

Heterogeneous Agendas around Public Engagement in Stem Cell Research: The Case for Maintaining Plasticity

Sarah Parry, Wendy Faulkner, Sarah Cunningham-Burley and Nicola J. Marks

Although public engagement is now part of the business of doing science, there is considerable divergence about what the term means and what public engagement *ought* to be doing. This paper reflects on these heterogeneous meanings and agendas through an analysis of focus group data from research on public engagement in stem cell research. Three broad visions of public engagement are identified: as education and information provision; as dialogue; and as participation in policy making. In analysing the implications of these visions three dimensions are highlighted: weakly and strongly structured visions of public engagement; the co-production of roles and relationships; and the framing of what is at stake. Each of these has the potential to include or exclude some groups in public engagement. We conclude that social scientists should seek to maintain the plasticity of public engagement as a necessary condition for greater participation and reflexivity in science policy, practice and governance.

Keywords: public engagement, reflexivity, role of social scientists

Introduction

'Public engagement' has become the watchword in relations between scientists and their publics. *De rigueur*, the practice of science thus far in the 21st century involves having some kind of dialogue with non-academic groups, whether as an individual researcher or through scientific institutions. Increasingly, wider publics are entering forums that offer opportunities to come face-to-face with scientists and other interested publics; occasionally these forums offer the opportunity to shape policy. Despite evidence of increased institutional

involvement in public engagement, there is little consensus about what the term means or what public engagement ought to achieve. We can say that it involves various actors with diverse perspectives being brought together to learn about, discuss or deliberate on particular matters of concern; and that public engagement has spawned a range of activities under its banner. Nonetheless, there are some key fault lines in public engagement principles and practices.

Davies et al. (2009) distinguish between public engagement activities that intend to inform the policy process and those

that do not. The authors offer a defence of the latter, arguing that non-policy public engagement sparks citizenship and mutual learning between diverse actors. Precisely because there is little at stake in policy terms, they argue, non-policy public engagement brings the possibility of building non-confrontational spaces in which participants may move towards genuine dialogue (see Escobar, 2009), exploring different perspectives rather than defending entrenched positions.

This point signals a further fault line concerning the role and effect of information provision in changing attitudes to science within public engagement efforts. Here, the communication of 'value-neutral' information is seen as a precursor to effective engagement, stripping context from such information. Sturgis et al., (2010) empirically investigated the impact of such information provision on attitudinal change in relation to genomic science and found little evidence of such change. However, they postulate that more "argumentational discourses around the potential risks, advantages and disadvantages of genetic science for individuals and society" (Sturgis et al., 2010: 178) would be more likely to engender 'sizeable shifts' in attitudes.

For others, a key fault line exists between the public engagement intended by social scientists and that practiced in policy contexts, particularly regarding the role of experts in framing the issues at hand (Irwin, 2006; Wynne, 2006). While noting a "fresh phase in science-public relations", Irwin (2006: 301) highlights how entrenched deference to the status of experts and expert knowledge shapes public engagement efforts in ways that continue to exclude or marginalize public voices. More critical approaches to public engagement seek to disrupt this tendency, thus challenging contemporary science-public relations (Kerr et al., 2007).

These observations not only indicate a diversity of meanings attached to public engagement; they also suggest some incommensurability of agendas. This paper explores empirically these various meanings and agendas, and reflects critically on the fault lines surrounding them. Drawing on focus group data, we pose two questions: What visions of public engagement are expressed and what do our research participants want from it? What are the implications of these visions for how participants might experience public engagement and for how social scientists might practice it?

The data come from a research project, *The Social Dynamics of Public Engagement in Stem Cell Research*, which explored the scope for public engagement in stem cell research (SCR). Our normative agenda was to extend the scope and franchise of public participation in decision-making about science, technology and medicine. However, our overwhelming position remains one of ambivalence about the potential role of public engagement in science governance and about the role of social scientists therein. The project enabled us to explore the critical space this engenders (cf. Kerr & Cunningham-Burley, 2000; Kerr et al., 2007).

SCR was an obvious choice for a study of public engagement. It has a high profile in the public domain, because of the promised potential for new cures and treatments, and because of concerns about the human and animal tissues used to produce stem cells. Scientific practices in this field have raised a swathe of new questions (and revived some old ones) spanning the nature of life itself to the limits of science. Not surprisingly, SCR has been an exemplar research focus for many social scientific analyses of contemporary issues concerning governance, identity, bioethics and so on in the last decade.

The data analysed here concern how focus group participants articulate their understandings of public engagement. We identify similarities and differences in our participants' visions of the roles and nature of public engagement. We then address the implications of these visions for the practice of public engagement. We conclude that social scientists should seek to maintain the plasticity of public engagement as a necessary condition for greater participation and reflexivity in science policy, practice and governance.

The Study

Building on prior work on discourses around SCR (e.g. Parry, 2003a; 2003b), and around lay and professional expertise and public engagement (e.g. Kerr et al., 1997; 1998a; 1998b), our project involved two stages of empirical work based in Scotland, UK. The first, on which this paper is based, consisted of eighteen small focus groups designed to explore the views of a diverse range of scientists and other publics on SCR and on public engagement. The second stage drew iteratively on these findings and a review of public engagement approaches to produce a programme of eight public engagement events of varying design, reach and topic focus. In stage one we adopted a conventional role as researchers of people's views about SCR and public engagement, albeit through the dialogic approach of focus groups, while stage two involved a reflexive, dual role of simultaneously doing and studying public engagement.

The Sample

Our methodology emerged through reflection on team members' previous research and on ongoing debates – in the field of science and technology studies, about science-public interactions and the role of scientists and non-scientists in

decision-making processes (cf. Collins & Evans, 2002). We recruited a broad range of people into the study, with different relationships to SCR, across two axes: scientists and non-scientists, stakeholders and non-stakeholders (see Table 1). We recognize that any such classifications are problematic and do not reflect fixed subject positions. Our categories are both heuristic and pragmatic: we wanted to recruit a range of actors with different relationships to SCR in order to examine our key research question about the heterogeneous meanings and agendas around public engagement in stem cell research.

'Scientists' for our purposes were deemed to be those trained and working in science, technology and medicine. By distinguishing between scientists and non-scientists, we sought to explore whether and in what ways these two groups had different perceptions of SCR and public engagement. Following Wynne (1996), we did not presume that the expertise held by non-scientists is necessarily any less specialised or less valuable than that held by scientists. Rather, we sought to destabilize lay-expert divides and conventional presumptions about the primacy of scientific knowledge, drawing on our prior work on the interplay of expertise and power when scientists come together with publics (Kerr et al., 1997; 1998a; 1998b; Williams et al., 1998). Accordingly, we adopted a symmetrical approach to scientists and publics; we expected, and found, that both groups would bring rich meanings and complexities to their understandings of SCR developments and of public engagement.

'Stakeholders' for our purposes were deemed to be those who had a direct professional or experiential interest in SCR. By distinguishing between stakeholders and non-stakeholders, we sought to explore whether and in what ways people's perceptions of SCR and public engagement

were affected by their proximity to the research or to issues it raises, following the methodological approach of Kerr et al. (1998a; 1998b) in their work on genetic science. Importantly, Parry’s research (2003a; 2003b) had shown that debates around SCR were confined principally to natural scientists, politicians and ‘pro-life’ organizations; while patient and fertility groups were *invoked* as stakeholders yet largely absent from public debate. Further, this research found that many of the groups identified as stakeholders in public debate about SCR did not recognize themselves as such – thus raising questions about how stakeholders come to be defined as such (see Parry, 2003b). ‘Non-stakeholders’ were important to us, pragmatically, because one aim of the study was to explore what issues surrounding SCR might be of concern to wider publics, and normatively, because of our shared commitment to widening public participation around decision making around science, technology and medicine.

To clarify further, the ‘stakeholder scientists’ who participated in our focus groups included core natural scientists (cf. Collins & Evans, 2002: 242) plus medical professionals who are at the ‘front end’ of SCR through providing eggs, embryos and

fetal material for the research (see Franklin, 2006 on the IVF-stem cell interface) or who were engaged in translational research. ‘Stakeholder non-scientists’ included groups identified as stakeholders within public debate about SCR (see Parry, 2003a). Some of these groups also self-identified as stakeholders, and some were involved with charities and foundations key in securing legislative support for SCR. We also included research nurses whose professional work contributes to SCR but are not (in the narrow sense) scientists or directly involved in knowledge production, e.g., recruiting women to donate their eggs or aborted fetuses for research. The ‘scientist non-stakeholders’ were chemists and clinical researchers identified as being outside of the core group of experts directly involved in SCR but nonetheless certified science experts in their own field. ‘Non-stakeholder non-scientists’ were identified as groups who came together around an identity issue that is neither invoked as ‘stakeholder’ in public debates about SCR (cf. Parry 2003a; 2003b) nor organized around a natural science expert identity. We anticipated that SCR would be less topically relevant for both sets of non-stakeholders.

Table 1: Focus groups conducted

	Stakeholder	Non-Stakeholder
Scientists	Postdoctoral stem cell scientists Senior stem cell scientists Doctoral stem cell scientists Adult stem cell scientists Fertility clinicians and nurses	Postgraduate chemistry students Clinical scientists
Non-Scientists	Research nurses Older persons’ group Breast cancer group Dementia group Diabetes group Spinal cord injury group Fertility interest group	Unemployed women Rural community group Interfaith group Postgraduate social scientists

Table 1 provides a summary of those who participated in our focus groups using the above classifications. In summary, we sought to include a cross-section of groups and structured the sample in a way that reflected the dominant debates about SCR and public engagement. However, this did not mean that we were prejudging the standpoints or contributions of participants, their expertise or their self-identification and we have tried to be mindful of that throughout analysis. Inevitably, the final selection of research participants was also shaped by practical limitations on which groups we could feasibly access in the time available.

The Focus Groups

In each of the 18 focus groups we conducted, our participants were known to one another, and sometimes very familiar. The sessions generally took place in a location of their choosing and lasted an hour or just over. Our schedule asked for their reactions to a number of issues we had identified as being current and germane to SCR, then moved on to the subject of public engagement. Precisely because public engagement is open to multiple interpretations, with different goals and outcomes, we did not impose or presume a definition or meaning for public engagement. Towards the end of the session, we simply asked whether the participants would like to have a say regarding any of the issues we had raised and/or an opportunity to discuss them further with other scientists or publics. We then posed the normative questions of whether there should be wider involvement in decision-making over such matters, and if so who they felt should be involved in what kinds of decisions. Finally, we explained what we hoped to achieve in the stage two public engagement activities and asked for suggestions as to what kind of practical approaches might work: for instance, what kinds of forums might

help break down of lay-expert divides, and what might make participation in these activities feel worthwhile? For our purposes below, all focus group extracts are attributed to the group in which the speaker participated; individual participants are fully anonymised.¹

Visioning Public Engagement

What emerges from our data is that public engagement is understood to have various facets, unevenly emphasized by different participants across the groups. Not only does public engagement mean different things to different people, it also means multiple things to individual people. Nonetheless, three visions of public engagement can be distilled from our participants' contributions: public engagement as education and information provision; public engagement as an opportunity for dialogue; and public engagement as a mechanism for involvement in decision-making.

Public Engagement as Education and Information Provision

The idea that public engagement events should move beyond a simplistic, one-way model of science communication is now an established position (cf. Burchell et al., 2009; Kurath & Gisler, 2009; Thorpe & Gregory, 2010). Yet, our focus groups reveal that this earlier vision of engagement, as informing and educating people about science, remained highly influential. For many of our participants across the focus groups, a central purpose of public engagement is for stem cell scientists to convey knowledge about SCR to publics and other scientists, who thus participate in public engagement in order to learn. Although this relational positioning was a clear point of consensus, some important differences were evident around the role and the nature of education and information provision in public

engagement – differences which reveal multiple agendas for public engagement and reflect the diverse role that information can have as noted in the first fault line of our introduction.

One difference concerns the relationship between understanding of and support for SCR (see Sturgis et al., 2010). For some of the stem cell scientists, public engagement is seen as an opportunity to allay fears about SCR amongst wider publics, by increasing their understanding of the science. These participants see a clear association between lack of public support for SCR and lack of understanding of the research – the “deficit model” – which has been roundly criticized by social scientists (e.g. Irwin & Wynne, 1996) and policy makers alike (House of Lords, 2000). More specific motives surfaced around these deficit model assumptions:

B: Of course it is in our interests that people understand what we do, especially in our field because people have such negative views about what we do. And it can only be in our interest for people to understand it better, because we believe that we are being effective more and that might help when we start asking for more funding. (Postdoctoral stem cell scientists)

This next illustration addresses potential donors of embryos and other tissues used for SCR, the supply of which is a recurring concern for many scientists in this field:

D: I think it is also an important factor that when you have people very often that have fears about doing things with their body, with things because of lack of knowledge. So I think actually they can make a much better decision in some things required if they know much more about it. So really I think there is definitely an advantage of having this

goal to educate people. (Senior stem cell scientists)

Thus, in this vision, it is hoped that public engagement geared to teaching non-stem cell scientists about SCR will not only reduce public concerns about the research, it will also increase public support in quite material ways.

The argument that increasing non-stem cell scientists’ knowledge of science increases their support for SCR was not put forward by any non-stem cell specialists; nor was it shared by all stem cell scientists. For example, when asked about any relationship between public engagement and public trust towards science, the fertility clinic staff claimed that placing information about stem cell science and laboratory practices in the public domain might generate more critical public voices towards it, particularly from “extreme views”.

Other groups expressed various motives for wanting to learn more about SCR through engaging with scientists. All of the patient groups had a clear stake in finding out about promised therapies from SCR and several of these participants had already had conversations with specialists along these lines. In this sense, they identified themselves as stakeholders and saw further interaction with stem cell scientists as a major potential benefit of public engagement around SCR. However, many of the non-stakeholder non-scientist participants expressed a general interest in finding out more about what SCR involves, seeking to understand SCR and how it does or might have implications for their own and others’ lives, rather than focusing on specific therapeutic potentials. When we came to discuss public engagement, several of the non-stakeholder non-scientist participants expressed a specific desire for knowledge to be conveyed *prior* to public engagement events. This position is in line with Davies et

al.'s (2009: 346, original emphasis) argument that knowledge provision is important "in order for opinions to be formed or challenged and for dialogue to take place". This was most strongly expressed by the group with unemployed women. These women wanted prior knowledge not solely so they could better understand the science and related issues, to not be "bamboozled by science", but also so they would feel *confident* enough to enter a discussion with scientists, without fear of being made to feel stupid. Unanimously, they said they would not attend public engagement events otherwise. This is a crucial insight in a context where power imbalances due to social and educational inequalities can profoundly undermine dialogue and participation. As the women asked, "Would they [scientists] understand us and would we understand them?"

So, whilst many in the non-scientist non-stakeholder groups and scientist stakeholder groups alike believe public engagement should include opportunities to increase knowledge, their reasons for wanting more knowledge differ, as do their expectations about the outcomes of such learning. In effect, the unemployed women and other non-scientists in our study see education and information provision as a *necessary pre-condition* of more dialogic forms of public engagement – an interesting contrast to the perspective of some stem cell scientists who view education and information provision as the *raison d'être* for public engagement.

A further difference concerning public engagement as informing and educating concerned what types of knowledge should be imparted. Many scientists and non-scientists alike were interested in wider issues surrounding SCR rather than simply its technical content. They saw public engagement as a means of learning about and discussing its social and ethical

context. The focus group discussion with older people, for example, debated how much scientists ought to share with the public about their current research. One participant called for scientists to declare the long-term direction of their research projects, believing that limits ought to be established:

G: Well in regard to stem cells, I want to know just exactly how far they will go with it, just exactly what kind of end results. I know it is good if they can help people from fetuses, aborted fetuses and, you know, the umbilical cord and things like that. You were saying there are all sorts of different things they will be able to take out of the blood stem cells to help different things and that is good. But I would not like them to get carried away to the stage where they are making new human beings, sort of thing, human robots – well, cloning I suppose. I am totally against that sort of thing; I think there has to be a limit. (Older persons group)

In a similar vein, the interfaith group argued that public engagement should address questions such as "Who funds the research?" raising concerns about the role of commercial interests in shaping SCR which they contrasted to the disinterested pursuit of knowledge or therapies. In these contributions, we see the possibility of public engagement offering spaces for reframing SCR as socially situated and subject to conflicting interests, and for potentially conflicting expectations of scientists and non-scientists to be voiced.

A final area of divergence concerning information provision and education in public engagement was about whose knowledge counts. This came out when we posed questions about widening the inclusion of decision-making in SCR

through public engagement. For instance, participants in the breast cancer group felt a democratic impulse to widen inclusion but at the same time expressed concern that decisions might be taken out of the hands of those with relevant knowledge. Many of the patient groups argued that some forms of non-scientific knowledge should, in effect, carry more weight than others. Specifically, they felt that the knowledge of those with disabilities and/or illnesses (and their carers) should provide an important counter-balance to that provided by those who rejected some sources of stem cells outright (such as “pro-life” groups). For example:

D: ... I mean to have someone who just says “No, this is wrong because you are going to use fetal tissue”, just because that is the point of view they hold, I don’t know if that is even a valid argument.

E: If they were in your position they would think differently.

D: Many, many people change their views when it comes to that [using fetal tissue in SCR]. You know, to just say no because that is not what I believe is just plain wrong. I think if you try and involve as broad a church as possible, that is probably the wrong word, but a group of people it would directly affect, I think that is, you have got a valid perspective on where your argument can go because you would like to think that people to whom it most directly affects are those who would have an opinion. (Spinal cord injury group)

According to this position, not all publics are equal. Alluding to similar concerns, participants in the clinical scientists and senior stem cell scientists groups argued that public engagement in the field should include a focus on the therapeutic hopes for SCR. At the extreme, this should include

providing stories about the experiences of people with conditions that SCR seeks to cure in order to generate “a shocking impact” upon wider publics (Senior stem cell scientists). From this perspective, bringing non-stem cell scientists into the public debates is clearly seen as an opportunity for manufacturing public assent. Here, patient groups are enrolled by stem cell scientists as stakeholders through emotive claims to be working towards cures, but simultaneously positioning patients as passive. This in turn closes down opportunities to engage in critical debate about SCR – a similar strategy to that observed by Parry (2003a) in the UK Parliamentary debates. As one clinical stem cell scientist said: “Then we can start a debate so everyone is involved, you know, they are looking to the same direction”. Clearly, the question of whose knowledge counts is often inseparable from what knowledge counts; issues of power and alliances surface again.

Public Engagement as an Opportunity for Dialogue

Aspects of the analysis above hint at a bigger vision of public engagement, beyond the provision of information about science. This second vision of public engagement – one of dialogue – provides a window for stakeholders and non-stakeholders, scientists and non-scientists to hear the views of others while sharing their own: an opportunity for exchanging ideas and mutual learning.

Alongside the strong ‘deficit model’ views of public engagement, many of the stem cell scientist participants also understood public engagement as an opportunity to generate dialogue. They welcomed the opportunity to listen to others and so identify their concerns, rather than assuming they know these, suggesting a move from “deficit to dialogue” also identified by Burchell et al. (2009). For example:

D: I would like to know what the public really want to know. If they feel there is any sort of, you always feel like they feel there is a deception going on, they are not sure what scientists are actually doing. They are unsure, so I would like to know [...] what they are unsure about, what would perhaps not comfort them but what would put their minds at ease. What their fears are. (Postdoctoral stem cell scientists)

This interest in dialogue with wider publics is also instrumental. Both the senior and postdoctoral stem cell scientist groups noted how the GM controversy had prompted widespread opposition to the technology; through dialogue and mutual learning they hoped that SCR would avoid this fate.

The fertility clinic staff group had experience of user involvement in clinical research. They argued that the opportunity to learn from lay representatives on ethics committees, for example, is beneficial in reassuring clinicians that their research is “on the right track and it is worthwhile doing” (Fertility clinic staff). Such public involvement, they claimed, can help identify and resolve ethical problems, and set research priorities in ways that develop a shared agenda between scientists and their publics. Clinical scientists also felt that greater mutual understanding between scientists and non-scientists could help generate scientific research with greater societal relevance. This hints at a degree of institutional reflexivity (cf. Wynne, 2006; see also Marks, 2011) whereby the practices of science may change through public engagement.

As we noted earlier, many non-scientist participants viewed education and information provision as a necessary precondition for any dialogue with scientists. Time and again, participants in the non-scientist groups stressed that

scientific knowledge must be available in readily accessible forms. They lamented the inability of scientists to communicate in terms non-scientists can understand and engage with. Several described situations where they had read about SCR on the Internet or attended public events with stem cell specialists present, leading to comments such as “they are incapable of talking to people who are not at their level” (Spinal injuries group) or, from the unemployed women:

A: ... it was a micro-genetic-biopic-this-and-that. What the Hell does that mean, you know? It probably means something like, oh, “It is a cell”.

F: Put it in layman’s terms.

A Yes, put it in layman’s terms, yes, so everyone can understand it not just the experts. (Unemployed women)

For all of the patient groups, the dialogic vision of public engagement was one where their views are both solicited and valued. It was striking how often and how emphatically patient group members told us they valued that we had come to talk with them, and that we listened. For example:

D: It is just so nice to be asked our opinion. As [B] alluded to a couple of times, all too often we have sat and listened to the medical experts telling us, it almost gets a bit like a lecture sometimes and it really is quite refreshing to get asked our opinion. (Diabetes group)

C: I have loved this. Nobody asks me the questions that need to be asked. You have asked me the questions, you are interested in what I want to see happening. (Dementia group)

The strength of these responses indicate just how little even these stakeholder

groups – whose interests have been mobilized rhetorically by scientists and other supporters of SCR (cf. Parry 2003a; 2003b) – had actually been asked their views, and how great the demand is from such groups for a genuinely two-way dialogue. Some members of the breast cancer group extended this vision, arguing for a commitment to provide feedback of how their contributions to any such dialogue event have been taken on board. Significantly, the dialogic vision of public engagement articulated here contrasts with the presumption of some stem cell scientists that dialogue's purpose is to generate assent for the field. Thus, a key and common vision for public engagement – as dialogue – is differently constructed amongst our participants.

This chimes with the observation of dialogue practitioners that, whilst 'dialogue' is increasingly being invoked in many arenas of policy discourse, there is often a gap between what is intended here and the principles of dialogue as developed by practitioners and theorists over the last century (Escobar, 2009). 'Dialogue' in this tradition implies an effective and collaborative form of communication, in which participants feel safe to speak openly and really work to hear and understand where others are coming from, even if they disagree profoundly or have very different backgrounds.

Public Engagement as a Mechanism for Involvement in Decision-Making

The relationship between public engagement and decision-making for policy in science, technology and medicine remains ill-defined and variable in theory and in practice (Davies et al., 2009; Rowe & Frewer, 2005). Our focus groups reveal two quite divergent perspectives: some are deeply sceptical about whether dialogic forms of public engagement do or ever

would actually inform or shape policy, whilst others are opposed to the very idea of extending the franchise for such decision-making, reflecting one of the fault lines identified in our introduction.

Following a discussion about public engagement informing public policy, one participant in the older persons' group described their experience of participating in a five-week consultation exercise, with two meetings per week. At the end of the process, the facilitator told them that the decision had already been made prior to and outwith the public consultation process. Such experiences breed a deep cynicism about, and potential alienation from, public engagement. For example:

A: But then interestingly, if you get five thousand lay people and various forums and discuss with it and if 95% of them come out and say, actually we are really not for SCR. Is that going to make a difference? Is that going to stop the scientists?

Moderator: That is a very interesting question isn't it?

A: And that is why people don't believe in participation because they think, at the end of the day, it doesn't make a difference. (Research nurses)

Our study thus confirmed mistrust about both government and scientists, even amongst some scientists (Bates et al., 2010). From this perspective, public engagement is seen as paying lip service to openness about and involvement in decision-making processes, rather than embodying it (cf. Brown & Michael, 2002; Irwin, 2006; Wynne 2006). Although the mechanisms of decision-making about science and technology were not explicitly explored, public engagement was not considered to have sufficient bite to disrupt scientists' privileged position vis-a-vis policy. Such

scepticism represents a challenge to those scientists who seek to engage seriously in dialogue: it begs normative questions about how scientists, their institutions and broader policy processes should respond to public concerns expressed in public engagement events.

Some participants argued that public engagement ought not to be used as a basis for decision-making in the policy process but only for discussing issues. Some in the breast cancer group, for instance, distinguished between having one's say and directly shaping public policy, arguing that the latter should be the domain of stem cell researchers:

B: There are probably some things that are too important to ask the public about. I mean you can't ask everybody their opinion because you will get sort of too many opinions. As long as you have got informed, you know, the medical people, informed opinion. (Breast cancer group)

This contribution followed a lengthy discussion about the importance of including a wide citizenry in public engagement, which then raised fears about debate being dominated by single-issue groups (i.e. the 'pro-life' lobby). Participants went on to discuss difficulties that might arise in managing the diverse experts relevant to SCR (they referred to themselves as "little experts"). They identified a troubling process of decision "creep" (O'Riordan & Haran, 2010) whereby previous complex or controversial decisions about science and medicine lead to a trajectory of incremental decisions which have been agreed without public consultation and cannot be undone: "How do you stop and consult when all these things have already happened and lots of people have benefited from them

over the decades? [...] You could never go back on that." This discussion illustrates that people hold different visions in parallel. For them, however, the solution is a recourse to conventional(ised) processes of expert-led decision-making rather than more public involvement (cf. Weingart, 1999).

The issue of expertise was raised more obliquely in the focus group with postdoctoral stem cell scientists, who felt that public engagement activities should address only ethical questions, not scientific ones. Thus, while public engagement is offered as a platform for *communicating* scientific issues (as discussed earlier), these are simultaneously deemed to be a no-go area in terms of discussion and/or decision-making. It seems that the questions of who should be at the table, and of what kinds of knowledge and expertise are admissible, remain a site of contestation in relation to public engagement and decision-making about science, technology and medicine.

Discussion

The previous section has explored the three broad visions of public engagement identified in our focus group discussions, outlining differences and tensions within these. The iterative relationship between stage one and two of the study, and our aim to include our focus group participants in the subsequent public engagement events, meant we had to reflect carefully on our participants' views on public engagement before moving on. These data thus fed into the design of our stage two public engagement events and, indeed, shaped our role therein. In this way, our research design echoed the ethos of Burawoy's public sociology: we sought to "strike up a dialogic relation" with our research participants "in which the agenda of each is brought to the table" (Burawoy, 2005: 267). Nonetheless, we were in an ambiguous and sometimes

uncomfortable position in terms of how much of our own wider views on public engagement we put on the table. Whilst our commitment to giving all participants a voice was explicit, our interest in extending public involvement in decision-making about science was more muted, not least because we were not in a position to deliver such impact. So our ambivalence lay in the fact that we were using public engagement on SCR both to research conventional sociological questions and to explore critically our own normative agenda for public engagement. We were thus working with our own multiple agendas and those of scientist collaborators and other participants in the study.

In this section, we analyse the implications of the different visions of public engagement for how participants might experience it and how social scientists, including ourselves, might practice it. Our approach was to consider what work gets done (or is attempted) by these different visions, and this has led us to propose three dimensions to our analysis, which we elaborate below.

Strongly and Weakly Structured Visions of Public Engagement

The three visions of public engagement explored earlier are analytical constructs: they distil people's accounts of how they understand public engagement or what they want from it, but should not be read as mapping in any straightforward way onto particular groups. Aspects of all three visions were present in all of our focus groups, and each vision contained tensions and fault lines. To some extent, this means that people hold contradictory views about public engagement both within and across the three emergent visions. This poses an interesting analytical question for us, one which resonates with that faced by Star and Griesemer (1989) when examining

the Museum of Vertebrate Zoology in California: How is cooperation managed in contexts involving diverse actors with diverse interests and expertise?

Star and Griesemer developed the concept of "boundary objects", which can be concepts or artifacts, and which have fluid enough meanings to enable cooperation across different groups (what they call social-worlds). However, these boundary-objects retain specific enough meanings so as not to lose their core identity when they are "translated" and re-interpreted across different groups. This is possible because boundary objects are "weakly structured" - hold much interpretative flexibility - when used by multiple, disparate groups, but are "strongly structured" when used by individuals belonging to the same group (Star & Griesemer, 1989: 393). Drawing on this work, we find it useful to distinguish between strongly and weakly structured visions of public engagement, whereby weakly structured visions comprise areas of commonality and yet have a large degree of interpretive flexibility, and strongly structured visions are more tightly defined so comprise areas of divergence. This distinction helps us to cut across the three visions outlined earlier in an analytically useful way.

We can identify two key goals of public engagement that are compatible with all our three visions: one involves stakeholder scientists communicating knowledge to other scientists and both stakeholder and wider publics; the other involves dialogue through which participants hear the view of others and share their own. In principle, these two goals are not mutually exclusive. Accordingly, these weakly structured visions enable public engagement to operate as a site where diverse actors with diverse interests and agendas can come together and achieve something which all find meaningful, albeit in diverse ways.

Importantly, these weakly structured visions have a lot of interpretive flexibility in how they operate as coordinating mechanisms while remaining something that is widely recognized as public engagement. For instance, as we showed earlier, the vision of public engagement as education and information provision is flexibly interpreted by different people – particularly around the goals of this form of public engagement and what knowledge should be provided. Nevertheless, from our focus groups it is clear that all participants broadly consider public engagement to include these two aspects: education and learning, and dialogue between diverse actors.

These weakly structured, highly flexible visions of public engagement constitute a common terrain on which strongly structured, divergent visions of public engagement may be built. For instance, while all participants adhere to a view of public engagement as providing information and education, the work that gets done by these weakly structured accounts is not only variable but, in some instances, irreconcilable, as what counts as relevant information, provided in what contexts and by whom remain contested. An example here is the pre-circulation of information about SCR *before* public engagement events e.g. through the Internet. For some this should include emotive stories about suffering while for others it should include information about the funding sources and potential commercialization processes. This is potentially problematic in so much as strongly structured visions indicate goals (for public engagement and SCR) which are not shared by all participants, and which may result in some becoming disenfranchised, alienated or excluded.

Three strongly structured visions become evident when we move our analytical focus from the broad terms in which public engagement is conceptualized to more

specific themes. First, the interests of the scientists and patient groups in promoting the field leads them to want to position themselves as key *stakeholders* and, thus, to exclude or marginalize other voices in public engagement (especially those who oppose stem cell research whether from a “pro-life” perspective or for other reasons or those considered not to have sufficient knowledge, including experiential knowledge, such as more general publics). Such visions simultaneously constitute who is and who is not considered a stakeholder thus demonstrating the contestable nature of who should be involved in public engagement. Second, strong differences regarding the *content* of what learning, dialogue or decision-making public engagement should facilitate – ethics, regulatory questions, technical issues, etc. – in turn can exclude particular groups as not having legitimacy. Third, it follows that the question of whether public engagement should or can involve wider publics directly in *decision-making* processes around science, technology and medicine has clear implications about who should be included; it may also lead to alienation if participatory processes fail in themselves and in relation to influencing policy processes.

These strongly structured visions of public engagement highlight fault lines in public engagement agendas and practices and serve to limit the interpretive flexibility of the weaker versions thereby limiting the scope of public engagement. Failure to acknowledge what diverse participants of public engagement expect or want from such events will inevitably lead to further disenfranchisement and a weakening of the democratic potential of public engagement. It may also lead to an inability to maintain a critically engaged social science involvement in this area as this is most likely to exploit the flexibility offered

through weakly structured version of public engagement.

Roles and Relationship Building through Public Engagement

A second, but related, analytical thread we propose is how different visions construct particular roles and relationships within public engagement. In effect, our participants' claims about shared or different identities, goals and inclinations signal the potential to build alliances with some groups and not others (cf. Michael, 1996). This is most evident in the vision of public engagement as educational. Here, stem cell scientists establish a goal that is shared with other participants – for others (who are not stem cell scientists) to learn about the science from specialists in the field. Here, non-scientists, and to some extent non-stem cell scientists, are constituted as requiring education and stem cell scientists are cast as the educators. These roles and relationships are likely to be co-produced dynamically through public engagement processes without any shift in the normal hierarchical ordering of expertise. For instance, our research revealed that some members of patient groups were conversant in the implications of SCR for their own condition and had heard stem cell scientists talk at previous other public events. For these individuals, future public engagement with stem cell scientists affords the possibility to hear and understand more. While for non-patient groups, learning about SCR was itself a motive for engaging. However, because many non-stem cell scientists consider that such learning *is* a necessary pre-condition for other types of public engagement, there is a danger that this initial co-enrolment of stem cell scientists in an educative role may unduly shape the relationships between them and publics throughout any ensuing public engagement process.

As we have seen, many non-scientists view public engagement as an opportunity to call upon and engage scientists as responsible citizens as well as educators – to demarcate limits to their research, to consider collaboratively what kind of society we want to live in, and to shape their research goals and practices accordingly. This vision of public engagement can be understood as attempting to bind scientists into a relationship of responsibility and accountability towards those outwith their domain of specialism (cf. Szerszynski, 1999; Michael, 1996). Many scientists share this vision of public engagement as a mechanism to access *and respond to* their publics' views on the practices and goals of science. Yet this vision challenges cherished notions – of science as the disinterested pursuit of knowledge, and of scientists being answerable only to other scientists.

We should remain mindful of the epistemological status of scientific knowledge and the associated cognitive authority of scientists, which flows from this (see Gieryn, 1999; Kerr & Cunningham-Burley, 2000; Parry, 2009). As Gaventa and Cornwall (2008: 184-185) have argued:

Simply creating new spaces for participation, or new arenas for diverse knowledge to be shared, does not by itself change social inequities and relations of power, but in some cases may simply make them more visible. ... marginalized groups may enter these spaces but find themselves without voice within them, co-opted as tokens or manipulated by the powers that be ... access to new spaces does not automatically imply greater presence or influence of new voices within them as 'old' power surrounds and fills such spaces.

This resonates with the scepticism expressed by many of our non-scientist

participants about scientists' ability to do either science communication or dialogue effectively, and about whether publics' voices will ever be taken seriously in decision-making. Add to this the fact that some of the strongly structured visions of public engagement mentioned above seek to exclude the visions and participation of less powerful actors, we might expect tensions between existing seats of power and public engagement efforts to level the playing field between scientists and non-scientists through dialogue or participation (see also Kerr et al., 2007). Critical social scientists, engaging in public engagement, will share some of the publics' scepticism but may also be able to challenge the cognitive authority of science through ensuring diverse expertise is harnessed in dialogues. Our expertise in generating dialogue, as qualitative researchers, may help flatten the power relations that so commonly suffuse public engagement activities. At the very least, we are able to analyse dialogic discourse and how power relations are played out within them in order to promote more reflexive practice amongst all those participating.

Public Engagement as a Site for Framing what is at Stake

A third dimension for analysing what work gets done by different visions of public engagement concerns how participants frame what it is that public engagement should address. The case of SCR offers insights in this regard precisely because there is no consensus about "the problem" to be addressed: is it about the use of ethically sensitive tissue, the involvement of commercial interests, inadequate regulatory frameworks, etc.? The accounts of public engagement offered in our focus groups illustrate how it is a site where particular framings of the issues at stake

may be asserted and contested, sometimes to the exclusion of others.

Framing may involve what topic is addressed or how a problem is presented. For example, worries about "pro-life" groups framing SCR as unethical provide a shared meaning for those who want to promote SCR. The desire of some stem cell scientists to use public engagement as a means of alerting wider audiences to the suffering of people with diseases for which SCR may offer a treatment essentially reframes the issue as a medical humanitarian one and in a very emotionally-loaded way. In this framing, it is difficult to insert critical voices – whether these be about alternative philosophies of bodily matter, exploitation, the role of private companies or inequalities – without seeming to be promoting medical injustice and continued pain (cf. Parry, 2003). Framing what is at stake in public engagement may, then, be used to close down not open up debate by explicitly or implicitly making some issues off limits (cf. Stirling, 2008). It may operate to establish or maintain boundaries between different social groups, and to (re)negotiate the social legitimacy of particular groups to participate in and shape public engagement processes.

We should not assume that what is at stake in public engagement is limited to the building of particular visions of public engagement or to the particular topic to be engaged in. In the case of SCR, public engagement also offers scientists a platform on which to defend science in general – the epistemological status of scientific knowledge, the ethical legitimacy of scientists and the methodological rigour of science – as Harvey (2007) noted in relation to the UK's *GM Nation?* exercise. Hence, public engagement is a political space where wider issues relating to science and society are also played out and as such, vested interests will prevail in determining both content and outcome of such engagement.

Whilst some believe public engagement should enable all citizens to deliberate on and influence policy outcomes, our findings indicate some resistance and scepticism towards this vision of public engagement.

Claims that the science is too complex to be fully understood by non-specialists in the field, or experiences of alienation generated through previous encounters with public engagement, indicate that the role of public engagement in policy-making is itself ambiguous and contested. The very diversity of the meanings of public engagement (its weakly structured forms) could evoke two different trajectories. In one, this flexibility is manipulated so that scientists, and policy makers, can carry on with business as usual with lip service to consultation and engagement. In another, such flexibility can open up creative opportunities for multiple framings, reflexive deliberations and citizen involvement in science as policy and practice.

Conclusion

Existing public engagement literature and practice tells us that the label “public engagement” holds diverse meanings and covers a range of methods (cf. Rowe & Frewer, 2005); that its proximity to decision-making processes varies (cf. Davies et al., 2009); and that we should be mindful of competing political agendas for public engagement concerning science governance (cf. Irwin, 2006). For research such as ours, where we are both doing and studying public engagement, it is vital to understand the heterogeneous agendas different participants – including ourselves – bring, along with their normative implications. In analysing our focus group material, we have identified potentially conflicting agendas for public engagement both across and within different groups. We have distilled these into three broad visions of public engagement – public engagement as

education, as dialogue and as participation in policy making – and identified fault lines within each. Further analysis of the work performed by these visions has highlighted three dimensions cutting across these visions, which in turn has allowed us to reflect on their implications.

First, we found that public engagement is widely recognized as involving two key goals: knowledge provision and dialogue. In principle, this widely shared, weakly structured vision enables diverse actors with diverse interests and agendas to come together over public engagement. The very flexibility of these shared visions also means that less compatible, strongly structured visions can co-exist within the public engagement arena. We found significant and sometimes incommensurate differences amongst our research participants concerning who is deemed to be a stakeholder or a legitimate participant; which knowledge counts as relevant; and whether wider publics should be engaged in policy making about science, technology and medicine. Second, in analysing how different visions of public engagement construct different roles and relationships, our participants’ reflections point to factors which are likely to resist any leveling of the conventional hierarchy between scientists and non-scientists, in both knowledge provision and dialogue. Third, the framing of what is at stake in public engagement serves to identify which questions, which groups and which knowledge are deemed as legitimate for public engagement. In short, what we see in examining all three of these dimensions is that the strongly structured visions of public engagement all have the potential to include some groups and exclude others.

We conclude by reflecting on what implications we might draw from this analysis for our role as social scientists in co-producing public engagement. From the outset, we have been struck by what we

have called – drawing on a term used in SCR – the plasticity of public engagement. We propose this concept in order to capture the empirical observation that different people can attach quite different meaning to public engagement, its purposes and practices; that ‘public engagement’ is subject to considerable interpretive flexibility amongst those who (potentially) come together to practice it. We have come to the view that it may be possible to derive advantages from this plasticity – from the standpoint of our own normative aspirations for public engagement. The co-existence of weak and strongly structured visions of public engagement potentially offers a prescriptive framework for public engagement as well as an analytical lever through which to understand it. We might actively seek to keep all visions in play, to maintain the plasticity of public engagement and resist its stabilization or coherence. We base this suggestion on awareness of the powerful interests at play in this arena, confirmed in many respects by the focus group material. We conjecture that any stabilization and coherence of what public engagement means would tend to order it around the interests of the powerful and drain it of its potential for change (cf. Mouffe, 1993). But what are the potential benefits and pitfalls of maintaining plasticity?

Clearly, pitfalls include the danger that already dominant framings and actors are asserted to the exclusion of others. Our (subsequent) experience of designing and managing public engagement events has had only limited success in avoiding this danger; and we remain mindful of Gaventa and Cornwall’s (2008) caution that new spaces of participation may simply be filled with “old” voices and “old” power. Nonetheless, we view public engagement as a potential stage for hegemonic struggle, that is, one which could serve as a site of resistance and change. The potential benefit of maintaining the plasticity of

public engagement, then, is that this very plasticity provides opportunities to disrupt dominant narratives – such as distinctions between facts and values, science and ethics, expert and lay – and to nurture new models of citizenship, which support the greater involvement of non-scientists, diverse stakeholders and non-stakeholders, and the airing of other epistemologies. The political and practical challenge is to create spaces which at once reveal existing power dynamics whilst allowing new, hopefully more democratic, ones to emerge. We argue then for a reflexive plasticity, where participants actively examine the diverse meanings, contents and practices of the engagement they are involved in.

We are entirely aware of the apparent contradiction in our position. We are, in effect, wanting to maintain the plasticity of ‘public engagement’ in order to further our own strongly structured vision of radical change through public engagement but at the same time deflect and avoid the strongly structured visions of those who would preserve the status quo. This tension is at the heart of how we now see our role as social scientists organizing public engagement activities. One obvious consideration here is that we too have power. We can enroll other actors – including scientists, potentially – as allies, addressing and reinterpreting their concerns to mesh with ours, shaping whose voice and contributions have legitimacy within our public engagement efforts – just as other “centres of authority” do (cf. Callon, 1986). As Clarke (1991: 144) suggests, different groups may wield quite different kinds of power. Scientists wield epistemological authority, policy makers wield political authority, and patients wield power as experiential experts. As social scientists, we wield authority as bearers of knowledge about *social and political processes*, which means we are able to define major elements of public engagement processes for our participants – not least,

through how we design events and frame aspects of their content..

We see three ways in which social scientists can use their power to work with, and hopefully through, the tension identified above. First, and widely acknowledged, we can be reflexive about the impact of our actions and framings on public engagement participants and outcomes, and as noted above, encourage reflexivity in others. Second, we can harness these insights, and mobilize the analytical contributions of our and other social science research, to unsettle attempts by “old” power and “old” voices to promote *their* strong visions of public engagement. Key to this, we suggest, is making visible different visions and framings of public engagement, so revealing any implications for the inclusiveness and outcomes of public engagement in terms of which questions, which participants and which knowledge are deemed legitimate. Third, we can take our social science analyses out into public engagement spaces and engage in the “double conversation” of sociology with publics (including scientists), who are themselves involved in conversations with others (Burawoy, 2005: 263).

All of this, we would suggest, is necessary if we are to further the critical social science agenda for public engagement. But arguably of even more significance ultimately, will be our ability to ensure the “quality” of the engagement, to nurture an ethic and practice in which each and every voice is heard, respected and valued – as ‘dialogue’ practitioners are achieving in many walks of life (cf. Bohm, 1996). If we are to achieve deeper forms of democracy along these lines we need to work hard on the processes and trust those engaged in the process to find a better way forward. This will bring its own tensions since it requires a relinquishing of our own power to direct while retaining our own critical voice.

Acknowledgements

This research was supported by an ESRC Grant ‘The Social Dynamics of Public Engagement in Stem Cell Research’ (RES-340-25-0008). We offer a heartfelt thanks to all who generously gave their time and participated in this research. We also thank Stephen Bates, Siân Beynon-Jones and Fiona Harris who assisted in collecting the data used in this paper, and Rob Evans and Robin Williams for their helpful comments. Two reviewers were equally generous with their help and suggestions, for which we are grateful. The paper benefited greatly from feedback on an early version presented at a workshop organized by the ESRC Genomics and Policy Research Forum in July 2008: ‘*Public Engagement: Promise and Perils*’.

Note

- 1 When we anonymised our participants, they were each assigned a letter of the alphabet – “A” “B”, “C” and so on – in the order in which they entered the discussion. These are used in our presentation of the data.

References

- Bates, S. R., W. Faulkner, S. Parry & S. Cunningham-Burley (2010) “How do we know it’s not been done yet?!” Trust, trust building and regulation in stem cell research’, *Science & Public Policy* 37(9): 703-718.
- Bohm, D. (1996) *On Dialogue* (London: Routledge).
- Brown, N. & M. Michael (2002) ‘From authority to authenticity: The changing governance of biotechnology’, *Health, Risk & Society* 4(3): 259-272.
- Burawoy, M. (2005) ‘American Sociological Association Presidential Address: For public sociology’, *British Journal of Sociology* 56(2): 259-294.

- Burchell, K., S. Franklin & K. Holden (2009) *Public Culture as Professional Science* (London: BIOS, LSE).
- Callon, M. (1986) 'Some elements of a sociology of translation: Domestication of the scallops and the fishermen of St Briec Bay', in J. Law (ed), *Power, Action and Belief: A New Sociology of Knowledge?* (London: Routledge): 19-34.
- Clarke, A. E. (1991) 'Social worlds/Arena theory as organizational theory', in A. L. Strauss & D. R. Maines (eds), *Social Organization and Social Process* (New York: A. de Gruyter): 119-149.
- Davies, S., E. McCallie, E. Simonsson, J. Lehr & S. Duensing (2009) 'Discussing dialogue: Perspectives on the value of science dialogue events that do not inform policy', *Public Understanding of Science* 18(3): 338-353.
- Gaventa, J. (2006) 'Finding the spaces for change: A power analysis', *IDS Bulletin* 37: 23-33.
- Gaventa, J. & A. Cornwall (2008) 'Power and knowledge', in P. Reason & H. Bradbury (eds), *The Sage Handbook of Action Research*, 2nd edition (London: Sage): 172-189.
- Escobar, O. (2009) 'The dialogic turn: Dialogue for deliberation', *In-spire Journal of Law, Politics & Societies* 4: 42-70.
- Franklin, S. (2006) 'The IVF-stem cell interface', *International Journal of Surgery* 4(2): 86-90.
- Gieryn, T. F. (1999) *Cultural Boundaries of Science: Credibility on the Line* (London: Chicago University Press).
- Harvey, M. (2007) 'Citizens in defence of something called science', *Science as Culture* 16: 31-48.
- House of Lords (2000) 'Science and society', *Select Committee on Science and Technology, Third Report*, 23 February 2000.
- Irwin, A. (2006) 'The politics of talk: Coming to terms with the 'new' scientific governance', *Social Studies of Science* 36(2): 299-320.
- Irwin, A. & B. Wynne (eds) (1996) *Misunderstanding Science? The Public Reconstruction of Science and Technology* (Cambridge: Cambridge University Press).
- Kerr, A. & S. Cunningham-Burley (2000) 'On ambivalence and risk: Reflexive modernity and the new human genetics', *Sociology* 34(2): 283-304.
- Kerr, A., S. Cunningham-Burley & A. Amos (1997) 'The New Genetics: Professionals' Discursive Boundaries', *Sociological Review* 45(2): 279-303.
- Kerr, A., S. Cunningham-Burley & A. Amos (1998a) 'Drawing the Line: An Analysis of Lay People's Discussions About the New Genetics', *Public Understanding of Science* 7(2): 113-133.
- Kerr, A., S. Cunningham-Burley & A. Amos (1998b) 'The New Genetics and Health: Mobilizing Lay Expertise', *Public Understanding of Science* 7(1): 41-60.
- Kerr, A., S. Cunningham-Burley & R. Tutton (2007) 'Shifting subject positions: Experts and lay people in public dialogue', *Social Studies of Science* 37(3): 385-411.
- Kurath, M. & P. Gisler (2009) 'Informing, involving or engaging? Science communication in the ages of atom-, bio- and nanotechnology', *Public Understanding of Science* 18(5): 559-573.
- Marks, N. J. (2011) 'Stem cell researchers' trust, ambivalence and reflexivity: Opportunities for improved science-public relations?', *Science & Public Policy* 38(7): 541-554.
- Michael, M. (1996) *Constructing Identities* (London: Sage).
- Mouffe, C. (1993) *The Return of the Political* (London: Verso).

- O’Riordan, K. & J. Haran (2010) ‘From reproduction to research: sourcing eggs, IVF and cloning in the UK’, *Feminist Theory* 10(2): 191-210.
- Parry, S. (2003a) ‘The politics of cloning: Mapping the rhetorical convergence of embryos and stem cells in parliamentary debates’, *New Genetics & Society* 22(2): 177-200.
- Parry, S. (2003b) Stem cell research and human cloning: Multiple meanings, competing constructions (Unpublished PhD thesis, University of Edinburgh).
- Parry, S. (2009) ‘Stem cell scientists’ discursive strategies for cognitive authority’, *Science as Culture* 18(1): 89-114.
- Rowe, G. & L. J. Frewer (2005) ‘A typology of public engagement mechanisms’, *Science, Technology & Human Values* 30: 251-190.
- Star, S. L. & J. R. Griesemer (1989) ‘Institutional ecology, ‘translations’ and boundary objects: Amateurs and professionals in Berkeley’s Museum of Vertebrate Zoology, 1907-39’, *Social Studies of Science* 19(3): 387-420.
- Stirling, A. (2008) “‘Opening up” and “closing down”: Power, participation and pluralism in the social appraisal of technology’, *Science, Technology & Human Values* 33(2): 262-294.
- Szerszynski, B. (1999) ‘Risk and trust: The performative dimension’ *Environmental Values* 8: 239-252.
- Thorpe, C. & J. Gregory (2010) ‘Producing the post-fordist public: The political economy of public engagement with science’, *Science as Culture* 19(3): 273-301.
- Weingart, P. (1999) ‘Scientific expertise and political accountability: Paradoxes of science in politics’, *Science & Public Policy* 26(3): 151-161.
- Williams, R., W. Faulkner & J. Fleck (eds) (1998) *Exploring Expertise: Issues and Perspectives* (London: MacMillan Press).
- Wynne, B. (1996) ‘May the sheep safely gaze? A reflexive view of the expert-lay knowledge divide’, in S. Lash, B. Szerszynski & B. Wynne (eds), *Risk, Environment & Modernity: Towards a New Ecology* (London: Sage Publications): 44-83.
- Wynne, B. (2006) ‘Public engagement as a means of restoring public trust in science—hitting the notes, but missing the music?’, *Community Genetics* 9: 211-220.
- Sarah Parry
Science, Technology and Innovation Studies
School of Political and Social Science
University of Edinburgh
Old Surgeons’ Hall, High School Yards
Edinburgh, EH1 1LZ, UK
sarah.parry@ed.ac.uk
- Wendy Faulkner
Edinburgh Beltane - Beacon for Public Engagement, and
Institute for the Study of Science, Technology and Innovation
University of Edinburgh
Old Surgeons’ Hall, High School Yards
Edinburgh, EH1 1LZ, UK
w.faulkner@ed.ac.uk
- Sarah Cunningham-Burley
Centre for Population Health Science
University of Edinburgh
Medical School, Teviot Place
Edinburgh, EH8 9AG, UK
sarah.c.burley@ed.ac.uk
- Nicola J. Marks
School of English Literatures and Philosophy
University of Wollongong
Wollongong, NSW 2522, Australia
nicolam@uow.edu.au