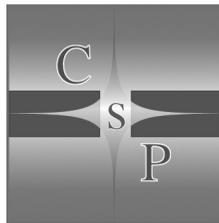


Science and its Publics

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Edited by

Alice R. Bell, Sarah R. Davies and Felicity Mellor



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INTRODUCTION

“SOLVERATING THE PROBLEMATISING”

FELICITY MELLOR, SARAH R. DAVIES
AND ALICE R. BELL

Science and its publics: depending on your perspective, the title of this volume could encompass anything from weather forecasting to science policy studies. The book’s actual focus, however, is the critical analysis of science communication. It was inspired by a conference held by the Science Communication Group at Imperial College London in the summer of 2007, which provided an opportunity for researchers from a variety of backgrounds to come together to discuss issues surrounding the public mediation of science. The success of this conference suggested that a collection of essays building on its themes would be of interest.

There is, however, a counter story to this tale of a well-received event. Some of the initial reactions to the conference were rather different from the enthusiasm later expressed by participants. Our first call for papers for the conference prompted a brief flurry of hostile emails in response. As we discovered, the diversity that makes science communication such an exciting field to study can also be a cause of conflict. The call for papers had noted the need to problematise the term “the public”—especially with respect to the often-assumed dichotomy between science and the public—and had also stressed that this would be an academic, rather than a practitioner-focussed, conference. The previous summer, we had convened a conference drawing on a mix of practitioner and theoretical viewpoints. It had been an enjoyable event, but we had at times been frustrated by the difficulty in getting beyond calls for the public to know more about science. At this second conference, we wanted to draw together, and build on, the considerable but dispersed academic research into the interactions between science and its publics—work which has long since moved beyond a preoccupation with force-feeding scientific facts to the public.

Our, no doubt clumsy, attempt to focus on academic work seemed to annoy some members of the email list on which we first circulated the call

for papers. Science communication practitioners were quick to note the exclusive nature of our language. They objected to what they saw as unnecessary academic jargon (words like “problematise” and “dichotomy”) and felt that our conference was part of a broader attempt to marginalise practitioners. As one respondent put it: “Perhaps a bit more practitioner focus would lead to more insight into the public, thereby ‘solverating’ the problematising?”

Things quickly calmed down after some mutual clarifications and apologies and the conference went ahead as planned, attended by researchers from a range of disciplines who were able to share their perspectives on the science/public nexus. Yet those initial exchanges were a sharp reminder of the tension that lies at the heart of the field of science communication: how should the relationship between theory and practice be managed? Or, to put it in more soul-searching terms, what is the purpose of academic research into science communication?

Dealing with theory and practice

Science communication is not, of course, the only field to raise questions about the relation of theory and practice. Other fields focussed around a practical or professional activity—education, social work, law, media studies—frequently go through periods of reflection about the relationship between academic research and professional activities. Indeed, the relation of theory to practice has itself, ironically enough, generated much heavily-theorised discussion. Yet the relatively recent emergence of science communication as a field of academic interest and the practically-oriented concerns which prompted its development—in the UK at least—mean that any such tensions arise here afresh and, arguably, in a rather different form. Moreover, as a field tightly linked to the practical training of postgraduates, science communication academics confront the practical concerns and agendas of their students at every lecture. There is no hiding in the ivory tower for us—our students, intent on pursuing careers in the practice of science communication, would not allow it.

In the UK, the centrality of practical concerns to discussions about science communication can be traced back to the emergence of the field during the late 1980s and early 1990s, when interest coalesced around the public understanding of science (PUS) movement. This movement worked with the aim of disseminating scientific knowledge to an uninformed public, and largely drew strength from a scientific community who felt under attack (Miller 2001). A landmark piece of research arising from

these concerns was the survey into public attitudes towards science carried out by John Durant and his colleagues in 1988 and published in the journal *Nature* the following year. The results of the survey were widely reported by a shocked media which gasped in horror at the “public ignorance of science” that the survey had apparently revealed (*New Scientist* 1989). *How many people think the Sun goes around the Earth? Do only a third of us know that atoms are bigger than electrons?*

The supposed ignorance of the public was not a new concern in the mid-80s, and it is one that continues to be recycled today (see Broks 2006 for an overview of this history). It had been part of the basis for C. P. Snow’s (1998 [1959]) iconic *Two Cultures* speech and is still common today, as in the leaflets bemoaning the myths of “celebrity science” published by the group Sense About Science (Tyler 2007). The preoccupation with public ignorance did, however, appear to reach a peak in the mid- to late-1980s, and it was in this particular context that the discourse now known as PUS was forged. The Durant *et al.* survey served to reinforce the PUS movement’s calls for the need to increase public knowledge of science through improved media coverage and through more extensive institutional attempts to communicate science directly to public audiences.

Yet in terms of the academic development of the field, the survey was more notable for the critiques it attracted than for its findings. Researchers working from a “constructivist” perspective—especially those within the sociology of science—identified problems with construing science as a body of facts or a set of unambiguous methods which the public either did or did not know independent of context (see Wynne 1995 for an early review of such critiques). Surveys of public understanding, it was argued, like many of the practical initiatives of the PUS movement, were premised on what is now widely recognised as a “deficit model” in which the public’s failure to reproduce researchers’ statements about scientific knowledge was interpreted as a deficiency, an undesirable lack on the part of the public which needed addressing. Furthermore, PUS often assumed that an increased release of information from scientists to the public would lead to an increased public understanding of science—something which in turn was expected to lead to greater public acceptance of science. These assumptions did not necessarily hold true. As critics of the deficit model pointed out, to know science does not necessarily mean that you love it (Bucchi and Neresini 2002; Turney 1998).

Traditional PUS took both “science” and “the public” as homogenous categories, ignoring the varied needs or interests of different constituencies within each group. Social researchers, by contrast, insisted on

deconstructing these terms and noted the ways that definitions of such terms could be applied rhetorically. Indeed, constructivists set about “problematizing” (our email correspondents would wince!) all three of the terms in the phrase “public understanding of science” (Wynne 1991). As Christopher Dornan (1990) and Stephen Hilgartner (1990) argued, the neat black-boxing of non-scientists as “the public” was politically advantageous to those in the scientific community whose interests lay in reinforcing their own authority. Hilgartner, in particular, suggested that by defining the public as recipients of knowledge, PUS provided the scientific establishment with “the epistemic equivalent of the right to print money” (Hilgartner 1990, 534). These were dimensions which had not been questioned in the earlier survey work of Durant and his colleagues.

In the same year that his survey had been published, Durant had been appointed to the world’s first Chair in the Public Understanding of Science at Imperial College. Later professorships in the field would be awarded to scientists who were successful popularisers but who had no research experience in the area: for instance, Richard Dawkins, the biologist and popular science author, became Professor of the Public Understanding of Science at Oxford in 1995; most recently, in 2008, fertility expert and TV presenter, Lord Robert Winston, was appointed Professor of Science and Society at Imperial College. Such appointments embodied a split within universities over the perceived role of academics with respect to public science. On the one hand, popularising scientists did their best to assume ownership of a field whose subject was their own activities. On the other, academics from a range of disciplines loosely assembled under the umbrella of science studies were best positioned to mount the critical analyses of science and public which they felt were needed.

Yet despite this divide between academics involved in practice and those involved in analysis, the constructivist critique of the deficit model did come to influence science communication practice, leading to a significant re-formulation of PUS initiatives. When it undertook an investigation into the relationship between science and society, the Lords Select Committee on Science and Technology appointed John Durant and the sociologist of science Brian Wynne as special advisors. The title of the committee’s report—*Science and Society*—signalled a significant departure from the earlier, and increasingly discredited, label of “Public Understanding of Science”. This report (House of Lords 2000) has been widely credited with encouraging a new approach to public science activities in the UK by identifying a “new mood for dialogue”. Traditional pedagogic and uni-directional modes of communication, such as public lectures, have given way to a greater emphasis on panel debates and

audience interaction; and the PUS movement, with its reliance on a deficit model of communication, has been replaced with a public engagement with science and technology (PEST) movement inspired by a contextually-sensitive dialogic model.

Problematising PEST

Or so it might appear. But this narrative of a smooth journey from deficit to dialogue can be questioned. There has certainly been a proliferation of new acronyms (accompanied by the odd desire to build the kinds of manifesto-based movements to which the acronyms refer). Occasional alternatives to PEST—all with their own unfortunate abbreviations—have included PUSH (Public Understanding of Science History), PUR (Public Understanding of Research), and PANTS (Public Awareness of New Technologies). Yet none of these movements, PEST amongst them, is as critically rigorous as its advocates suggest. All can be used as cover for a very old-fashioned politics of empire building—be these the empires of scientific institutions, business, left- or right- wing politics, individual scientists, science communication professionals, or of sociologists themselves.

Even the Lords Report, for all its apparent reach, had its omissions. As Wynne himself noted, despite being produced from within the UK’s political establishment, the report said little about the political nature of the science/public interface (Wynne 2001; see also Dickson 2000). Questions about the play of power in public science were not addressed, even though the fundamental insight offered by constructivist analyses of public science was that the deficit model was *normative*. In the constructivist reading, the PUS movement was just the latest expression of anxiety from a social elite keen to maintain control within a technologically-dependent economic system. The assumption that greater public understanding of science would lead to greater acceptance of the technological products of science was based on a whole set of ideological assumptions which failed to question whether science was always an unambiguous social good (Wynne 2006). Arguably, PEST has much in common with the tactics of the New Labour government in its spinning of public consultation exercises. Just as PUS needs to be located in the historical moment in which it emerged and to be understood as, on one level, the defensive reaction of scientists who felt under attack from the funding cuts of the Thatcher government, so too PEST emerges in a distinct historico-political environment.

One might suspect that, at this ideological level, PEST is little more than a rhetorical disguise for traditional PUS. The switch from PUS to PEST came after polarised public debates over GM crops and the safety of the MMR vaccine. In both cases, public concerns seemed to challenge an establishment position supported by both government and mainstream scientists. In this context, with no clear indication of how PEST activities can inform either science policy-making or scientists' own technical practice and priorities, PEST comes to seem more like a public relations exercise aimed at avoiding future confrontations rather than a sincere effort to accommodate public concerns (Beder 1999). Wynne (2006), discussing the move to "public engagement", describes it as "hitting the notes but missing the music"—much-vaunted dialogue activities, he suggests, remain focussed on gaining public trust in science. Likewise, Jon Turney (2003)—responding to comments by the Director of the Royal Institution, Susan Greenfield, in which she bemoaned the public's ignorance and fear of science—challenged Greenfield's rhetoric of public engagement: "invite them to participate, and really mean it, and they will find the motivation to become as scientifically literate as you, or rather they, please." The question of whether many PEST practitioners "really mean it" remains open. Certainly, scholarship which has analysed some of the new "public participation" processes gives us leave to doubt it (Goven 2006; Irwin 2001; Schibeci *et al.* 2006).

Many of these concerns were exemplified in the "GM Nation" debate about the future of genetically-modified crops, launched by the UK government in 2002. In what could have been an important coming-together of theory and practice, the government's preparation for GM Nation had included consulting with a number of UK academics whose expertise lay in science and society. Unfortunately, however, the process did more to highlight the disjunction between theoretical input and practical processes than it did to overcome it. Shortly after the debate had been publicly announced, the academics involved in the process wrote to the Public Debate Steering Board with extensive criticisms of the way the debate had been framed and timed (Burgess *et al.* 2002). The debate was to be conducted alongside a scientific review and an economic cost-benefit analysis, but while these other two strands were to inform decision-making, the government stressed that there would be a clear separation between the "overall dialogue" and the much later decision-making about the commercialisation of specific crops (DEFRA 2002). Despite claiming to want a "genuinely open and balanced discussion", the government spoke of using the dialogue to identify which questions the public had about the issue and to develop from this "the provision of comprehensive

evidence-based information *to* the public on scientific, economic and other aspects of GM” (DEFRA 2002; italics added). For all the talk of two-way communication and dialogue, the end-point seemed to be old-fashioned top-down PUS.

A further critique is that PEST, and arguably most of the manifesto-building around science communication, assumes a policy-based agenda for science communication. By focusing on policy it provides the science communication industries with an apparently democratically sound excuse for their existence, but forgets that much science communication is in fact consumed for its *entertainment* value. This is not to suggest that science-as-entertainment—be it in the form of museums, popular science books, science fiction films, or any number of other cultural products—is not political. Indeed, identifying the political discourses in such works is a key aspect of science communication research and teaching. But many of these products are not framed around policy endpoints in the way that meaningful PEST demands (see, for example, Rowe and Frewer 2005). Ironically, by calling for science communication to show non-scientists more respect and emphasising the democratic potential of PEST, academics have managed to ignore the vast majority of science communication activities and the publics who enthusiastically participate in them (Davies *et al.* in press).

It is also all too easy to replace a model of the public as deficient in science with one that imagines that what “they” “really need” is a good dose of history, philosophy or sociology—as Locke (1999) noted in response to Collins and Pinch’s *Golem* books. Bucchi (1998) discusses the way in which—by describing and therefore constructing a meaningful gap between science and the public—much “dialogue” work actually exacerbates and emphasises science/society boundaries. By this reasoning, perhaps (and rather pessimistically) the best solution to the problems faced by post-PUS science communication is to lie as low as possible and simply let everyone get on with their own business.

The place of theory

It seems, then, that the theory/practice relationship in science communication remains inevitably interwoven with political concerns and is laden with pitfalls for the unthinking academic or practitioner. It is this, we believe, that makes the theory side of the relationship all the more important. As long as governments and other powerful players are involved in the public mediation of scientific issues—as they always will be in a technological society—questions about science and its publics will

be inherently political. Actors in these ventures have ideological interests and motivations that need to be scrutinised by those who are able to maintain a critical distance. Practitioners caught up in the pressures of actually delivering such initiatives rarely have the luxury of reflecting on their underlying assumptions, nor the opportunity to speak out in a critical fashion.

Yet the development of a critical body of theoretical work within academia has been further complicated, as we suggested earlier, by the vocational orientation of most postgraduate teaching in the field. The UK's first science communication degree—launched in 1991 at Imperial College—aimed to prepare science graduates for careers in the media and other sectors of the communications industry. Despite its focus on career outcomes and communications practice, this masters programme had a strong intellectual component (as indeed it still does today), drawing heavily on analyses in both science studies and cultural and media studies to encourage students to adopt a critical perspective which would inform their own practice. The Imperial course was followed by several other postgraduate UK courses, each finding its own balance between theory and practice. Yet, despite the fruitful exchange between theory and practice that these postgraduate courses have provided for their students, the focus on teaching has, arguably, come at a cost. Teaching programmes have, on the whole, failed to act as a nucleus for new research groups and courses have been justified in terms of their practical outcomes rather than the synergy between postgraduate teaching and research.

In the field of science communication, then, theory and practice constantly come together and pull apart. In different contexts the relationship works out in different ways, presenting multiple re-configurations. Even at its simplest the relationship operates across three, rather than the usual two, axes: scientific practice, communication practice and scholarship from the humanities and social sciences. But there are further fractures: the tension between teaching and research and the proximity of teaching to professional practice; the many different research traditions which scholars bring to the subject; and the range of activities which constitute practice, from scientists' own popularising activities through institutionally-based liaison work to professional journalism and media production.

We should also remember the diversity of views, approaches and agendas at work within each of these axes. One of the most noticeable developments in recent years has been the increasing interest in science communication issues amongst historians of science (see, for example, Secord 2004). Indeed, several academic centres for the history of science,

technology and medicine have recently started up MSc courses in science communication. The work coming out of history of science and science and literature studies (several examples of which are included in this volume), and historians’ re-engagement with science communication are developments which can only be positive. Despite these new unities, however, the research field remains scattered, with individuals tending to face their original disciplines rather than coming together into a coherent field. Indeed, one might question whether science communication studies exists as an academic field at all. Researchers engaged in this area tend to work as individuals rather than as members of formally-constituted groups with a common interest in public science. Despite several journals dedicated to the subject, science communication has failed to develop within universities as an institutionally-recognised academic field rather than as a teaching concern or set of outreach activities.

It is for this reason that we feel—practitioners’ worries about being marginalised notwithstanding—that there is a continued need for meetings and publications dedicated to academic research which can serve to draw researchers in the field together. We hope that this volume contributes to that effort. A coming-together need not imply an attempt to homogenise research, nor to develop a single unifying research agenda, and that is certainly not our intention here. Indeed, the interdisciplinary nature of the field is also its strength. It ensures that research is not focussed on just one aspect of practice, but examines its many manifestations—including mass media coverage of science, fictional renderings of scientific issues, the historical context of public science discourse, the relation of public science to laboratory practice, educational issues, and much more. Crucially, the interdisciplinarity of the field also ensures that analytical insights from a range of disciplines can inform our understanding of public science.

This volume, then, is not intended as a comprehensive overview of the field, nor as a manifesto for one particular approach, but rather as a celebration of the diversity of the academic field of science communication. Our contributors come from a range of disciplinary backgrounds, including history, literary studies, education, and cultural studies. Some are based in science communication groups formed around teaching activities; others are to be found in broader groupings of science studies scholars or in departments based on traditional disciplinary boundaries. Several do not especially identify with science communication at all—they simply noted a productive overlap of interests. What we all have in common, however, is an interest in critical analyses of the intersection of science and its publics.

Content of the book

Despite our interest in the public dimension of science, we have chosen to start, more or less, in the laboratory. The first chapters take us from examining scientists' talk about their publics to looking at their interactions with those publics. Davies (chapter one) argues that scientists' talk about the public is an area which has been under-studied by science communication researchers. Sociological critics, she suggests, were perhaps too quick to ascribe ideological motives to the scientific community. In the heat of 1990s PUS, this might have been understandable, but arguably the time has come for a more nuanced understanding, especially if PEST really does seek to put scientific and public talk together. Previous work has often been content to accept homogenised accounts of scientists' talk of the public, assuming without question the power of the deficit model. Davies's analysis draws to the fore the flexibility and diversity of such talk, pointing to the concurrent presence of multiple models of publics and to a deep intertwining of the attributes of "science" and "the public". Since her findings indicate the presence of at least some "non-deficit" models of publics within scientific cultures, Davies concludes by noting that public engagement activities should both hope for, and work towards, the increased use of such models by the scientists involved.

The following two essays start to take up this challenge by discussing two very different cases of public engagement and the effects they had. Harris and Thiessen (chapter two) guide us through the fascinating case study of post-revolutionary China and its experiments in "total engagement". The success of these processes—in terms of a genuine mixing and use of all relevant knowledge—has been, they suggest, greater than anything so far observed in a European or US context, despite the experiments' brief and inevitably (and terribly) flawed nature. They finish by observing that as the challenges of, for example, climate change heighten, those involved in science communication and policy will increasingly have to look for guidance from both history and other cultural contexts.

In chapter three, Murphy's case of engagement is rather different. He examines classroom interactions with science, and in particular the ways in which young people talk about biomedical issues in classes designed around these topics and using specially designed stimuli material. Such engagements, he suggests, are increasingly important in the context of late modernity—the "emotive, argumentative, and political" deliberations it involves are vital for a working-through of prospects and the negotiation of moralities. Young people's talk around these issues, he argues, is both

complex and important—a theme which is picked up by Bell in chapter four.

Bell points out that children’s relationships with science are both under-studied and extremely interesting—children comprise an unusual form of social group, one which is frequently marginalised politically. There is, however, also something universal about the child—we were all once young, in a way that we were not all once the same gender, race or sexuality. The child and science can be, she suggests, a site that focuses many of our culture’s concerns and hopes. In elucidating this, she uses the case study of *Horrible Science* (a popular UK-based series of science books) to consider a range of ways of imagining children’s relationships with science. These relationships vary depending on changing (and sometimes inconsistent) definitions of either children or science, and may prioritise the child-public over the scientists just as much as follow “deficit model” ideas of the scientist knowing best. Yet, overall, Bell finds a lack of agency given to the child—at best, they are seen as adults in waiting.

A further site where the child is emphasised is described in Sleigh’s account of Mark Haddon’s novel, *The Curious Incident of the Dog in the Night-time* (chapter five). Sleigh examines the puzzle of how this book came to be interpreted as a story about a child with Asperger’s syndrome even though the book itself never once mentioned the condition. Sleigh argues that to understand the interpretation of the novel, we must look at how the text intersected with its cultural context. She argues that the debate over the MMR vaccine’s possible links to autism and broader public anxieties about the nature of childhood, meant that the metaphor of Asperger’s syndrome was readily available to the readers of Haddon’s novel. By studying the relationship of text and context in a book such as this, Sleigh suggests, we can cast light on the way that scientific issues circulate through our culture.

Given their frequent construction as “adults in waiting”, a key feature of discourse about children is how they are positioned with respect to the future. Future talk of a rather different sort is the topic of Leach’s analysis of the promise of a \$1000 genome (chapter six). Leach argues for the rhetorical significance of hype, not just in popular media texts about science but also in the writings of scientists. Hype, she argues, is characterised by the conflation of celebratory rhetorics with rhetorics which deliberate future actions. She takes as an example the comments posted by scientists on the *Nature Genetics* website in response to a question asking what they would do if it were possible to sequence a human genome for \$1000. These responses address multiple audiences, including an imagined public worried about the genetic future. Yet despite

the provocations of some of the responses, they fail to reference each other or to draw out any further commentary. For all the opportunities of this discursive space, Leach concludes, these rhetorical prognostications have so far failed to combine into deliberative dialogue.

One key feature that Leach identifies in the scientists' rhetoric is that they talk as if the future were now. Similar rhetoric can also be found in the case of nanotechnology, as Erickson discusses in chapter seven. Erickson examines a range of texts—from the formal science discourse of journal papers, through textbooks and popular science books, to works of science fiction. Drawing on Ludwik Fleck's notion of esoteric thought communities—small groups with shared knowledge—and exoteric thought communities whose membership is more extensive and inclusive, he argues that expectations of nanotechnology arise from the interplay of esoteric and exoteric discourses. Far from formal science being separated from speculative forms of discourse, Erickson shows that there is a two-way dynamic between science fact and science fiction. These permeable discursive boundaries give rise to a shared culture of nanotechnology across different communities.

Where Erickson's focus is on the emergence of shared technological expectations, Mellor focuses on contested technological expectations. The news media provides an important site in which technological developments can be debated. Yet in her analysis of the newspaper coverage of two controversial technologies (genetically-modified crops and a new generation of nuclear power stations), Mellor finds that scientists who take a critical stance towards the technologies are under-reported, as are research findings which might be used to support arguments against the implementation of these technologies. She suggests that the norms of news production lead to the representation of science as aligned with a technologically libertarian position. Media reports, she stresses, construct science in ideologically loaded ways.

Contested claims about new technologies revolve around anticipations of a future which is not yet here. Looking back at the discursive formations of a now-established technology can help reveal how such future-oriented anxieties and hopes are played out. This is what Lean examines in the final chapter. Staying with news media, but reminding us that news outlets include advertisements as well as journalistic copy, Lean analyses how representations of computing technology developed over the three decades following the construction of the first computers in the late 1940s. He finds that computers were imagined in contradictory ways, as both wondrous and threatening. Even when this image was apparently superseded in the early 1980s by a new image of the computer as a user-

friendly domestic object, the older conceptions persisted. The same hopes and fears that had been attached to the earliest machines could be found, albeit in a new form, projected onto what had now become a consumer technology. Perhaps, Lean suggests, the representations of a technology never die, but circulate in new forms as the technology itself develops.

This book, then, takes us from scientists’ discourse about the public through various manifestations of public discourse about science. It shows how a number of analytical approaches can be brought to bear upon the question of science and its publics. We do not wish to fashion this analytical variety into a single research programme, but if there is a common theme that arises from the cases presented here, it is that the relationship between science and its publics is a complex one. In the chapters that follow, we see how science is expressed through, informed by, engaged with, appropriated, negotiated, and contested by a diversity of voices in a range of fora. Science is not only a body of knowledge constructed by scientists in their research labs, but is a cultural—and often political—production, in which different publics participate in different ways for different reasons. These complexities are worthy of academic attention as well as practical intervention.

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CHAPTER ONE

“A BIT MORE CAUTIOUS, A BIT MORE CRITICAL”: SCIENCE AND THE PUBLIC IN SCIENTISTS’ TALK

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The boom and bust of the public understanding of science (PUS) movement provided rich sources of data for social scientists interested in science and its interactions with publics. While science was subjected to a strong institutional critique, empirical attention focussed on the “public” of PUS as studies opened up the talk of lay publics in order to examine the ways in which they interacted with science. Such studies—for example Layton *et al.* 1993; Wynne 1992—showed the richness and complexity of lay negotiations of science. This complexity, scholars argued, stood in stark contrast to the simplifications assumed in the “deficit model” of public understanding frequently adopted by scientists (Wynne 1993).

Despite early calls for a literature of “the understanding of the public by scientists” (Lévy-Leblond 1992), for many years this remained something of an under-studied area in PUS research, with detailed studies of public talk not being mirrored by similar studies of the discourse of science. Existing work on understandings of publics by scientists has so far tended to fall into two camps. It has examined institutional or policy discourses, making use of policy documents or the tools and practices of the traditional PUS movement itself (see Hill and Michael 1998; Irwin 2001; Wynne 1996). Alternatively, it has looked at the talk of scientists, but has focussed on particular controversial issues such as genetically modified crops (Burchell 2007; Cook *et al.* 2004) or the use of animals in research (Michael and Birke 1994a; 1994b; Michael and Brown 2000; 2005). The former has tended to highlight science’s “sociological naivety”; the latter the context-dependence of talk about publics. There remains, I suggest, a need for detailed examination of scientists’ talk about

the public in a more *generalised*—rather than controversy-focussed—context.

The identification and critique of the “deficit model” (see Gregory and Miller 1998; Irwin and Wynne 1996; Wynne 2006) has been a key component of this work (as indeed of the entire PUS field). The term has, however, undergone some development in usage since its first appearance. David Dickson (2000) tells us that the phrase was first used in 1988 by Brian Wynne in a seminar, and it appears in print for the first time in 1991. Wynne writes:

Once we move outside a simple “cognitive deficit” model of the public understanding of science, we become increasingly aware of the range and variety of possible interactions between people’s existing understandings of particular situations and those that emanate from science. (Wynne 1991, 113)

Wynne’s use of “cognitive deficit” implies that the term refers to a deficiency in knowledge or mental ability. However, there is also a slightly different usage present within the literature. As well as being about public ignorance, the term in some cases is tied to a *narrative* of public ignorance—a causality is developed, in which distrust or scepticism is a result of scientific ignorance. Thus Sturgis and Allum (2004) explain the term in this way:

The assumption that it is a lack of public understanding or knowledge that has led to the present climate of skepticism towards science underpins what has come to be known as the “deficit model”. In this formulation, it is the public that are assumed to be “deficient”, while science is “sufficient”. The public’s doubts about the value of scientific progress or fears about new or unfamiliar innovations ... are due to ignorance of the science behind them. (Sturgis and Allum 2004, 57)

These more developed descriptions of the deficit model (see also Cook *et al.* 2004; Gregory and Miller 1998; Miller 2001) seem to derive from the 1990s work of critical scholars who examined both science and the PUS movement’s interactions with the public (for example, Hill and Michael 1998; Irwin and Wynne 1996; Wynne 1993; 1996). However, much of the work that has described this model has been based on institutional or policy discourses rather than the talk of individuals, and a cursory reading of these studies could, in fact, result in a deficit model not of the public but of the scientific community. From all the references to “science”, the “expert community”, and generalised “scientists” (see, for example, Irwin and Wynne 1996; Jasanoff and Wynne 1998), one can

easily build up a picture of a homogeneous scientific body composed of individuals who all, in all circumstances, subscribe to the deficit model and hold simplistically to their “naïve sociology” (Jasanoff and Wynne 1998, 26).

There is therefore, I suggest, a need for a study which focuses not just on scientists' generalised talk about their public, but which also provides a detailed examination of their discourse and which aims to discover whether this is as homogeneous as some literature might imply. This essay attempts to do this. Using data from group discussions held with seven different research groups, I will argue against homogeneity in scientific talk. Drawing on the notion of the deficit model, my key point is that, though “deficit” discourses certainly appear, they are intermingled with other, more complex, models of publics. There is not one smooth narrative which dominates. Indeed, sudden switches from one discourse to another can occur throughout the groups, within the talk of a single individual, and even within a single turn. In contrast to some previous studies in this area (Cook *et al.* 2004; Frewer *et al.* 2003), I am therefore seeking to highlight the complexity of scientific talk—while still acknowledging the power of dominant deficit discourses which serve to problematise the public and protect science.

In what follows I start by examining talk which does seem to construct deficit models of “the public”, finding a variety of deficiencies attributed to this body. I move on to look at a range of competing, more positive depictions of the public, and to examine the ways in which the talk of my interviews can be seen as flexible and shifting. Finally, I look at the ways in which publics are co-constructed with science, before drawing my discussion together to suggest that the data as a whole can be viewed in terms of themes of separation and identification with science. I use exemplar quotes of themes throughout; such quotes represent recurrent types of talk in the data.

From deficit...

I first wish to consider a set of negative portrayals of “the public” which—as we will see—has obvious similarities to the canonical deficit model (see, for example, Irwin and Wynne 1996). Here the public are constructed as deficient not simply in knowledge but in a whole raft of other factors as well—agency, capability, and understanding, amongst other features such as fear of uncertainty (Wynne 2006). As I show below, these characteristics can also be found in my data.

The public are impressionable/passive

Passivity as a characteristic of the public is linked to the concept of one-way communication and a simple “filling up” with scientific facts, and is therefore also related to fears of the impact of the media upon an impressionable public. This concept of passivity or impressionability is by far the most frequently occurring description of the public, suggesting that it is an easily accessible and important discourse within scientific culture. Such concepts are demonstrated in the quotes below:²

Dm: So I think that I think that they are respectful I think that that actually I think that the public are unbelievably blindly trusting in what a- a scientist would say.

I: Do you think the public are quite accepting of what science there is in the media?

Sf: Yes. I think they take- I think they take it as gospel, that what's in there is true. And I think it's really scary, that they do...

Here the public are characterised as unquestioningly accepting, both of the media and what scientists themselves tell them. They demonstrate no discernment and are, in fact, the classic “empty vessel” (see Gregory and Miller 1998) which absorbs what it is given.

The public are not critical

Linked to passivity is the concept of the public as uncritical, often expressed very directly:

Dm: ...If one scientist says one thing and another scientist said another thing, so people don't have a deep understanding of the process of science such that they can critically analyse what anybody said. But if everybody's agreed if scientists as a- have consensus on something people will definitely go with that, but if there's a difference of opinion the public has no way to er critically a- analyse wh-what that means at all. Which is- you know that's because eff-effectively they're not scientists they don't actually understand the process that deeply...

This lack of critical ability or analysis, as Dm explains it, is linked directly to the fact that *the public are not scientists*. In some ways an extension of the construction of public passivity, this discourse points out something important that the public are lacking and which science is constructed as having. The quote from Dm also demonstrates a claim as to

the result of the inability to critically analyse/discern—the public cannot cope with scientific disagreement or uncertainty.

The public are ignorant

Statements of public ignorance are found in my data, sometimes in the bluntest of terms:

Gm: ...it's like people are amazingly ignorant about medicine and- and biology and their own bodies and they would be better off if they knew a bit more, I think.

Note that there is an implicit judgement within what Gm says: ignorance is not a neutral state but something which people would be "better off" without. (We might also note that ignorance is a passive position, of simply "not knowing", rather than an active decision to avoid certain kinds of knowledge; cf. Michael 1996.) We also find ideas of a public deficit in knowledge of the process or culture of science, as well as of its content:

Om: ...I don't think they really have that much of an idea of what it actually means to be a scientist and we what we- what-what you what you do on a day to day basis.

The public fear, blame, or mistrust science

There are a constellation of themes relating to the public having negative attitudes to science. While the idea of fear of science is a particularly strong one (in terms of the frequency with which it is referenced), the various negative attitudes are not clearly distinguished and appear to be interrelated, as well as being linked to ignorance. Thus we not only see references such as this:

Sf: I think science is seen as evil, and scary, and as causing all the problems in the environment.

but also segments where the fear (or other negative attitude) is linked directly to a lack of knowledge or understanding:

Hf: ...a lot of people for example um genetically modified crops or something like that, people don't really understand what they're all about, because they- they're just scared of something, that they don't understand.

A range of similar but less prevalent discourses, such as the public being “anti-science” or readily misunderstanding scientific information, also appear in the data in addition to the four I have described. Many of these, however, can be viewed as sub-categories of the main discourses described above. Taken together, we therefore have a discourse made up of a network of negative characteristics—*the public are passive, uncritical, ignorant, and have a wrong attitude towards science*. In addition, many of the quotes given above demonstrate a coherence between these characteristics. The different themes often colocate and are linked together in talk. In particular, it seems that the passivity/ignorance/uncritical themes are linked to and colocate with the fear/blame/distrust themes:

Tm: ...because they're so ignorant of what's going on it's very easy to induce fear and loathing and suspicion and hatred and all of those kind of things-

Mm: Er some- some people I-I I would say are scared of what they don't understand.

Taking as an example Tm's quote above, we can see that ideas of ignorance, passivity (through the easy “induction” of particular emotions) and fear/hatred of science are all present in his talk and presented as interlinked. From this and the rest of the discussion above we might reconstruct an “ideal-type” narrative which both constructs the public and defines the causality behind its attitude to science. This reconstructed narrative would go something as follows:

The public are passive and ignorant. They can be easily manipulated and fear what they don't understand. This leads to a negative attitude towards science.

What are some of the implications of the prevalence of this kind of talk about the public? As I have noted, it presents an essentially negative picture of the public, problematising them in their relations with science. Science itself is untouched and unconsidered. Interestingly, however, the concepts of passivity and manipulation allow something of a get-out clause from the portrayal of a morally-culpable public. There is little sense of *blame* for their attitudes—rather they are viewed as helpless, at the mercy of more powerful others. They are morally neutral rather than malevolent. This narrative thus enables scientists to problematise publics without blaming them—to act to protect science from scrutiny while not alienating or demonising the public.

The discourse also acts to maintain science's authority over the public. By problematising and presenting them as ignorant, the public are shorn of any ability to contribute to science or to control it. Within this narrative, only scientific knowledge is valid knowledge. In addition, the discourse gives science explanatory power. The causal chain it presents—that ignorance leads to a bad attitude towards science—enables scientists to explain any science-society problems as being entirely due to an ignorant public. If the public are not blamed within this discourse, then science certainly isn't either—there is no sense that science could ever be culpable. Ultimately, then, this “discourse of deficit” acts to maintain existing power inequalities between science and its publics and to shore up scientific authority.

A further question might be how similar this assemblage of “deficit model” characteristics is to canonical accounts of this model. Certainly the reconstructed ideal-type discourse, and many of the sub-discourses (for example, ignorance or fear), fit in well with the ways in which science's “deficit” constructions of the public are described in the literature (for example, Irwin and Wynne 1996; Wynne 2006). In both my discussion and other accounts we see concepts of the public as deficient in knowledge, agency, trust, and understanding of process. The causality that I have noted—ignorance leads to mistrust—also appears in both my data and accounts of the deficit model (Miller 2001; Sturgis and Allum 2004; Wynne 2006).

While there are strong similarities, then, there are some variations which are worth noting. The emphasis on the public as specifically *uncritical*—as a subcategory of their passivity—does not appear to have been identified elsewhere. Furthermore, while many accounts emphasise the public's *mistrust* of science as being the key problematic attitude stemming from their ignorance (see Wynne 2006), in this data we see mistrust merely as one of a constellation of negative attitudes. It is closely linked to—and at times cannot easily be separated from—other features such as blame or fear.

...to diversity...

The deficit model and related negative characterisations of the public are, it seems, alive and well within scientists' talk. However, more complex models of publics also appear and while these are primarily minority discourses, appearing less frequently when compared to deficit model characteristics, some appear to be accessible and frequently used. Key themes are described below.

The public are differentiated

The public as diverse, rather than homogeneous, appears to be one of the key ways in which it is constructed by scientists and engineers. This is a strong theme which appears frequently, suggesting that it is easily accessible within the cultures under study.

Gm: ...so there's a difference between communicating to the absolute general public the man in the street, which is always going to be extremely hard, um maybe a slightly more practical angle would be to be able to communicate to the (kind of) the generally quite well educated person who wasn't a scientist...

As the quote above suggests, this differentiation often occurs within the context of talking about communication—audiences, as a type of public, are differentiated on various grounds (for example by age, educational background, or interest in science).

This differentiation is a particularly key point given that the homogeneity of the public, and its ensuing description as an undifferentiated mass, is an important part of the deficit model in canonical accounts (for example, Irwin and Wynne 1996). Thus the scientists and engineers in my study use at least one key discourse which is not only different from, but in disagreement with, the deficit model. Indeed, many interviewees explicitly rejected a model of a homogeneous public when it was presented to them, refusing to think in these simplistic terms and problematising the notion of a general public.³

Tm: ...you know the general public isn't a single homogenous entity either it has different people who behave in different kind of ways and do different things.

Importantly, there is diversity in the use of the homogeneous/differentiated construction—diversity which may, in fact, occur within the talk of one individual. Discourses of both “the public” and “publics” are present and appear to be used by the same individuals at different points in discussion. Take, for example, Tm. As quoted above, he at one stage queries the concept of the general public by pointing out that it is not homogeneous. At another point in the interview, however, he is happy to use this concept to argue that “the public” has a wrong conception of science:

Tm: ...I think there's a perception in the public you know the fear bit of that is that there's some kind of conspiracy (*some laughter*) that you know-

we are trying to make them do something which is not in their best interest...

The public as active and knowledgeable

Discourses of the public as *active* in finding and using scientific knowledge and as a site of useful knowledge also appear, in contrast to the “public as passive” discourse of the deficit model. These more complex discourses may be broken down further. We find talk about the activeness of the public or publics, talk about the expertise of specific publics, and talk relating to useful lay knowledge of “the (general) public”.

Public activity and agency is primarily related to a seeking out of, or engagement with, scientific information. In the language used this agency is, however, constructed as the exception rather than the norm.

Lf: ...there are people who- who don't have a particular science background but through interest or through it- there being an effect on them like say a family member affected by a disease will go out, and actually educate themselves about the topic and they can often have some quite specific questions...

In Lf's quote, some kind of motivation beyond the norm is required for agency to develop—a particular interest in science or a personal effect of science on their lives. The context is the discussion of *a* public rather than *the* public. But, given this motivation, individuals can be active both in gathering scientific knowledge (“educating” themselves) and in processing and responding to it (having “specific questions”). In this and similar quotes, we thus see public agency acknowledged but limited to certain situations, groups or times. Similarly, narratives of lay knowledge are frequently limited to particular publics with ownership of what is viewed as relevant expertise to the science involved:

Pf: Um you need pe- you nee- er to identify like interesting research questions you need to talk to people that know about the local area.

There is a strong sense of “lay expertise” in Pf's comment, which argues that for her science to be most effective she needs input from publics. But the input is not general or random. The expertise is not something that anyone can provide but derives from particular experiences or “local” knowledge (cf. Wynne 1992).

However, we also find talk about the public which depicts them as *generally* having valuable knowledge in the form of perspective. This

form of expertise is derived specifically from their being outside of science:

Af: ...you know the general public or laypeople are quite good at saying well why can't- why can't you do that ... they're quite good at taking a different perspective on things. So I think it's very valuable to have people of different training involved.

Here, then, useful expertise is not limited to particular sub-populations but applies to everyone—to, in fact, “the general public”. These accounts of active, knowledgeable and diverse publics echo some of the critical literature on publics (Irwin 1995; Layton *et al.* 1993; Wynne 1992) which similarly differentiates different publics and different types of knowledge. While such talk remains in the minority, it is present in scientists’ language in competition to the deficit model (and in particular, to the latter’s portrayal of the public as passive and ignorant). Its presence should encourage us that scientists’ “sociological naivety” is just one of a repertoire of approaches to the public.

The reader will also have noted that the quotes given above might suggest that scientific discipline could be important in drawing out these more complex discourses. Lf works in medical research, while Pf is an environmental scientist—both speak from their personal experience of working with lay publics in ascribing agency and knowledge to them. Certainly this does seem to be a theme within the data. While there are multiple and competing discourses present within each of the different research groups I spoke to, more complex discourses did seem to be used more frequently in the groups that had more contact with publics in the course of their research (Davies 2007; 2008). Further research is likely to elucidate these links further.

...and flexibility

I have discussed the discourses above within two main categories—negative depictions with links to the “deficit model”, and more positive and sociologically complex models with links to critical descriptions of publics. But not all talk about the public fits so well into these kinds of categories. Within this section I want to examine a *spectrum* of talk around the public as other and as self. In this case there is not simply a two-way repertoire of “positive” or “negative” talk of the public, but rather an entire range of alternative ways of conceptualising publics. It seems that speakers can use a “pick and mix” approach, using whichever types of discourse that are appropriate at the time.