversial areas of scientific research was repeatedly mentioned, particularly by stem cell scientists, is not surprising given the time period of the study. Sociologically, these comments are notable not only for their content (that listening carefully to people's concerns can both assist your credibility and your ability to represent them), but, once again, because of their implications for the role of the professional scientist and, in particular, the scientist's sense of vocation. In the following extract, Robin Lovell-Badge looks ahead to one of the many public engagement exercises in which he and other scientists participated during the public and parliamentary debate of the new Human Fertilisation and Embryology Act:

> *Robin Lovell-Badge: On Saturday I'm doing this focus group of 40 people in London and we'll take them through the science of stem cells. ... I think it's very important to understand what the social concerns are and what people are worried about, why they're worried about what they're worried about, who they trust, what sort of arguments will convince.*

The transition we describe as the 'shift from deficit to dialogue' is here both illustrated and given an important corollary. Anticipating an event with a familiar format, Lovell-Badge describes his forthcoming role as a traditional pedagogical performance, of sorts, in which he will 'take them through the science of stem cells' by presenting an overview of the basic scientific facts. After completion of this mini-lecture, discussion will ensue, and here he expects to change gears, no longer giving out information but instead hearing about concerns and in particular 'worries': 'what the social concerns are and what people are worried about, why they're worried about what they're worried about'. In this context the role of the scientist is significantly transformed from

experimentalist, knowledgeable authority or published author to something much more pastoral, personable and caring. The shift from deficit to dialogue is thus accompanied by a shift from scientific reason to public reasonableness, and from distant rational authority to proximate discursive exchange, in which affective qualities figure prominently. That Lovell-Badge is not simply 'giving out' but is receiving something in return is evident in his references to trust and persuasion. As both his and Burn's comments illustrate, the value of such exchanges lies in their ability not only to reveal what people know but to explore how they feel and, at another level, what they want. Successful public engagement, like most successful social exchanges, are not only two-way but at some level also symmetrical. It is thus through *the exchange of concerns* that the value of public engagement is increased.

Personal reward and curiosity

Continuing the theme of what 'comes back' from public engagement and conversations, many of the interviewees described such events as personally rewarding – in some cases for reasons they did not initially appreciate or for reasons that differed from what they might have assumed before taking part.

> *Interviewer: Well, that's really interesting, Austin, because it sounds as if you're saying that there's pretty much nothing that a non-scientist can say to you that will have any value to you as a scientist. Is that putting it too strongly?*
>
> *Austin Smith: I'm just tying to think, is there any reason why I would reject that statement, and it's probably essentially correct. But that is a different thing from whether I personally might get any reward from speaking with the general public. It actually is very rewarding to do these things. When people say, thank you for making that clear, now I understand this, or you talk to patients' groups with Parkinson's say, and they say, we just want to know somebody is working on the problem. So that makes you feel good, but it doesn't change your basic scientific approach, that's already set.*

Austin Smith's comments here are notable in two respects. He notes that he finds it rewarding when people tell him that he has enhanced their understanding or that they are pleased to know

that he is 'working on the problem', for example Parkinson's disease. In addition, like Kay Davies earlier, he includes in his description a recognition that direct contact with scientists working on problems related to disease can be of value in and of itself for patients who are suffering as well as for their carers. Unlike Stephen Gentleman's comments earlier, Smith is firm in his assertion that no amount of contact with patients is likely to affect his basic research design, which Smith describes as 'already set'. A sense of reciprocity nonetheless infuses his sense of being rewarded and his appreciation of being thanked.

For Dr Jolanta Opacka-Juffry, public engagement is 'hugely rewarding' in ways that evoke the pleasure of sociality and human connection in and of itself.

> *Jolanta Opacka-Juffry: It's hugely rewarding. It's that kind of pleasure which you can derive from a conversation with a, say, randomly met stranger of perhaps a different cultural background and suddenly you realise that you're clicking and you understand each other.*

For Opacka-Juffry, reward comes from the emergence of shared or mutual understanding, a realisation, as she puts it, that 'you're clicking and you understand each other' despite other social barriers and uncertainties that might impede such a connection. Thus, she implies, part of the reward lies in the sense of overcoming obstacles.

Within the specific context of more formally structured public dialogue events, personal curiosity was sometimes mentioned as a motivation for participation.

> *Bill Newman: Not having been involved in that type of situation before where there was that type of patient forum designed in that way, I was really quite interested to see how would it work, what the structure would be, how the conversation would be facilitated. So I think it was more my own sort of curiosity to see.*

In the above comment, Dr Bill Newman responds to the interviewer's query about why he agreed to participate in the Royal Society pharmacogenetics public dialogue by stating that he was personally curious about, or 'really quite interested' in, a variety of rather practical or methodological aspects of the process or event. Professor Geraint Rees makes a similar point – he was curious,

'intrigued', and he wanted 'to find out more' – in his response to the interviewer's question about his motivations for taking part in the Meeting of Minds public deliberation on brain science.

> *Geraint Rees: Curiosity, an altruistic and somewhat foolish desire to help out somebody who wants a panellist. Yeah, curiosity, intrigue, just it seemed like an odd thing so I was intrigued to find out more.*

In their discussions of their own personal curiosity, both Newman and Rees notably reveal the high levels of autonomy that scientists currently enjoy with respect to their public engagement activities. This is a key theme in the next chapter on the role of public engagement in the working lives of professional scientists.

Summary

Interviewees were familiar with the term 'public engagement' and understood it to describe a wide variety of activities that are undertaken for a wide range of purposes and sponsored by various sectors. The existence of a distinctive activity known as 'public dialogue' was less familiar to interviewees and was most often understood as a characteristic of an activity and only sometimes as a specific activity.

The in-depth analysis of interviewees' perceptions of public engagement and dialogue activities presented in this chapter confirms the importance of the two-way dialogic model within the scientific profession. Descriptions of the benefits of public engagement included those to science in general, individual scientists, patients and their carers, students and young people, 'the public at large' and 'society as a whole'. Many of the interviewees' perceptions of the value of public engagement were based on first-hand experience of it, often accompanied by a 'conversion narrative' of sorts, in which interviewees described unexpected enthusiasm for this type of activity in spite of its potential limitations, time-consuming nature and unconventional demands. Interviewees discussed public engagement as a means of accessing the highly valuable substantive contributions that the public can make to identifying scientific priorities, improving scientific projects, positively refocusing scientific objectives and improving clinical practice. Further, public engagement was often discussed as 'the right thing to do'; here, highly reciprocal

relationships with patient groups, medical research charities and society in general were evoked by interviewees.

The purposes that the interviewees attributed to public engagement are often best understood within the social context of the specific form of science, research practice, medical application or technology that they specialise in. For instance, scientists working in controversial areas such as stem cell research often emphasised the contribution that public engagement makes to ensuring the social conditions within which their research is possible. Often at the same time, scientists working on specific diseases or conditions also emphasised the importance of public engagement within the context of a reciprocal relationship with relevant patient groups and medical research charities. At other times, these objectives were rooted in broad-based issues relating to relationships between science and the public in general.

CHAPTER 6 SCIENTISTS ON: PUBLIC ENGAGEMENT AND THE PROFESSIONAL SCIENTIST

Introduction

When asked, many interviewees were straightforward in confirming that they now consider public engagement to be an important aspect of their role as a professional scientist.

Interviewer: So, would you say that by now public engagement is part of what it means to be a scientist?

Stephen Gentleman: Yes.

Interviewer: It's an aspect of the profession?

Stephen Gentleman: Absolutely.

The suggestion that public engagement has become an established component of many scientists' professional lives as part of a 'sea change' in professional scientific culture, arguably over a relatively short period, is clearly reflected in Stephen Gentleman's succinct, firm and positive – yet not atypical – responses to the interviewer's enquiries about whether public engagement is now an aspect of the scientific profession. Indeed, many interviewees, including John Burn, suggested that public engagement skills – or communication, as he puts it – are as important an aspect of scientists' professional repertoire as scientific, clinical and administrative skills.

John Burn: Sometimes we have had debates about whether it is more important to be a good communicator, or a good scientist, or a good clinician, and I just felt like saying, well which of the four wheels on your car is the most important one? Actually, if your car's not going to fall over, you need a good communicator, a good scientist, a good clinician, and a good administrator, and if you can do all four, you have a good car, and it will roll, but if you lose any of them, then you will have a problem. I'd rather not have to compare them, but would simply argue you need all the capacities and you pick people who can do it all.

Through likening these skill sets to the wheels of a car (other interviewees also emphasised teaching in this regard), Burn makes a powerful case for the centrality of public engagement in terms of what it means to be a contemporary professional scientist. In this account, and those of many other interviewees, public engagement is confirmed to be a core aspect of professional science.

At the same time, all of the interviewees described a number of underlying challenges, contradictions or tensions regarding the place of public engagement in the professional working lives of scientists.

Geraint Rees: I think scientists are increasingly, as a group, interested in engaging with the public and wider society, but face a number of barriers -- primarily that engagement with the public is not necessarily helpful to their professional advancement, and indeed, there can be disincentives that engagement can be harmful to their professional advancement.

Initially, Rees make a similar point to Gentleman in his observation that 'scientists are increasingly interested in engaging with the public'. However, he immediately alludes to 'a number of barriers' to public engagement by scientists, noting that public engagement is 'not necessarily helpful' to scientists or can be 'harmful to their professional advancement'. In so doing, Rees captures a basic contradiction that runs through many of the interviewees' discussions of the current place of public engagement in the professional lives of scientists: while public engagement is becoming an increasingly important aspect of scientists' professional lives, it retains an ambiguous role in the systems of incentives, rewards and priorities that govern professional scientific advancement, and it brings its own professional challenges.

Perhaps in part for this reason, all of the interviewees noted the general desirability of more formal structures for the institutional incentivisation, assessment and reward of public engagement activities by scientists. However, such a development was also seen by most of the scientists to bring with it a range of troubling tensions and problems.

Chris Boyd: I can see the attraction of including [public engagement] as part of professional assessment or at least a mark of esteem to use the best word. But what I would find difficult about it is how would you measure it. If there was a quota system, it would be a disaster because [scientists] would fill the quota, but they wouldn't necessarily be engaged

to do it. So as soon as you make it a compulsion like that, you get the problem of people meeting their targets but not necessarily engaging with it. So I'm going to reserve judgement on that, I'm not going to come down either way on that. It's an attractive idea, and there should be encouragement for people to engage, but the point is I'm not sure whether it should be a part of their professional assessment.

In common with all of the interviewees, Chris Boyd initially confirms that he sees the benefits of more meaningfully assessing and rewarding public engagement. However, both at the beginning and the end of his comment, Boyd draws a distinction between informal modes of incentivisation – for example, as 'a mark of esteem' or through 'encouragement' – and formal modes of assessment, as 'part of their professional assessment'. In common with many interviewees, Boyd identifies practical obstacles to the measurement of public engagement activities and describes significant drawbacks to the formal professional assessment of public engagement through 'quotas', 'targets' and 'compulsion'. Thus, Boyd underscores the presence of a troubling tension, and a sense that something important might be lost, at the heart of otherwise understandable desires to formalise the assessment of public engagement activities. Boyd associates such measures with a loss of sincerity: 'as soon as you make it a compulsion like that, you get the problem of people meeting their targets but not necessarily engaging with it'. These issues are explored in more detail in the following sections.

Rewards, incentives and lip service

For all of the interviewees, the key reason that public engagement is not necessarily helpful to scientists' 'professional advancement', as Geraint Rees put it, is the ambiguous place of public engagement in the current reward and incentive structures that direct the priorities of scientists.

Sarah-Jayne Blakemore: More and more scientists are willing and encouraged to engage with the public which must help a lot. I mean, now on grant applications and that kind of thing, there's a whole huge space for your public engagement

activities and if you're doing none it doesn't look very good. So people are definitely encouraged. … I don't think it's just lip service anymore. I think really people do actually, reviewers comment on how much you do this and that kind of thing. In their reviews of your grant application and I think it makes a difference. I don't know but I think on a whole it probably does. And yet there are all these problems because it doesn't count as part of the RAE, public engagement doesn't factor in there at all.

Many interviewees, like Blakemore, complained that public engagement is not meaningfully rewarded within scientific reward and career structures the way that other scientific activities are (such as research and publishing, professional activities and, where appropriate, teaching and clinical activities). Existing incentives for public engagement, such as those developed by research councils and funding bodies, were the subject of mixed assessments. For instance, interviewees noted that they are now routinely required to discuss the ways in which patients' and carers' perspectives and experiences have informed their scientific research questions in biomedical grant funding proposals. Similarly, many noted that they are required to document the public engagement activities that will be undertaken as part of the planned research. Further, they observed that reviewers now comment on these issues when they review grant funding proposals. Interviewees also reported that scientists are encouraged to participate in public engagement activities by their institutions and that various forms of support are available for these activities. However, the general impression from the interview data as a whole is of an uncertain, mixed and developing scenario in which there is concern among scientists about the influence and sincerity of these incentives and, in particular, about the implications of their further institutionalisation (including through the Research Excellence Framework).[16]

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[16] To reiterate, in the UK, until recently, the quality of the research outputs of university departments has been assessed every seven years through the Research Assessment Exercise (RAE), which is used to determine future core funding levels of all UK universities from government. Following the 2008 RAE, the existing system of assessment is set to be replaced by the Research Excellence Framework (REF). Following an announcement by the

While acknowledging that public engagement is now part of the scientific profession, and nominally a component of its formal reward structure as part of funding and promotion decisions, Austin Smith raised a concern that public engagement is nonetheless not taken as seriously by institutions as it should be. Indeed, he suggests it is 'completely discounted' within both scientific grant funding systems and institutional appraisal or promotion criteria:

Austin Smith: What you'll find is the funding bodies and the universities will say, oh, that's great, and then when it comes to your next grant application or particularly your promotion application with the university, [public engagement] is just completely discounted.

Bill Newman: I'm afraid to say I think a lot of scientists pay lip service, they see that the application form says there needs to be public engagement, they tick it and say, oh, we've spoken to so and so from this group. And that will be the sum total of their public engagement until they write their report and then they get on the phone and get some feedback. … It's relatively new so there's always going to be a lag period. I think people are generally getting better. And I think that it's higher up the agenda and you do get more of a sense that people are starting to talk about it.

Bill Newman reflects a similar concern in his use of the term 'lip service' to describe the apparent insincerity of many scientists with respect to public engagement. In the above comment, Newman also evokes a negative image of public engagement as a tick-box exercise or as an afterthought that scientists go along with but do not take seriously. In reflecting on the relative novelty of public engagement, Newman then acknowledges an inevitable 'time lag' or delayed reaction and identifies a more positive, evolving scenario characterised by improvement over time, noting that 'people are generally getting better', 'it's higher up the agenda' and 'people are starting to talk about it'. However, Dian Donnai, a

colleague of Newman, takes a more equivocal or ambiguous view of the emergence of institutional incentives for public engagement. While acknowledging increasing recognition among scientists of the importance of meaningful public engagement statements in grant applications, she remains of the view that many scientists remain naïve about what this might mean in practice and about the importance of public engagement.

Dian Donnai: If you look at any grant application form, nowadays, in biomedical sciences, there is always a section for how you engaged the public, and it's a very naïve person these days, who just puts down, I have asked the patients, who've come to my clinic, whether they think this is an important study. That won't tick the box, so I do think that people are recognising that to get the grants they need to do the research they want to do, that public engagement is a factor. So, I think that is emerging in the scientific consciousness and I think that is important. I still think, because a lot of people are quite naïve about, what public engagement means, and I think just asking a few patients in the clinic whether they think it's a good thing.

Geraint Rees raises the possibility that lip service is also paid to public engagement in the context of grant funding review panels. Despite the fact that grant reviewers routinely comment on scientific researchers' plans for public engagement, Rees suggests that these plans do not figure in the deliberations of review panels, even in the face of 'two equally scientifically valid projects'. Thus, Rees points to an apparent contradiction between institutional commitments to the importance of public engagement and the provision of meaningful rewards for public engagement through institutional funding systems.

Geraint Rees: Then most review panels look at [statements about public engagement in grant proposals] and think, oh good, yes, that's fine. I don't know, but I perceive that lip service is sometimes paid to that aspect of it. I don't think I can think of a single example from my professional reviewing where in a critical funding decision, people say, well, let's look at the public engagement and use that to decide whether to fund these two equally scientifically valid projects, let's fund the one that's got better public engagement.

Science Minister Lord Drayson, it now appears the 2015 REF will include some form of assessment of both public engagement and policy impact in addition to the existing evaluation of scholarly impact.

The picture created by these comments is one in which many interviewees express an uncertainty, or sometimes scepticism, toward the sincerity of institutional incentives for public engagement. Instead, interviewees' incentives or motivations for public engagement appear to be derived from their own personal commitment to the objectives discussed in the previous chapter. This theme is further developed in the next section.

The '80-hour week', the scientific day job and voluntary public engagement

Almost as one, interviewees also associated public engagement with the overwhelming time commitment they feel they are obliged to – and, indeed, prepared to – make in order to pursue a successful scientific career.

To achieve reasonable success as a scientist is something like an 80-hour week, minimum, I think. Just trying to keep your head above water with teaching, research grants, research papers, and various commitments on public panels, like research council panels or one of the funding bodies. It's a committed job being a scientist, it's a vocation job, really, rather than a nine to five type job.

Here, in response to a question about the professional implications of public engagement, an interviewee who preferred to remain anonymous answers in terms of the rigorous commitments of her profession. Observing that it is not possible to conduct a scientific career within the bounds of a normal working day or week, she suggests that science is not a 'nine-to-five job', instead requiring an '80-hour week, minimum'. The interviewee goes on to list the long-standing core professional priorities of scientists; as well as the research, teaching and professional activities that she mentions, clinical work must be added in the case of many of the interviewees. This, then, is the already overloaded '80-hour week' into which the interviewees perceive that public engagement has more recently entered.

Thus, as previously noted, public engagement emerges as an anomalous activity; it is an increasingly important aspect of the scientific profession yet remains outside the incentive and reward systems that inform scientists' core priorities and responsibilities.

As a result, public engagement is seen by scientists as an activity that is additional to the scientist's already overloaded day job. Within this context, a scientific career emerges as 'a vocation job', requiring exceptional commitment. As Robin Lovell-Badge notes, the time spent on public engagement and media work is always time that might have been spent doing something else and, in particular, addressing the core responsibilities of scientists to their lab and their research.

Interviewer: Is [public engagement] something that you consider, at least by this stage, to be part of your professional role as a scientist?

Robin Lovell-Badge: Yes I do, for myself. … It clashes in some ways with what we do, my day job, which is to do science and research, publishing and all that. So if I spend lots of my time talking to the media and dealing with these debates and all this other stuff, then it detracts from the time I can spend dealing with my own research and my lab and what I care about.

Initially, in this comment, Lovell-Badge confirms that he considers public engagement has now become part of his professional role as a scientist. However, he immediately qualifies this by adding 'for myself', indicating that this is a personal choice and not for everyone, which he follows with an explanation that public engagement 'clashes in some ways' with what he describes as his 'day job, which is to do science and research, publishing and all that' and is thus potentially to the detriment of his core research priorities.

As previously mentioned, Clive Ballard specialises in dementia and holds research posts at the Alzheimer's Society medical research charity and at King's College London (KCL). Here, he begins to address what public engagement is, if it is not part of the 'day job'.

Interviewer: I'm wondering to what extent at this point you see public engagement as part of the professional role of a scientist, perhaps either for you or in general.

Clive Ballard: Well, for me, it certainly is within my role in the Alzheimer's Society I guess. Within my role at King's, I do feel personally a responsibility to do that, but I mean, the kind of events that are set up or organised in that context are far

fewer, so it's a much smaller call on time. … I think most people have been quite supportive of those kinds of events when they've happened, but it's not a key priority, it's not in anyone's job plan. It's something that people are doing out of goodwill, and probably they're quite happy to do it, but it's almost like a voluntary additional thing rather than a core responsibility.

Interviewer: And does that imply particular problems or challenges?

Clive Ballard: Well, I think it probably does. I think it means that if that goodwill doesn't exist, then it's not going go happen, and their appraisal isn't going to be affected by not doing it. And I think also that, if something's given a very low priority, then if the chips are down, then that's exactly what it will have, a low priority.

Ballard here introduces an important distinction between the prominent place of public engagement in his Alzheimer's Society work and the more minor role that it plays in his KCL work. He reiterates the observation that scientists' public engagement activities are not institutionally rewarded within contexts of appraisal and promotion, claiming that if a scientist has not participated in such activities, 'their appraisal isn't going to be affected by not doing it'. He concludes that public engagement is not a 'key priority' or 'core responsibility' for scientists and that public engagement will often make way for other activities that are key priorities. Notwithstanding this, Ballard reports that public engagement is something that people are 'quite happy to do'. In commenting that public engagement is 'almost like a voluntary additional thing' that scientists do 'out of goodwill', he is suggesting, like the earlier anonymous interviewee, that public engagement activities point to the 'vocational' character of a scientific career.

Dr Sarah-Jayne Blakemore explicitly mentions voluntarism in her account of doing public engagement 'almost as a favour' in some circumstances:

Sarah-Jayne Blakemore: You do public engagement on a sort of voluntary basis, you do it as much as you want but it does also really eat into your research time. So I get a bit

worried when I've published a paper that I know is going to have media interest. I do a lot of research on adolescence and if we've just published a paper saying something about the teenage brain, the next two weeks I'm just going to be on the phone to the media, and that's fine because I like doing it, but it means that a lot of my time in the office is not going to be working, doing my research. And, you do feel a bit like you're doing it as a favour almost because it's not rewarded in the same way that publishing papers is on the RAE and by your head of department. I happen to be in this institute which does really encourage it. But I know of other people around the country who say they're basically told not to do it because it's a waste of time.

In Blakemore's account here, as in Ballard's, public engagement is undertaken on a voluntary basis or as a favour. Yet, public engagement also takes up a considerable amount of time (and here Blakemore reiterates Lovell-Badge's emphasis on talking to journalists) that is seen as time away from research. However, notably, public engagement also emerges as an activity that is characterised by a considerable degree of autonomy; as Blakemore puts it, 'you do it as much as you want'. The idea of public engagement as an additional voluntary activity or a favour is important because it reinforces the notions about reciprocation and altruism that were discussed in the previous chapter. Equally importantly, it evokes public engagement as a matter of scientists' own personal choice, autonomy and motivation (rather than an obligation) and thus as an activity to which participating scientists may be expected to bring commitment, enthusiasm and passion. This can be seen to inform the concerns, raised earlier by Chris Boyd and discussed further in the next section, about obliging scientists to participate in public engagement through the introduction of formal metrics.

Within the context of their commitment to public engagement and their acknowledgement that public engagement is not a priority for scientists, many interviewees offered personal accounts of how they manage or reconcile core scientific activities and public engagement. In this example, Austin Smith describes the – apparently largely autonomous – ways in which scientists judge and select public engagement activities on the basis of informal assessments of their value.

Austin Smith: Next Tuesday, I'm going to Norwich, so that'll take most of the day, to give a 45 minute lecture to school teachers. And I was sitting and looking at my schedule yesterday thinking, I could do with this like a hole in the head. But then I thought, well, no, I chose to do this because it is actually quite a useful thing to do, because I'm talking to a lot of teachers. I question whether it's so useful for me to go at an individual school.

Like Lovell-Badge earlier, Smith here describes a future public engagement activity to which he has committed, a lecture to a large group of school teachers in Norwich that will take up 'most of the day'. Noting that he has a very full schedule, Smith reflects that he initially regretted having made this commitment; as he vividly puts it, 'I could do with this like a hole in the head'. He reiterates Lovell-Badge's concerns about spending time on public engagement activities that could instead be dedicated to core scientific activities. In his description of how he re-evaluated this negative perspective, he emphasises that the decision was his own choice (he is not doing it because he has been forced to), and in turn, the voluntarism of his choice is affirmed by his reasoning: it 'is actually quite a useful thing to do'. He further reflects on his assessment of the value of the activity from a different perspective when he says that he will be speaking to 'a lot of teachers', thus maximising the potential impact of the activity, as opposed to speaking to small numbers of teachers 'at an individual school'. In his account, then, it is individual choice based on personal assessments of the value of public engagement activities that stands out, ultimately prevailing in reminding Smith why he has made the right decision despite its considerable inconvenience.

Other interviewees appeared to be more sanguine about the additional time pressures presented by public engagement.

Interviewer: Does the time demand present challenges?

Caroline Pennington: No, I don't feel as if it does. I feel it fits in quite easily with what we do. Sometimes it's a challenge when I want to be going home at the end of the day, and there's people coming round in the evening, but it's not that often.

Dylan Edwards: I don't think so. I mean, in science you don't go into it necessarily for a typical nine to five working day.

Here, in a joint interview, Caroline Pennington and Dylan Edwards suggest that the time demands of public engagement do not present overwhelming challenges. Admitting, however, that it is 'sometimes a challenge', both interviewees acknowledge the extra demands, and thus hours, required for a career in science, where in any case one would not expect a 'typical nine-to-five working day'.

Metrics and compulsion: killing the goose that laid the golden egg?

As noted at the outset of this chapter, all of the interviewees suggested that public engagement activities should be more explicitly rewarded through structures within their own institutions and within funding institutions, and they cited a number of ways in which this might be achieved. The most significant of these was the development of metrics to inform the assessment, measurement and reward of scientists' public engagement activities. One of the interview questions used in data collection for this study raised the possibility of including public engagement in the next RAE (what will be, the REF). While broadly supportive of such a development, the interviewees raised a number of concerns about strengthening the incentives for scientists to undertake public engagement in these ways.

Interviewer: If public engagement could be factored into whatever new system replaces the current RAE, I wonder how that strikes you?

Caroline Pennington: Maybe that would be a little bit unfair because some on the physics side of things, how difficult would that be? Is it easier for some groups than for others to, to factor that in? And you know, as we were saying, people initially come to us and show interest because they've had cancer, or a relative has had cancer, and so we're in a very good position to think that would be an excellent idea. But if you work in a more obscure area of science, that could be really quite difficult, couldn't it?

In this comment, Caroline Pennington raises a concern about equity, suggesting that universal metrics and rewards for public engagement 'would be a little bit unfair' because public engagement is 'easier for some groups than for others'. She argues that public engagement is relatively easy with respect to her work on cancer because the public has interest in such work based upon personal experience of the disease. For other areas, such as physics, which is 'more obscure', public engagement would be less easy. Thus, science as whole might not benefit from including public engagement in its evaluation procedures.

Other interviewees raising the problems of compulsion, given scientists' variable aptitude for public engagement, noted that some scientists have better communication skills than others and that some scientists are more comfortable in the novel social contexts of public engagement than others. Since these comments focus on interviewees' judgements of the personal capabilities of colleagues, they are presented anonymously.

I'm not that comfortable with [public engagement], I prefer [my colleague] to do that sort of thing, he's much better at it than I am.

Similarly, in the following comment, the interviewee states that a colleague 'is a brilliant scientist' but 'is not terribly good in that sort of [public] environment'. With this in mind, the interviewee states that he and his colleagues share the task of public engagement to achieve the best outcome: 'it works better if he gives me a few slides and I do the talking'.

Last night it would have been more sensible for [my colleague] to stand up but, although [he] is a brilliant scientist, he grew up [overseas] and he is a bit shy, and he is not terribly good in that sort of [public] environment. Therefore it works better if he gives me a few slides and I do the talking.

In both of these cases, public engagement once again emerges as a matter of autonomous choice and decision-making for individual scientists and groups of scientists. On the basis of this autonomy, public engagement commitments can be managed individually and within laboratory and research groups on the basis of aptitude and preference as well as – recalling Austin Smith's discussion of his public engagement commitment in Norwich – availability. Some

interviewees expressed concern that, in a context of universal metrics and rewards for public engagement by scientists, such individual and group autonomy would be curtailed by the resulting obligations and compulsion that would be created. If scientists were obliged to conduct public engagement regardless of their aptitude or preference, the quality of public engagement could be diminished even if such measures increased its quantity.

Geraint Rees: If you really wanted to drive public engagement you would do something quite crude. You'd announce you were measuring each scientist's public engagement activity on a scale of 1–5. You would then announce that any borderline funding decisions would use that score to decide, and then sure as eggs are eggs every scientist would do public engagement. It might not be the right way to drive quality but it would certainly drive quantity and would drive a focus on it.

As Geraint Rees observes, public engagement could readily be incentivised using a simple assessment metric to inform funding decisions. However, mirroring the concern expressed earlier, Rees fears that, while such an approach might ensure a greater quantity of public engagement, compulsion could compromise quality. Alternatively, Rees suggests that the autonomy and volunteerism on which current approaches to public engagement by scientists are dependent also serve to protect the integrity of both scientists and their public engagement activities – again suggesting the importance of their link to the vocational qualities of the scientific profession.

Kay Davies: A more formal system of reward wouldn't bother me personally because it's part of my nature but I think it might be difficult for some people because they don't naturally communicate. … Just thinking of some of the brightest scientists, I don't think some of them communicate very well at all. … So I think it would probably be better and fairer to assess public engagement at an institutional level.

Recognising these challenges, Kay Davies suggests that public engagement might be best assessed and rewarded at the institutional level. In particular, Davies suggests that this approach would preserve some of the discretionary aspects of public

engagement and would avoid penalising individuals who 'don't naturally communicate'.

A reference point for the potential costs of a more formal system of public engagement, and of the loss of autonomy that is implied by metrics and rewards, was the RAE.

> *Clive Ballard: For example, the publication based [RAE] system doesn't offer [scientists] any latitude, and I think that's, certainly in our area [dementia], that's been a big problem. So I think in principle I could see advantages of it [a more formal system], but I think what I wouldn't want to see is some sort of arbitrary metric which hadn't been well field-tested put into place that becomes a criteria that's a barrier rather than something that enables.*

In describing the RAE as a system that 'doesn't offer [scientists] any latitude', Ballard argues that such systems of incentives and rewards can create conditions in which the actions of scientists are over-directed and constrained. In a similar way to Chris Boyd, then, Ballard reveals a fundamental ambivalence toward the proposal that public engagement should be subject to a universal reward system: he can see that this brings 'advantages' 'in principle', yet he is concerned that such systems can also act as 'a barrier rather than something that enables'. In particular, through his reference to the importance of field-testing, Ballard suggests that reward systems can produce consequences that are unforeseen and unintended by the implementing institutions.[17] Delivering public engagement in order to be seen to be delivering public engagement might, according to such arguments, evacuate the exercise by changing its purpose to the fulfilment of externally imposed requirements rather than the expression of internally generated motivations to participate in engagement activities for their own sake because they bring their own rewards.

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[17] Ballard's argument here is reminiscent of Michael Power's compelling analysis of the ways in which the emergence of a private and public 'audit culture' has served to reduce rather than enhance transparency and accountability (Power 1997).

Public engagement and professional stigma

When it was put to them directly, a number of interviewees rejected the notion that scientists' participation in public engagement brings with it the risk of professional stigma or opprobrium.

> *Chris Boyd: I don't think there's generally a negative perception, in fact I think in general people are glad that there are people in the profession who are willing and able to do that. … I don't think it something that is perceived as negative, in fact, I think it's probably perceived as a positive thing by fellow scientists.*

Other interviewees reported that they are familiar with the view among other unspecified scientists that public engagement is often not well perceived by scientific peers.

> *Robin Lovell-Badge: I'm not sure whether I really experience it myself, but I've been told by others that their colleagues can often look on it, this guy's a media tart. … And whether it's jealousy or whether they really think that your goals are not about science but about self-promotion, I really do not do [public engagement] for self-promotion. So anyway, there may be some jealousy sometimes, or there's this feeling that you can't be a serious scientist if you spend all your time doing this.*

As mentioned earlier, Lovell-Badge has been involved in public engagement activities since the early 1990s and has had a public profile in public debates about animal research and stem cell research over much of that period. More recently, he was one of the scientists most involved with the new UK Human Fertilisation and Embryology Act. Lovell-Badge readily identifies two key elements associated with the notion that excessive participation in public engagement might compromise a researcher's scientific credentials. First, that scientists who pay great attention to public engagement are said to have objectives that are not consistent with the norms of science. For instance, such scientists might be accused of sacrificing scientific principles – including modesty, communalism and factual accuracy – because they are seeking fame or satisfying their egos, promoting their own interests or seeking commercial gain; as Lovell-Badge puts it, 'your goals are not about science but about self-promotion'. This pejorative view –

particularly of working with the media – is condensed into the expression 'media tart' (other interviewees used the expressions 'media whore' and 'prostituting yourself to the media machine' in the same way). Second, Lovell-Badge refers to the view – from which he distances himself – that public engagement is an activity that might compromise scientists' attention to their science; as he puts it, 'this feeling that you can't be a serious scientist if you spend all your time doing this [public engagement]'. Geraint Rees reflects on the latter point at what he describes as the 'macro level', or highly public level.

Geraint Rees: So, the macro level would be people who are very successful at public engagement and are highly visible figures that are scientists, so we're thinking [three highly prominent scientists] or someone like that, I think [such figures] are sometimes regarded by their peers, perhaps unjustifiably, as slightly flaky. As people who didn't necessarily make it and have pursued an alternative career pathway. And that's, as I say, not always justified but I think it's a perception, you're the Big Brother *psychologist, you're doing something a bit flaky even if that is doing something positive in terms of engaging with the public and science.*

Like Lovell-Badge, Rees distances himself from the perspective that he describes. However, Rees identifies three 'highly visible' scientists, who are anonymised here. Thereafter, Rees suggests that there is a 'perception' among other unspecified scientific 'peers' that such scientists may have turned to the 'slightly flaky' discipline of public engagement because they 'didn't necessarily make it' as scientists. Thus Rees candidly encapsulates the central tension that is revealed in interviewees' discussions of the potential stigma of public engagement: scientists may be 'doing something positive in terms of engaging with the public', yet peers may still perceive that those who do so are 'a bit flaky' or, worse, have pursued an 'alternative career pathway' because they are inadequate as scientists.

The challenges of non-scientific social contexts

A consistent finding in the data is the concern expressed by almost all of the interviewees about the challenges of undertaking professional scientific work outside recognisably scientific spaces (such as laboratories, clinics, universities and scientific and policy meetings) and their reluctance to venture into the range of non-scientific spaces that are associated with public engagement (such as public meetings, media encounters and school classrooms). In these discussions, such spaces emerge as potentially unfamiliar, unpredictable and difficult to control, and scientist interviewees often described feelings of discomfort, exposure and vulnerability.

David Porteous: I know that a lot of colleagues are very reluctant for the reason that they find it very difficult to translate the technical language of their science into something that's bite-sized and understandable, but not distorted. They think, oh, they've got to really know that I put 5 mls into the tube and I cooked it for two hours before I got the reaction to work. So, no, no, no, you don't need to do that; but that's quite tricky.

Here, David Porteous comments on the communication challenge that is experienced by his colleagues when they undertake public engagement.[18] Describing these difficulties in terms of translation from the 'technical language' or the jargon of science to a 'bite-sized' language that is understandable to a lay audience, Porteous notes that achievement of this language runs the risk of distorting the science, perhaps through omission of qualifying and cautious 'ifs and buts' (as Dylan Edwards put it) that would be important to a scientific or medical audience. Porteous himself then provides an example of the technical 'ifs and buts' that he considers to be inappropriate in communication with a lay audience, though he notes that achieving the balance between simplicity and complexity is 'quite tricky' for scientists. For Professor Ian Craig, a molecular geneticist, this challenge is compounded by the fact that

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[18] Notably, this was a particularly strong theme in the discussions with interviewees who do not have clinical responsibilities.

different lay groups demand a different 'pitch' or 'level' of complexity or simplicity:

> *Ian Craig: Well, the challenges with any audience of knowing at what kind of level you're going to have to pitch something, which obviously depends upon which section of the public you're going to be talking about. If you're talking to people whose children have muscular dystrophy, you don't have to describe it or anything relating to the condition, but they may not know about the muscular dystrophy gene and how big it is and how difficult it is to get hold of and other molecular details. So, it's always about having to make a decision concerning the level of pitching it and the possibility you're going to lose people so they're going to get turned off and that kind of concern.*

In this comment, Craig implicitly differentiates between engaging with a group of 'people whose children have muscular dystrophy', who understand the condition but not necessarily the genetics of the condition, and engaging with a more general group who may understand neither. The pitfalls of misjudging the appropriate level of simplicity or complexity – in particular the dangers of pitching an interaction at a level that is too complex – are the 'possibility you're going to lose people' or that 'they're going to get turned off'.

A number of interviewees, though again – notably – none who have clinical responsibilities, also reflected on the problematic or uncomfortable nature of the forms of personal contact with individual members of the public that can arise out of public engagement activities – for example instances in which individuals request advice and help with respect to their own or their loved ones' medical conditions.

> *Caroline Pennington: So, one of the things that I've had happen a couple of times, is that people will email me after they've had a meeting, and they want you to write back to them, and you have to be so careful what you say, and I find that a little bit difficult sometimes. Because, you know, your words can then be taken out of context and you've actually written something, and I find that a bit difficult.*

Caroline Pennington is a medical geneticist working on cancer but without clinical responsibilities. Here, she describes the difficulty

that such situations cause for her as a scientist and her concern about advising individuals given the ways in which her written words might be interpreted – a concern that is at once specific and practical and amenable to generalisation as a symptom of the role confusion so often depicted by scientists in the context of public engagement. Other interviewees described a sense of exposure or vulnerability in public engagement contexts, often in terms of negative expressions of personal discomfort, terror, feelings of being tainted and encountering unfamiliar difficulties and problems. A number of interviewees commented on the aggressive and sometimes violent approaches of activist groups that campaign against specific areas and methods of biomedical research – most notably animal research.

> *Chris Boyd: Many of my colleagues are reluctant to put their heads above the parapet, because if they are involved directly or indirectly with animal experimentation, they think they may be putting themselves or their families at risk. So, that has to be taken into account. And actually that's an extreme example of the hostility I mentioned earlier that can actually have the effect of silencing people who would otherwise be quite happy to present their research.*

Here, Boyd draws on his own and his colleagues' experiences as scientists who use animal models in their research, confirming the risk that such work can become subject to extreme hostility and occasional violence from animal rights protestors. Notably, this sense of hostility and threat in Boyd's account is both heightened and linked to public engagement by his use of the expression 'reluctant to put their heads above the parapet'. A military term, a 'parapet' is a protective wall at the front of a trench, and although idiomatic, this figure of speech makes reference to war. Pointing out the chilling effect of such threats on the establishment of a more open public sphere for science and debate about scientific innovation, Boyd suggests that, as a result of such threats, scientists are 'silenced' when they would 'otherwise be quite happy to present their research' in the form of public engagement.

Youth and experience

In their discussions of the place of public engagement in the professional working lives of scientists, interviewees often returned to two issues relating to youth and experience. When asked, many interviewees assessed the importance of public engagement to PhD and early career scientists in much the same terms as for more senior scientists. Indeed, a number of interviewees stressed that PhD students and early career scientists are more important to public engagement than are their more senior colleagues.

Ian Craig: But what you need are the young people, you need the vigorous, exciting people who are really having to make an impact through their science but at the same time communicating that enthusiasm and everything else to the public or to students or whoever, and it's an important part of being an academic.

For instance, Ian Craig suggested that young scientists are perhaps more vigorous, exciting and enthusiastic than their senior colleagues and that these are highly valuable characteristics in public engagement as well as 'an important part of being an academic'. For her part, Caroline Pennington, in an attempt to address the negative 'boffin' stereotypes of themselves that scientists attribute to the public, stressed that the participation of young scientists in public engagement with schools is essential. This is important, Pennington suggests, because it portrays science as a youthful and (like Stephen Minger earlier) possibly even a 'trendy' pursuit that would be attractive to school children and older students.

Caroline Pennington: So I've been asked to go to a school and talk about how girls go into science, and how to encourage girls to go into science. So, I've been trying to get some of the younger people here to come along, because I think I'm a bit old really, and it would be nice for them to see younger people. And we've got some very trendy young people here, so, you know, yes, I would encourage, and I do encourage them to, to get involved in it too. And they were all very happy to.

As Pennington notes in her reference to encouraging more girls to go into science, public engagement activities such as school visits may play an important role not only in recruiting the next

generation of scientists but also in changing the demographic profile of this group. While involving younger and early career scientists in public engagement is seen to have numerous benefits, other interviewees added a concern that the multiple imperatives and intense time pressures of a scientific career are even more acute with respect to junior scientists.

Julia Polak: The challenge is horrid, because young scientists are at the bench and they haven't got time, they are busy writing papers and grants. They reject the grants, they turn the paper down, and they have to go and do more experiments, and then you tell them to spend a whole evening in entertaining the public.

For Professor Dame Julia Polak, a specialist in tissue engineering and regenerative medicine, the whole gamut of scientific activities – from running experiments to writing successful papers and grant proposals – is much more time-consuming for early career scientists, who may thus be particularly ill-suited for time-consuming public engagement activities. Once again, the sense that public engagement is something that has to be undertaken in addition to the 'day job' or the '80-hour week' is reflected in Polak's comment that junior scientists' scientific tribulations are then to be followed by a 'whole evening' doing public engagement. As Kay Davies reflects in the following extract, these are issues that junior scientists themselves think about and bring to the attention of the senior colleagues from whom they seek advice.

Kay Davies: We had a unit retreat last week and we had a discussion on public understanding of science. One of the post docs said, well what are we supposed to do, what is the priority because if we do too much public understanding of science we get no credit for it whereas if we just concentrate on the science we do. So what do you advise us as young scientists to do? That's a difficult thing. I said you have to do what you feel comfortable with, but you have to say really, since their future depends on the scientific output, they can't spend very much time doing public understanding of science.

Davies makes a similar point to Polak, while also drawing out her post doctoral researcher's cognisance of the lack of reward for public engagement in scientific reward and career structures. She recognises the challenge that public engagement poses for both

junior researchers and their more senior supervisors. In her response to her advisee's question, Davies once again invokes the autonomy that scientists have with respect to public engagement activities, and the sense that it is a matter of individual choice and preference how much, or how little, he or she wants to take part in them. In her role as advisor, she confirms this is her official line ('I said you have to do what you feel comfortable with'), adding the typically ambivalent counter-advice that she thinks privately ('but you have to say really, since their future depends on the scientific output, they can't spend very much time doing public understanding of science').

In addition, a common theme in the interview data was a gradualist model that associated greater responsibility for public engagement with the expertise and experience that comes with progression through a scientific career to a more senior level.

> *David Porteous: When I was a young scientist and I was first making discoveries that were getting into press release format and so on, I did come away from pretty much every experience feeling tainted in some way because I can't think of a single occasion when what I said was correctly quoted or put in a context where it was balanced in the way that I felt it should be. Now, I may have been naïve and maybe I'd got the balance wrong, but that was a pretty painful process. And now I go into it saying, right, the probability is that I will be misquoted and misinterpreted, let's try to minimise the probability of that happening; and you do that in a number of different ways.*

Echoing earlier discussions of the media, David Porteous here reflects that, as he gained more experience of working with the media, he learned that, although it is impossible to eliminate the risk of being misrepresented, it is possible to minimise this risk in a number of ways. He also describes a changing set of expectations and a more pragmatic managerial approach to media interviews, an approach that he contrasts with his earlier negative feelings of being misinterpreted ('feeling tainted') in a 'painful process' about which he 'may have been naïve'.

The importance of experience was also manifest in the comments of more junior interviewees. Within the context of the Meeting of Minds deliberative event in which she participated, Catriona

Morrison 'felt okay' and that she was 'able to make a useful contribution', but nonetheless expressed doubts about her own expertise or her ability to communicate effectively, deferring to other more senior panellists, in particular Professor Andy Young and a woman from Leeds Metropolitan University.

> *Catriona Morrison: I felt very much the most junior, so Andy Young has so much more experience than me and he knows a lot more about how the education system works, how psychology works, how the health service works, and I was sitting there going, oh, I don't know that much really. But he had a lot of that kind of professional knowledge, but this woman, she was fantastic and the panel really liked her, but she kept talking about, well, when my mother had Alzheimer's disease and this kind of thing. … So I was to be part of an expert panel and that I didn't need to do any preparation, but they were just going to be tapping on my psychology knowledge. So I kind of felt okay about that. You know, as I say, when I turned up and I knew Andy was… I know Andy well, and I knew that he was going to be there, and I didn't know the woman from Leeds Met, but I did kind of feel on the day that they knew so much more than I did. I did feel very junior in it. But I did feel I was able to make a useful contribution. And I think probably for the members of the public as well, to have a range of people was quite nice. We all had different perspectives on things.*

In her comments, Morrison twice refers to being the junior expert, or the expert with the least experience or professional knowledge, confirming a perception shared by other interviewees that long-standing professional scientific experience brings with it the breadth and depth of expertise and general knowledge, as well as speaking skills, that are useful in public engagement.

Summary

Public engagement emerges as an anomalous activity in interviewees' accounts of their professional working lives. This is because, although most interviewees readily confirm that public engagement is – by now – an important aspect of their professional careers, it is not as well-integrated into their working

lives – including the systems of incentive and reward to which they are subject – as other scientific, teaching and clinical activities are. Such activities are both daunting and time-consuming. Within the context of already overburdened working lives, this means that – though important – public engagement is an *ambiguous priority* for scientists and is undertaken in addition to – and possibly to the detriment of – core scientific activities. Public engagement emerges as an activity that is characterised by a high level of volunteerism, implying a range of characteristics that are highly valued by interviewees (including autonomy, goodwill, passion, sincerity and a sense of duty). Interviewees also revealed that participation in public engagement can render them subject to professional stigma and can expose them to unfamiliar and challenging social situations. As scientists who are committed to public engagement, many interviewees saw value in the development of more meaningful institutional mechanisms for the incentivisation, assessment and reward of public engagement; for instance within scientific institutions as well in core- and project-funding bodies. However, such mechanisms were also readily associated with targets, compulsion and problems of measurement that might produce unforeseen consequences, might compromise the highly valued characteristics of public engagement activities mentioned above, and might be unfair to scientists working in areas that do not have an obvious public interest or dimension. Thus, they too were viewed with ambivalence.

CHAPTER 7 SCIENTISTS ON: PUBLIC DIALOGUE

This chapter focuses on the nine interviews conducted with scientists who had participated in the Royal Society pharmacogenetics public dialogue project and the Meeting of Minds deliberative project on brain science. These two projects have the characteristics of public dialogue in the more narrow, technical sense in which it is institutionally understood. For instance, they not only emphasise dialogue and deliberation between public participants and experts of various kinds, but are conceived with the explicit objective of contributing to a policy process in some way and thus are designed according to predefined criteria (they are closed, by-invitation-only events).[19]

We focus on this subsection of public engagement events in this final data chapter for three reasons. First, public dialogue events are the outcome of a lengthy process of evolution in the public engagement sector and, to some, represent its cutting edge. Second, these events are arguably more institutionalised and thus reflect this aspect of the public engagement sector as a whole. Finally, public dialogue can also be seen as an experimental sector in which new approaches to science and its publics coincide with other, broader, changes to definitions of the public sphere and its significance for contemporary society.[20]

'Bridging the gap', enabling 'conversations'

As this study found for public engagement events in general, scientists' views of public dialogue events were largely positive, with praise often focusing on their two-way, reciprocal nature. Dr Jolanta Opacka-Juffry, for example, discusses her experience of one of the Meeting of Minds deliberative events in terms of breaking down barriers between scientists and their publics and 'bridging the gap' between them.

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[19] For further details about these projects, see the Royal Society website (http://royalsociety.org/page.asp?id=3779) and the Meeting of Minds website (http://www.meetingmindseurope.org/uk_site.aspx?SGREF=207).

[20] The public sphere is a key concept in sociology referring to the semi-formalised sectors of public debate through which participatory democracy is strengthened (or tested). Sociologist Nancy Fraser, for example, defines the public sphere as 'a theater in modern societies in which political participation is enacted through the medium of talk' (Fraser 1990).

Interviewer: How would you characterise, if it's possible to generalise, your interactions with the public participants, the citizens? Did you feel distanced from them?

Jolanta Opacka-Juffry: No.

Interviewer: Did you feel consensual in a way with them?

Jolanta Opacka-Juffry: Very much so.

Interviewer: Were you talking on the same wavelength?

Jolanta Opacka-Juffry: Very much so. I thought we were separated on the floor and I said the arrangement was not terribly helpful because we were just separate, a group of them and a group of us, and they could think them and us. But, in fact, there were no barriers. I didn't feel that at all. Just because of the competence of their questions and the topical issues they tackled, it just bridged the gap.

In the final phrase of her comment, Opacka-Juffry speaks of a pre-existing 'gap' between the scientist and public participants. This is perhaps a merely physical gap, caused by the 'not terribly helpful' physical arrangement of the room in which the event took place. However, this is possibly also a reference to the broader cultural gap in relationships between science and society that some interviewees identified (as discussed in Chapter 4). For Opacka-Juffry, the practice of public dialogue transformed this relationship by 'bridging the gap' or removing the 'barriers' between the scientist and public participants. Significantly, she asserts that it was the public participants themselves who achieved this transformation through the 'competence of their questions' and the 'topical issues they tackled' (this issue is discussed in more detail below). As a result of 'bridging the gap', Opacka-Juffry confirms that the event had a positive consensual character that enabled scientists and public participants to talk on the same wavelength.

Dr Bill Newman – who participated in the Royal Society pharmacogenetics public dialogue – discusses his positive experience of public dialogue in a manner that reinforces Opacka-Juffry's comment.

Interviewer 1: And did you feel comfortable?

Bill Newman: Yes, I did. I think so. And after myself and my colleague maybe interjected at times or were asked to just

contribute, there wasn't any point that that suddenly stopped the conversation so you felt there was a pregnant pause. Actually, then things flowed or people picked up on that and then sort of moved things forward again. ….

Interviewer 1: Yes, it sounds like it was a very positive…

Bill Newman: …experience, yeah, I think it was, it was.

Interviewer 2: And enjoyable, did you have fun?

Bill Newman: Yes, it was quite fun actually, yes. I mean, I'd be quite happy to do it again, I didn't come away from it thinking it was a waste of time.

Newman confirms that public dialogue was 'comfortable', 'positive' and 'fun' for scientists and that he would happily repeat the experience. His comments are also significant because they reveal his pre-existing concern that dialogue with the public might not be straightforward, that it might be awkward, punctuated by 'pregnant pauses' or halts in the 'conversation'. Instead, as Newman puts it, the dialogue, or what he calls 'the conversation', 'flowed'. Taken together, Opacka-Juffry's and Newman's comments suggest that, for the scientists involved, public dialogue can remove 'barriers' and 'bridge gaps' between scientists and public participants, with the result that consensual 'conversations' take place easily and without uncomfortable 'pregnant pauses' or 'gaps'.

'Respect': transformed understandings of publics

A transformed, more positive impression of non-scientific participants in public dialogue processes was an almost universal feature of interviewees' reflections on these events and was a significant component of their overall enthusiasm for them.

Andy Young: They seemed highly articulate, very intelligent, very motivated to get to the bottom of these matters, and very absorbed in what they were doing. … I remember being extremely impressed at how quickly they grasped what the points were.

In common with many interviewees, Andy Young lists several ways in which the public participants impressed him, including that they are 'very intelligent' and able to understand or 'grasp' the science

'quickly'. In addition, they are 'highly articulate' and 'very motivated' by and 'absorbed in' the work that they were required to do as part of the Meeting of Minds project. The impression given by this quotation of pleasant surprise at this outcome was a further consistent finding in the interviews.

Jolanta Opacka-Juffry: Oh boy, they were so well-informed.

Interviewer: Did that surprise you?

Jolanta Opacka-Juffry: Yes. And I think I wasn't the only one that was surprised. I was impressed. I was very impressed because those people worked so hard and they learnt so much and they used their knowledge so intelligently and they taught us so much. … I learnt, I think, to respect the public in this kind of dispute. Please don't get me wrong. It's not that I ever disrespected. … They can make a serious partner in a serious, focused, academic discussion. Serious dialogue.

Opacka-Juffry reinforces Young's view concerning the intelligence, ability to learn and commitment that is shown by public participants in public dialogue. Her comment also suggests gratitude, as well as a certain self-consciousness about being seen to have previously held a less confident view of the public (a view that she is quick to correct). In suggesting that the public participants 'taught [the scientists] so much', members of the public emerge not only as individuals who are themselves able to contribute as 'a serious partner' to a 'serious discussion', even to an 'academic discussion', through their contributions in public dialogue, but also as concerned citizens whose efforts offer a corrective to doubts about the value of time-consuming engagement with non-experts. Consequently, in her confirmation that these public capabilities 'surprised' her, Opacka-Juffry confirms that her experience of public dialogue transformed her understanding of public capabilities with respect to scientific matters, leading her to reconsider the role that the public might usefully play in debates concerning science, and enhancing her 'respect' for such events and for the lay public. These themes are also central to Dr Catriona Morrison's reflections on the public participants at the Meeting of Minds event.

Catriona Morrison: It told me how little they know. I think it makes you respect the public more as well.

Interviewer: Why is that?

Catriona Morrison: Because they are interested. … And they all have opinions and questions. So when you say, well science is rational and objective and so on, we know best, we should be involved in the policy making; you have to rethink that when you actually encounter the public.

Interviewer: Yes. So you felt that when you met them that they didn't know very much about psychology or neuroscience, perhaps. Did you feel that they learnt a great deal about it during the course of the event?

Catriona Morrison: Yes.

Interviewer: And were you surprised at the capability to learn in that way?

Catriona Morrison: Yes, definitely. Because I'm so used to dealing with undergraduate students, who have difficulty coping with half of what I say, so I think you just work on this assumption that if these students can't understand me I can't possibly explain this to the public.

Morrison here reiterates Opacka-Juffry's observation that her respect for the public was enhanced through experience of public dialogue, in Morrison's case because the public participants were 'interested in', had 'opinions and questions' about and had the capability to learn a great deal about neuroscience. Through this last comment, Morrison evokes a group of public participants that is itself transformed – that is, is made knowledgeable and capable – through public dialogue. Like Opacka-Juffry, her comments also suggest a sense of appreciation for having been given the opportunity to rethink some of her previous views. Here, as in much of the data for the project, first-hand experience is once again not only transformative but inspiring – as in the effect of a conversion experience or epiphany. Here Morrison notes that her pre-existing assessments of public capabilities were based upon the assumption that the general public would be less capable than undergraduate students and that, since these students 'have difficulty coping' with neuroscience, it would be all but impossible to explain her field to members of the general public – an assumption she realises was both inappropriate and incorrect.

Professor Chris Frith, a neuroscientist who participated in another of the Meeting of Minds events, similarly praises the 'sensible' public participants – using this adjective twice.

Chris Frith: As I say, I was very impressed with them [the public participants]. They seemed genuinely interested, they asked sensible questions. And usually, if I give a talk, there's always at least three people in the audience who are completely mad and this was not the case. … They didn't have bees in their bonnets as they were asking perfectly sensible questions. … I guess I think my worry [is] that the sort of people who volunteer for this will be the strange ones, whereas I've now got the impression that actually people do volunteer for good reasons.

Frith's comment also highlights the interviewees' general impression that 'closed' public dialogue events and 'open' public lectures produce very different dynamics. This is particularly evident in his contrast between the self-selected publics of 'open' public lectures (who might have 'bees in their bonnets' or even be 'completely mad') and the recruited publics in 'closed' public dialogue (who are 'genuinely interested' and 'perfectly sensible'). It is also notable here that Frith, reflecting the sense of exchange that has been previously noted, goes on to extend the positive sense of volunteerism – which characterises interviewees' understandings of the current context for scientists' participation in public engagement – to the public participants in public dialogue.

Understandings of scientists' roles in public dialogue

In contrast to the clarity with which many scientists interviewed for this section of the study revealed their thoughts concerning the overall value of public dialogue events, their perceptions of their roles in these processes were more ambivalent. Here, arguably, implicit criticism of public dialogue processes emerges, and, again, scientists' relationships with their expertise appear as sources of mixed feelings and confusion, as do the implications of their authority as experts in an event modelled on polite conversation. When describing the roles that they were either pre-assigned by the organisers or that they actually performed in public dialogue

processes, all of the interviewees emphasised the importance of their identities as experts, although this was viewed equivocally, as both a positive and potentially negative asset. Thus, interviewees typically reflected on the roles they might or might not assume in public dialogue in terms of how best to fit in with, rather than 'drive', the proceedings.

Bill Newman: They certainly didn't want me to drive the agenda. They felt that my role, and I was quite happy with that, was basically to provide what they call expert opinion. But really it was so that if people started talking about things that were clearly not feasible, or if they had slightly misconstrued conceptions as to what pharmacogenetics really was, or had to offer, or the actual process of it, then I was able to inform further on that.

For Bill Newman, the expert role that was ascribed to him by the organisers of one of the Royal Society pharmacogenetics public dialogue events was defined in terms of providing 'expert opinion' in order to correct 'misconstrued conceptions' concerning the facts of what pharmacogenetics is and how it works. Thus, according to this definition or assignment of roles, public dialogue again becomes a site for putting the record straight through correcting misapprehensions about science. Newman's comment is also notable since he states that it was not his role to 'drive the agenda' of the event. Instead, his role was essentially responsive in character: while he was to respond to misconceptions, he was not asked to determine the course of the discussions. Thus, although 'happy', his role was also constrained. Professor Geraint Rees makes a similar point based upon his understanding of his role in one of the Meeting of Minds events, namely that he was 'not there to preach'.

Geraint Rees: You're not there to preach or provide information that you think is important, you're there to answer questions and interact. … It didn't seem like a dialogue role, it seemed like I was a reservoir of information to be probed, so the citizens could form their views.

Here, again, Rees evokes the role of a responsive expert. He states that he was not there to provide the information that *he* thinks is important, but rather to respond to or answer questions; he suggests that his role was to be an expert 'reservoir of

information' that could be tapped or 'probed' by the public participants so that they could form their own views. However, in defining himself as a resource or a 'reservoir' to be drawn upon, he also sets himself apart – a point he makes explicit by noting that he did not recognise himself as having 'a dialogue role'.

The role of providing 'balance' and 'steering' while not being 'overbearing' is similarly described by Professor Walter Bodmer, who, like Newman, participated in one of the Royal Society pharmacogenetics public dialogue events.

Walter Bodmer: My role was largely to act as a sort of advisor on the science and to do it in a way that hopefully was not overbearing in any way, but try to explain things when the questions arose, try to steer the discussion into ways that one thought were more relevant.

In common with all of the interviewees who had participated in public dialogue processes, Bodmer identifies his primary role as that of a scientific expert, or an 'advisor on the science', as he puts it. His understanding of the responsive nature of this role coincides with Newman's and Rees's to the extent that he sees himself as 'a sort of advisor' who is there to 'explain things when the questions arose'. His use of the prefacing expression 'hopefully' acknowledges his awareness that the best intentions may not override the force of habit and, thus, that his role involves a combination of restraint and provision. In her discussions of her experiences at one of the Meeting of Minds events, Dr Catriona Morrison raises further perspectives on this issue.

Catriona Morrison: So I was to be part of an expert panel and I didn't need to do any preparation, but they were just going to be tapping into my psychology knowledge. … We were asked about access to diagnosis and memory clinics and [another 'panel' member] spoke a lot about her mother, or whoever had been diagnosed in her family, and I didn't go on personal experience but I did draw on my experience from my own research.

Interviewer: Did you feel that it was a role that was ascribed to you, or was it a role that you yourself wanted to take on, to advocate neuroscience and to, perhaps, answer some of the

objections that people might raise on developments in neuroscience?

Catriona Morrison: Oh yes, in that sense definitely yes. Yes, so people have a big issue with things like animal testing, and I think that came up on the day. … I don't do animal research, but I'm fiercely defensive about animal research and its value and its help in understanding things like dementia. And as I remember, we did have that opportunity on the day to talk about some of these methodologies. So certainly if I ever get the chance then, yes, I'm very keen to advocate neuroscience in that way.

At the outset of these comments, Morrison reinforces the understanding of a responsive, or perhaps even passive, expert role in public dialogue that is universal among the interviewees: she is an 'expert', ready equipped with 'psychology knowledge' that can be 'tapped' and did not need to prepare for the event. However, in contrast to Rees's understanding that he was not to 'preach', Morrison reports that – perhaps regardless of the role that she was ascribed – she is 'very keen', both in the specific context of the Meeting of Minds event and more generally, to perform an advocatory role, in this case with respect to animal research. Here, then, the responsive expert role for scientists, a role within which personal normative commitments might be downplayed, is complemented by an advocatory role in which normative commitments are foregrounded.

In response to a question about whether he assumed any other roles in addition to that of an expert at one of the Royal Society pharmacogenetics events, Bill Newman reflects upon the place of personal experience in his role as an expert, within the contexts of both public dialogue and the clinic.

Bill Newman: No, I didn't. I sort of tried as much as possible I think to just keep completely to that remit. I certainly didn't mention anything at all about any personal experience I've had of medication. I think in my professional experience very rarely would I draw, I mean clearly the way you engage with people and all sorts, in conversation and how you have a consultation with somebody is completely embedded in who you are and what your experiences are whatever. But, actually vocalising that and saying to a person, well, in your *situation I would do so and so, I can't think I ever do that, because I see myself very much in a role of providing information and a context for that information and trying as much as possible, allowing the person to make their own independent decision based on that information and not trying to draw on, in any overt way, my own attitudes and experiences onto their decision making process. … I think that I brought that very much to the forum, that I decided very much that my role there was just to help to keep people on track, factually.*

Newman closely models his neutral and distanced approach to the pharmacogenetics public dialogue on his experience as a consultant clinician, noting that it is his clinical training and experience that enables him to approach public dialogue in a particular way. On this basis he understands his role in both public dialogue and the clinic as 'provid[ing] information' and 'keep[ing] people on track, factually', thus allowing other people to 'make their own independent decision' within the context provided by a facilitator or counsellor. Thus he is reluctant to mention personal experiences (for example, of 'medication') and personal opinions ('in your situation, I would do so and so') in both clinical consultations and the pharmacogenetics public dialogue. Here, as above, Newman's contribution is asymmetrical: he seeks to engage with the public in a non-directive fashion, but in doing so he must largely exclude himself by maintaining a strict sense of professional distance.

Two areas of concern: 'representation' and 'expertise'

On the basis of their experience of public dialogue, interviewees raised two key areas of concern about the practice of public dialogue (in addition to the concerns about the notion of public contributions to decision- and policy-making that were discussed in Chapter 5). Many of the interviewees were intrigued about the sampling processes that had been employed in the Royal Society pharmacogenetics public dialogue project and the Meeting of Minds project, and they expressed concerns about the extent to which the public participants in public dialogue were representative of the broader population. This concern took a number of forms.

Drawing on his statistical expertise, Professor Walter Bodmer reflected on these issues at several points in his discussions of the pharmacogenetics public dialogue project.

Walter Bodmer: I distinguish between arbitrary and random, if you know any statistics. They were picked arbitrarily but whether that was a random, proper random sampling is another matter. They were picked off the street arbitrarily, whether you can really say that's a proper random sample is not true, perhaps. But, nevertheless, there were a range of different views represented.

In this first comment, Bodmer distinguishes between 'arbitrary' and 'proper random sampling', as he calls it, which implies that all members of a population have an equal chance of being selected. Bodmer assumes (correctly) that the purposive sampling processes employed in the Royal Society project were not strictly 'random'.

Walter Bodmer: I think the general impression I had [of the public participants] was one of more intelligence and awareness than would often be ascribed to so-called Joe Public, and these were not people who were picked because of that, no, and I think that's good. Now where they went, they probably didn't find the yobs that were drinking themselves sick in the pub. How you get a representative group is quite difficult.

Bodmer here affirms the positive impression that he gained of the 'intelligence and awareness' of the public participants, while acknowledging that the participants were not specifically selected on that basis. His concern lies with other sections of the public that might not have been represented among the public participants, such as 'the yobs that were drinking themselves sick in the pub'. Bill Newman makes this point in a slightly different way.

Bill Newman: I think it's difficult with a relatively small number [of public participants]. I think there was a forum in London, maybe something in Manchester, and that was about it over a couple of days. So you're looking at a relatively small amount of opinion and I think you can interrogate that information, in terms of developing some themes, … but in terms of getting to an absolute answer, I don't know if you've got enough

information there, you can't do anything quantitative, certainly. And I don't know if doing that small number of groups in two big urban centres would be fully reflective, 40 or 60 people or whatever of a population of 50, 60 million is difficult.

Here again, Newman's concern is that the public views as they are understood through public dialogue may not be representative of broader public views, in this case owing to the relatively small number of participants in public dialogue events. It is notable here that both Bodmer's and Newman's reflections are embedded within their expertise as quantitative, scientific statisticians. They reflect a yearning for the 'proper random sampling', statistical representation, large sample sizes, quantification and 'absolute answers' upon which the authority and legitimacy of such approaches, as well as their scientific status, rest. Their comments reflect the profound philosophical and methodological distinctions between such approaches and the more qualitative and interpretative approaches that are associated with public dialogue (some of which were discussed in Chapter 3 within the context of the methodology of the ScoPE project).

Professor Geraint Rees, who participated in one of the Meeting of Minds events, also raised concerns about the 'asymmetric' procedure that was employed in the selection of experts in these public dialogue projects. In doing so, he raises the broader issue of the nature of expertise in public dialogue.

Geraint Rees: I suspected the [expert] panellists were chosen by a random selection of who [the organiser] could find in his address book at short notice to come. …it seemed to be a highly asymmetric selection procedure in which the members of the [public] panels were chosen by a highly inclusive public canvassing and selection procedure that was very elaborate and involved a number of selection stages to get the socio-demographics perfectly right. …[whereas] the scientists on the panel seemed to be a completely random selection of who was available in somebody's Rolodex at the time, and could be contacted by phone.

Rees's contrast between the 'elaborate' sampling or 'selection' procedure through which the public participants were recruited and the relatively unsophisticated selection process used to recruit the expert participants, which he describes as a rather last-minute and

'completely random' procedure based upon existing contacts in an 'address book' or 'Rolodex', once again underscores the role of asymmetry characterising public dialogue events. As in the above cases, his observations are rooted in his expertise as a scientist and clinician familiar with the sampling principles employed within scientific and medical research. He is more specific about this issue in this later comment on the Meeting of Minds event.

Geraint Rees: While I have plenty of opinions about big pharma, I can't claim to have any practical information about pharmaceutical lobbying and so on. So, I do remember sitting there thinking, oh my gosh, how can I say something that's relevant to these questions they're interested in, when really they're very peripheral [to my expertise]. …I'm taught to be cautious in my generalisations, to not go beyond the data, not to speculate unduly, and certainly not to make wild pronouncements scientifically on things I know nothing about, and consequently my domain of knowledge is, sort of, rich in the area I colonise which is quite broad, consciousness, it's quite a lot of stuff. But it doesn't, for example, include attention-deficit hyperactivity disorder. But I think the public often have an impression of domains that are much wider than scientists have, that somehow I can comment on anything to do with the brain. So, they don't realise how narrow, relatively speaking, people's expertise is. …People expect you to know stuff you really don't.

In this passage describing different types of knowledge and how they are perceived, Rees recounts his struggle to contribute to some aspects of the discussions while maintaining his expert role. From a scientific perspective, Rees suggests that his expertise with respect to 'consciousness' is 'quite broad' and covers 'quite a lot of stuff'. However, on the basis of his experience in public dialogue and perhaps elsewhere, it might, conversely, appear quite narrow, leading to Rees's concern that, as a scientific expert, 'people expect you to know stuff you really don't'. For instance, Rees notes his impression that the public participants expected him to be able to provide expertise on 'anything to do with the brain', including 'big pharma' and 'attention-deficit hyperactivity disorder'. On the basis of her experience in another of the Meeting of Minds events, Dr Catriona Morrison reflects on this issue in terms of what she feels 'comfortable' with:

Catriona Morrison: So as far as psychology is concerned, I'm comfortable. I was comfortable with everything that was asked. And it was great to be able to say, I can tell you about this. And you could really get your teeth into it. So that was really good. When people start talking about policy-making and medical research and things like that, which I do a little bit of, and Andy [Professor Andy Young] knows a lot about. So that was fine. But there were certain bits where you just think, it's like the psychologist going on the radio and talking about whatever they don't know about. You just kind of feel, should I comment on this or should I maybe not say something, because I'm really not representing an expert view on some of these things.

Here, Morrison describes how her sense of comfort diminished as discussions moved away from her area of expertise. She opens her comments by reporting that she was 'comfortable' and 'it was really good' when she was discussing 'psychology', her area of expertise; she then identifies two issues – policy-making and medical research – that she felt 'fine' discussing because she has 'a little bit' and her more senior colleague 'a lot' of experience in those areas. However, she then describes uncomfortable feelings of uncertainty at moments when the discussion moved outside areas on which she felt she could 'represent an expert view'. In these circumstances, she felt unsure whether to comment or not. She worries about being out of her depth and resembling the popular 'psychologist going on the radio and talking about whatever they don't know about' (see further discussions of the relationships between public engagement and professional opprobrium in Chapter 6). She thus demonstrates again the difficulty that scientific expertise is not a homogeneous, firmly bounded phenomena. Instead, scientists' scientific expertise emerges as a more heterogeneous, gradated and fluid phenomena with core areas featuring high levels of expert knowledge and peripheral areas featuring lower levels of expert knowledge.

Summary

Interviewees discussed their experiences of policy-oriented public dialogue events in generally positive terms, reporting that public dialogue brings scientists and publics closer together in ways that enable them to have conversations with each other and in ways that differ from other forms of public engagement. A particularly notable aspect of interviewees' discussions is the extent to which participation in public dialogue can transform scientists' perceptions of public capabilities to assimilate and work with complex scientific and technical matters, thus prompting respect for the public among scientists.

Interviewees' misgivings concerning public participation in decision-making with respect to matters of science, technology and medicine were discussed in Chapter 5. In addition, in the present chapter, interviewees raised three further uncertainties or difficulties regarding their participation in public dialogue. First, while all agreed that their primary role in public dialogue is that of a relatively passive scientific expert who responds to public participants' questions, a range of views emerged about the potential for scientists to act as advocates, to more deliberately direct the course of the dialogues, and to draw on their own personal experiences. Second, interviewees expressed a range of concerns regarding the rigour of the qualitative, small-group approach that is commonly employed in public dialogue. In particular, some interviewees revealed their concern that such approaches cannot claim to be representative and do not provide any guide as to where the weight of public opinion lies. Finally, interviewees expressed concerns about what they saw as the unrealistic public expectations of the breadth of their expertise. These issues are discussed in more detail in the following chapter.

CHAPTER 8 DISCUSSION

Public culture as professional science

The findings from this project confirm the 'sea change' affecting scientific culture in the UK, in which public engagement activities have become an increasingly important part of the scientific profession for individuals and institutions alike. These findings suggest that the vision of the 2000 Jenkin report, of a shift from deficit to dialogue, has been at least partially realised as a shift from deficit to dialogue models. The findings also provide a snapshot of an evolving public culture of engagement activities in which scientists currently participate more out of a positive sense of voluntarism and vocation than as a result of managerial or bureaucratic drivers. A finding that is reinforced by the qualitative data presented here is the extent to which the two-way, reciprocal model of engagement activities as exchanges has become a dominant paradigm, or 'ideal type', of engagement activity. As the data presented here confirms, public engagement and dialogue activities are seen to be desirable and necessary because science and the public are increasingly understood as interdependent and mutually beneficial: science presents social challenges and is dependent on public funding and consent; in turn, science benefits patients and the public, while the public can benefit science, in a series of interactions most optimistically conceived as a 'virtuous circle' or 'win-win' situation. Tellingly, in the accounts presented here, images of scientific isolation or academic ivory towers are limited to interviewees' perceptions of how the public perceives the interviewees. More firmly than in the past, public engagement emerges from the interviewees' discussions as an established component of professional commitment, part of the everyday practice of professional science. Thus, public lectures, media interviews, science festival debates, visits to schools and a variety of other activities under the broad remit of public engagement take their legitimate place alongside other professional or academic activities. This development within professional scientific culture is consistent with external policy developments that have located public engagement at the centre of all scientists' – and, indeed, all academics' – future concerns.

The second broad area of findings from the ScoPE study is that public engagement emerges from the interview data and workshops as an anomalous aspect of professional science. Public engagement is an increasingly important aspect of the scientific

profession worthy of time and commitment; at the same time, it is an activity that is under-rewarded and potentially professionally distracting and stigmatising. It is thus, confusingly for some scientists, seen to represent both the best and the worst features of scientific professionalism – at best an expression of the chief ideal of science as a vocation (to further scientific progress), and at worse a symptom of professional failure. The strong finding that public engagement work can be stigmatising and, in this and other ways, potentially detrimental to a professional scientific career is a reminder that the 'sea change' has also produced an undertow of tension. A similar tension surrounds the third major finding of the study – that although interviewees show strong support for the principle of robust and meaningful institutional structures for the incentivisation, evaluation and reward of public engagement, a range of potential problems associated with measurement, compulsion and targets are equally a source of concern.

Sophisticated and embedded accounts

Interviewees' accounts of relationships between science, the public and public engagement were thoughtful, layered and nuanced. Public engagement activities emerged as a topic about which they care and think critically. The descriptions given by scientists of public engagement were in many cases highly sophisticated, including perceptive sociological and psychological insights. These descriptions contained many distinctions and qualifications in characterisations of the public, or publics. A basic equation that, if the public were treated reasonably and respectfully – in a word, sensibly – they would reciprocate in kind, appeared to enjoy general consensus. Lapses in public support tended to be seen to be located among specific groups or oriented toward specific applications of science and, to some degree, due to errors of judgement by the scientific community. Fewer distinctions are observable in interviewees' discussions of the media, and activist or 'opposition' groups – such as animal rights protesters or religious groups – were rarely distinguished from one another.

The importance of first-hand experience of public engagement and dialogue activities would be hard to overstate on the basis of the interview data. Interviewees' descriptions and analyses can be

best understood as embedded or rooted in specific professional and personal contexts and experiences. In many instances, interviewees drew upon their direct experiences of the public – in the clinic or in public engagement – and they contrasted these with representations of the public they experience indirectly, perhaps in the talk of colleagues. Moreover, in many cases, scientists working on particular conditions emphasised the direct value to their science of their public engagement work with medical research charities and patient groups. Interviewees with clinical experience often provided instances of *conversational translation*, which, if generalised, could be seen to represent the two-way exchange models informing the public engagement paradigm of reintegrating science and its publics through talk. Other interviewees encountered potential obstacles to their research, describing contexts in which public engagement activities became crucial to public debate and parliamentary lobbying.

Publics and public engagement

From the perspective of most of the interviewees, then, and in contrast to some representations of science and society policy debates, the context for public engagement emerged from this study as a generally positive relationship between science and the public. For instance, most of the interviewees identified a general and broad-based public support for developments in science, technology and medicine. Some – particularly those with clinical responsibilities – identified ongoing improvements in public understandings of science. However, interviewees were quick to identify familiar instances in which this broad-based support lapses and scientific developments are compromised (GM crops, the MMR vaccine and (hybrid embryo) stem cell research were often mentioned in this regard). These lapses in support were most often attributed to misconceptions of science and scientists among sections of the public and to the negative influence of other malign social actors (most prominently the news media, but also civil society groups and corporations) as well as aspects of scientific culture itself. Notably, interviewees sometimes shared, or expressed empathy with, negative public responses to scientific developments, particularly within the specific contexts in which they emerge.

Public engagement emerged as an activity with multiple objectives for the interviewees, including instrumental objectives for promoting scientific work. Most often, this takes the form of proactively or reactively putting the record straight in the face of public misconceptions and the malign actions of other social actors. These objectives were complemented by others. As well as highlighting the questions that scientific researchers might address, interviewees emphasised the importance of public engagement as a means of democratising science and improving the ways in which scientific research and clinical activities are undertaken. In some cases, aspirations toward democratic inclusion and citations of intelligent and objective publics were often in strong tension with concerns about the misguided choices and decisions that the public might make in practice. Public engagement was frequently cited as a reciprocal imperative or obligation to repay public funding (most often that obtained from medical research charities and patient groups, but also from the taxpayer).

Interviewees with experience of policy-oriented public dialogue events had largely positive experiences to report, particularly with respect to their transformed perceptions of the capabilities of non-scientists to understand and discuss complex scientific matters. Some interviewees expressed concern about the methods used in the design of public dialogue events, their roles as scientific 'experts' and public overestimations of the breadth of their knowledge.

Conversations with policy

As indicated earlier in this report, the core of the contemporary Science and Society policy trajectory – that public engagement implies a deeper or two-way engagement modelled on dialogue with the public – was strongly reinforced in the ways that interviewees discussed both public engagement and public dialogue activities. In common with policy trajectories, interviewees discussed public engagement in terms of a contemporary move from communication alone to a combination of *both* communication *and* deliberation. However, while many policy actors and practitioners might draw strong distinctions between the practices and objectives of public engagement and those of public

dialogue, this distinction was not noticeably present in interviewees' accounts. Instead, multiple objectives seem to be in play at all times and across the broad categories of 'public engagement' and 'public dialogue' events. These comments point to the importance of indirect and informal 'conversations' or connections between public engagement policy developments and the understandings of public engagement by scientists. As governmental plans to institutionalise public engagement to greater extents than heretofore become clearer, these conversations may become more direct.

Institutionalising public engagement

The ScoPE project provides an opportunity for scientists to address policy and practitioner communities with respect to two particularly prescient elements of the Science and Society and broader public engagement agendas. As mentioned in Chapter 1, public engagement by scientists has been increasingly encouraged and promoted over the past decade. More recently, under the auspices of the National Co-ordinating Centre for Public Engagement and the six pilot Beacons for Public Engagement (NCCPE/BPE 2009), public engagement is beginning to be encouraged and supported throughout the UK higher education sector. At the same time, it appears highly likely that the new Research Excellence Framework will somehow evaluate and reward, alongside the policy and scholarly impact of academics, the public engagement activities that they undertake (Drayson 2009).

Importantly, within this context, although the objectives that they ascribe to public engagement may differ to some extent from those espoused by NCCPE/BPE, the ScoPE interviewees gave every indication of sharing the commitment to public engagement that is evident in these policy developments. In addition, as is the case in the NCCPE/BPE and in the recent comments of Lord Drayson (2009), most of the ScoPE interviewees argued that public engagement should be more meaningfully and sincerely incentivised and rewarded by scientific/academic institutions and the providers of both core and project funding. However, the interviewees also gave compelling accounts of the positive aspects of the current professional culture within which they voluntarily

undertake public engagement, and which institutional actors now seek to change. Notably, the interviewees observe that they have a great deal of autonomy with respect to their public engagement activities; that teams and groups of scientists can manage their public engagement commitments in informal ways according to their individual strengths and weaknesses (thus, public engagement is often done well); and that public engagement is infused with a sincerity, commitment and goodwill that can be associated with the current voluntary and vocational nature of public engagement.

In common with the NCCPE/BPE, the ScoPE interviewees often noted the challenge of developing metrics for the evaluation of public engagement. More fundamentally, however, some expressed the concern that more formal systems of incentives and rewards also create systems of obligation and compulsion, of targets and quotas, which may well serve to undermine the positive characteristics described above (in a sense, possibly 'killing the goose that laid the golden egg') and produce other unforeseen consequences. Indeed, many interviewees expressed uncertainty about the extent to which the existing rather informal incentives for public engagement, such as the inclusion of public engagement statements in funding bids, might be prompting an insincere, tick-box mentality among scientists. In addition, the interviewees all spoke of science as an already overloaded profession, characterised by the motif of the '80-hour week'. In this context, some interviewees reflected upon the extent to which institutions might wish leading international scientists to be undertaking public engagement activities in the time that they might otherwise commit to leading internationally recognised scientific teams in contributing to the competitive knowledge economy of bioscience and biomedicine.

Practising public dialogue

Interviewees also provided detailed and revealing accounts of their experiences in policy-oriented public dialogue that are of value to those working within the Sciencewise-Expert Resource Centre (2009) and at other sites of policy-oriented public dialogue. Typically, these were positive experiences; in particular, interviewees spoke of the ways in which such processes

transformed their understandings of public capabilities to discuss complex scientific, technical and medical issues. At the same time, interviewees raised specific concerns. In particular, some interviewees expressed concerns about the potential pitfalls and appropriate limits associated with public involvement in decisions concerning science, technology and medicine. Does this mean, they imply, that such decisions will become subject to the perceived subjectivities, prejudices, ignorances, vagaries and fickleness of public opinion? From the perspective of public dialogue, the key point here would seem to be that public dialogue is specifically designed to obviate these often-cited negative characteristics of public opinion, and instead to deliver public views and perspectives hewn from the in-depth knowledge and understanding of multiple perspectives that should result from iterative and well-facilitated dialogue and deliberation.

Interviewees also expressed concerns relating to an assumed lack of rigour associated with the reliance on small public groups and qualitative data that characterises public dialogue. How, they appear to ask, can such small 'samples' be legitimate, representative or amenable to generalisation? And how can qualitative data tell us something meaningful about the weight of public opinion? In this instance, interviewees based their concerns on the contrasts between the unfamiliar methods of public dialogue and the familiar large-scale, quantitative methods in which they are trained as scientists and which they see employed within the context of public opinion surveys. Of course, 'experts' of many stripes are utilised in public dialogue processes, and many will be more familiar with qualitative approaches than the ScoPE interviewees are. However, the challenge would appear to be to emphasise the variety of ways in which the approaches that are typically employed in public dialogue can yield distinctive and valuable insights into complex issues, as well as countering the well-known shortcomings of quantitative approaches that may

oversimplify known factors while failing altogether to identify less well-known influences, obstacles and drivers ('factors').[21]

Benchmarking scientists on public engagement

The closing stages of the ScoPE project and the period during which this report has been written have coincided with the announcement of the potentially highly significant ministerial commitment to evaluate scientists' (and other academics') public engagement activities (as 'impact' measures) alongside scholarly indications of quality in the 2015 Research Excellence Framework, (Drayson 2009). Of course, this commitment may yet be reversed or become less meaningful than Lord Drayson's recent comments imply. However, it appears likely that this incentive – the implementation of which was both supported by many of the interviewees for this project and the subject of some concern – will become a reality over the coming years. With this in mind, it is to be hoped that the ScoPE project provides a meaningful benchmark for understanding scientists' own perspectives, critical reflections and experiences with respect to public engagement in the period immediately prior to the implementation of any such changes.

From the perspective of scientists, social scientists and policy-makers alike, the proposal to measure and evaluate public engagement activities prompts a range of questions. Not least, this proposal demands the future revisiting of the questions that were posed in the ScoPE project. For instance, how might meaningfully incentivised public engagement influence the relationships between science and the public, the objectives of public engagement (to meet institutional targets, perhaps?) and the place of public engagement within the lives of professional scientists? More broadly, how might such developments influence existing and nascent professional strategies, practices and relationships among and between individual scientists, formal and informal

[21] These issues, and many others related to the employment of 'experts' in public dialogue, are being productively investigated within the Sciencewise-Expert Resource Centre (Lansdell 2009).

teams or groups of scientists, academic departments, institutional public engagement professionals, academic institutions themselves, the funders of scientific research and so on? Indeed, how might novel imperatives to conduct public engagement alter the nature of a science already widely said to be increasingly required to orient itself around its contribution to innovation, problem-solving and policy (for instance, see Nowotny *et al* 2001), and how might widespread public engagement influence the science that gets done and the ways in which it is done?

More broadly, the prospect of larger-scale embedding of public engagement and public dialogue activities has implications for definitions of knowledge (how to achieve more interdisciplinary expertise while preserving specialist knowledge), translation (whether a version of public engagement can serve as a valuable feedback system for innovation) and the public sphere (whether a democratisation of scientific decision-making can serve as a model for new forms of active citizenship). The role of the UK, which is in many respects increasingly distinctive as a site of public engagement innovation, will also attract continuing appraisal internationally. To the extent that this report confirms the value of close readings of situated data drawn from within the professional communities most directly affected by the 'public engagement revolution' in UK science over the past decade, it too represents a contribution to both a more publicly engaged science and a more scientifically engaged public.

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