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Discriminating Citizens: Making Judgements About Science*

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Abstract

The science of genomics raises important questions about what it means to be a citizen in a scientific culture. Critics of genetics frequently point to public concern about genomics as a means of legitimating their own stance, whilst scientists and other proponents tend to see public opposition as based on, at best, partial information. In this paper, the complex and often contradictory rationales for public participation in debates about contested science are examined and the distinctions between engaged/un-engaged participants and expert/representative forums emphasised. The first distinction recognises the role played by experience and expertise in challenging technical arguments, whilst the second emphasises that debates about science and technology need are not solely matters of contested fact. Using these distinctions, the paper argues that the categories of 'scientists' and 'the public' need to be replaced by a more subtle differentiation between experts and citizens. The effect of this alternative terminology is to permit a more inclusive approach to the 'technical' whilst providing a positive role for the non-expert citizen in the democratic control of science policy.

Society needs to do a better job of asking what kind of tomorrow we create with the possibilities that science offers. Such decisions are governed by values, beliefs, feelings; science has no special place in such democratic debates about values. But science does serve a crucial function in painting the landscape of facts and uncertainties against which such societal debates take place.[1]

Introduction

STS scholars have done much to promote the view that public participation in decisions relating to science and technology is a good thing. This effectiveness of these arguments for public participation and scrutiny can be seen in a range of UK and EU policy documents that recognise the importance of soliciting opinions from stakeholders, concerned citizens and the wider public (RCEP 1998; House of Lords 2000; POST 2001; Hargreaves and Ferguson2001; Gerold and Liberatore 2001). In the US the practice is already well entrenched, at least in legislation, with Jasanoff (2003: 397) reporting that in 'regulatory decision-making, for example, all federal agencies are required by law to engage the public at least by offering notice of their proposed rules and seeking comment.'[2] Although it is possible to question the extent to which these policies will actually realise the goal of public participation, our concern in this paper is with the principles of participation rather than its practice. In particular, what does public participation seek to achieve, how should it be organised, whom should it include, when should it occur, and how are the claims made by different groups to be integrated, synthesised or ranked? To paraphrase the pigs on George Orwell's *Animal Farm*: Are we saying that all knowledge claims equal, or are some (still) more equal than others? (cf. Irwin 2001, Rayner 2003)[3]

In this paper, our aim is to use examples from debates about genetics to explore the idea of participation more critically and, in particular, to distinguish between different types of participation in order to state more clearly what the different contributions of experts and citizens to each might be. Our argument proceeds in three stages. First, we show that the distinction between 'scientists' and 'publics', on which the discourse of public participation is predicted, is part of the problem.[4] Scientist is too narrow and exclusive a category, whilst the 'public', even when pluralized, is too broad a term that unhelpfully lumps together groups that are analytically quite distinct. Categories are still needed, however, and we argue that a more useful way of thinking about the participants in controversies about science is to distinguish between *experts*, who may be scientists, activists or others with relevant specialist experience and *citizens*, who have no particular expertise in the debate beyond that acquired in the course of everyday life.[5] Whilst the former groups are needed for expert critique, it is the latter group who represent the authentic lay perspective implied in calls for the democratisation of science. The challenge of participation, which is the burden of the second and third parts of the paper, is to work out how the competing claims to relevance of both experts and citizens can be accommodated within democratic institutions.

The second stage of our argument is to explicate more clearly the consequences of recognising the diversity of expertise for debates about science and technology. The benefit, well recognised in STS, is that including additional voices enables a more searching debate to be conducted so that the assumptions and reliability of current science more fully tested, new knowledge that is unavailable by other means is articulated and, ideally, the values and future visions implied in different knowledge claims are made explicit. The difficulty for public is that making these arguments well invariably requires some expertise, but expertise, whether scientific or otherwise, is always grounded in a specific community of practice and values. Whilst promoting the rights of all such experts to make their arguments in the public sphere is clearly part of 'doing democracy' it is not without its problems. Not only are the established institutions that must manage and respond to such critique themselves thoroughly entwined with established scientific disciplines and values, a more fundamental problem also arises: how does this clash of more or less expert interest groups actually reflect 'public' concerns. Our aim in the third and final section of the paper is thus to consider the idea of lay participation more rigorously and use the example of the citizen jury and, in particular, the 'co-operative discourse' model (Renn 1999, Renn et al 1993) to bridge the gap between 'democracy' and 'expertise' without placing unrealistic demands on either.

The GM Nation? Debate: A brief example

The complexity of participation, including both the effect of established interests and the importance of distinguishing between experts and citizens, is clearly illustrated in the UK's *GM Nation?* Debate, which was held in 2003. The debate was organised on the recommendation of the Agriculture and Environment Biotechnology Commission (AEBC), who argued that, because of uncertainty about the consequences of growing GM crops commercially it was:

> … crucial for the *public* to be involved in the important decisions which need to be taken. We have to find a way to foster informed public discussion of the development and application of new technologies. (AEBC 2001: 24; emphasis added) [6]

This advice was accepted and *GM Nation?* was the result. The format of the debate was based on three main elements: an information pack and two types of public engagement. Whilst the framing of the debate's terms of reference was criticised by some for being too restrictive, and the information pack criticised by others for being too bland, the most difficult questions about the process relate to the status of the 'public' deliberations themselves.[7] The vast majority of the 670 or so public meetings organised under the auspices of the *GM Nation?* were attended a self-selecting sample that became known as the 'active participants' (DTI 2003, Horlick-Jones et al 2004). To offset the unrepresentative nature of this sample, the organisers also set up a parallel series of meetings. Described as the 'Narrow but Deep' sample, this representation of the 'public' consisted of 10 discussion groups attended by 77 participants who were recruited to meet specific demographic criteria and thus give a voice to 'silent majority'. As might be expected, the views of the 'Narrow but Deep' sample differed from those expressed by the 'active participants'[8]

Without wishing to criticise the *GM Nation?* debate unfairly we can nonetheless ask what it reveals about the choices that have to be made when putting 'public participation' into practice. For example, does it matter that the bulk of the data came from a demographically unrepresentative sample? The answer depends on what was supposed to be represented at the meetings. If the aim was to give 'ordinary' citizens a voice, then the fact that most speakers were already engaged in the debate, and by that token, not particularly ordinary does matter. Similarly, if the meetings were supposed to give an indication of the distribution of concerns across the population, then again the sampling problem is significant. If, however, the aim was to create a public forum in which experts of various kinds could state their views, then it doesn't really matter too much. Of course, if the latter was the aim, then this serves only to beg the question of how the different views are to be evaluated and ranked, who is to do this work and how is it then used.[9]

In the remainder of this paper we explore these complexities in more detail. We show how distinguishing between different types of expertise allows us to gain some purchase on the problem of what is being represented and to suggest some ways of resolving the tension between democratic participation and expert knowledge.[10] In particular, we examine how, as debates shift back and forth between what Collins and Evans (2002) characterise as expert/technical and democratic/political phases, the relevance of expert and citizen groups changes. In exploring these questions we will focus on a context where public engagement is being orchestrated around a technology that is already stabilising and where the terms of engagement are, to some extent, already defined. Nevertheless, we will also argue that the same ideas apply equally well – if not more so – to the 'upstream' framing and setting of research priorities.

Types of Expertise

Collins and Evans (2002) sets out a basic categorisation of expertise in which substantive expertise about a domain of activity is divided into three types: *no* expertise, *interactional* expertise and *contributory* expertise.[11] Roughly speaking, these correspond to knowing nothing about the activity, being able to converse intelligently about it and being able to contribute fully to the life of the relevant community.[12] In addition, the paper also identified some meta-expertises that might be used to make judgements about the expertise of others, the most important of which in this context is *discrimination*. Since the publication of the (2002) paper, the theory has developed to include a more nuanced set of categories and to highlight more clearly the difference that participation within a social group makes. The new categorisation is summarised in Table 1, and the most important distinctions for understanding expertise and public participation are as follows:

Firstly, the category of 'no expertise' has been sub-divided to recognise that are degrees of expertise between full linguistic socialisation and knowing absolutely nothing. For example, one might first acquire some basic facts, then a simple, schematic understanding from introductory, secondary or popular accounts and, using this, move onto the primary literature for that domain. Because this knowledge can be achieved using largely everyday skills determined individuals are able to gain significant levels of expertise without meeting a practitioner. Interactional expertise differs less in the

amount of substantive knowledge involved than in the acquisition of new and specialist tacit, social and cultural knowledges specific to the expert group and which can, therefore, only be gained through

UBIQUITOUS EXPERTISES					
DISPOSITIONS	**Interactive Ability** **Reflective Ability**				
SPECIALIST EXPERTISES	***UBIQUITOUS TACIT Knowledge***			***SPECIALIST TACIT Knowledge***	
	Beer-mat Knowledge	**Popular Understanding**	**Primary Source Knowledge**	**Interactional Expertise**	**Contributory Expertise**
META-EXPERTISES	***EXTERNAL***		***INTERNAL***		
	Ubiquitous Discrimination	**Local Discrimination**	**Technical Connoisseurship**	**Downward Discrimination**	**Referred Expertise**
META-CRITERIA	**Credentials**		**Experience**		**Track-Record**

interaction.

The second change is that the concept of meta-expertise has been refined to include a similar distinction between judgements that require specialist 'internal' experience and those that rely mainly on ubiquitous or 'external' experiences. Thus, there are some judgements that citizens can make based on their everyday experiences of living in society. Where these experiences are themselves widely distributed, then we say the expertise required is ubiquitous. Examples of these kinds of judgements – which are reflected in sayings like 'if something seems too good to be true, it probably is' – are to be found in the way inconsistencies and interests are detected and/or questions raised about the credibility of evidence. Although these may result in technical judgements – e.g. nuclear power is unsafe, the MMR vaccine is dangerous and so on – they don't require much technical understanding of the science involved. Instead, they rely on widely available social beliefs of the organisations involved and the ways things are done within those institutional cultures.

A similar idea underpins the category of local discrimination, which may well be of more relevance for controversies that involve genetics and other sciences. The difference here is that the experiences upon which the judgements are based are themselves somewhat specialist or local. In their original paper, Collins and Evans (2002) use the scepticism of people in and around Sellafield/Windscale towards government assurances to illustrate the idea. In this case, local people set scientific assurances from the government about levels of radioactivity in the context of the experiences, accidents and alarms that were part of their everyday life. In other communities, which lacked this knowledge base, the same government assurances would have been interpreted using different criteria. A more contemporary

example, that emphasises the role of experience rather than geography in informing judgements, is the ability of moderately sophisticated internet users to spot email hoaxes and to delete them without a second thought.

The other kinds of meta-expertise are of less relevance for this paper, and are thus only described briefly. The similarity between the two, and why they differ from either ubiquitous or local discrimination, is that they both require some socialisation within in a domain of expertise. Connoisseurship refers to judgements about what is good or bad that are based on criteria that are internal to the expert domain in question.[13] Whilst the idea applies most readily to the appreciation of art, the idea of recognising that something is done well according to the conventions of its own genre can also apply to science. The idea of downward discrimination is similar but signifies the ability to see that another person has made a mistake within the rules of the 'language game' they are seeking to play. This need not require a vast amount of expertise and, more importantly for this paper, says nothing about how to respond to any disagreement that might arise between competing paradigms, cultures or worldviews (cf. Winch 1974). In other words, whilst it may be useful to be able to discuss genetic engineering in terms that are technically accurate, this does not mean that the technical discourse of genes, vectors and DNA is the only appropriate discourse for debating the relevance of genetic science or that it should be the most important one.

These finer graduations and distinctions are important as they allow us see how the roles of citizens and experts can include both scientists and publics in each group. They also allow us to ask more precise questions about the kinds of knowledge experts and citizens possess, when and how they acquire it and how these different types of knowledge can by used in decision-making processes. For example, in what areas are experts (scientists or otherwise) really experts and when are they more appropriately treated as citizens? Similarly, when are citizens expert enough to make contributions to debates and decisions? Are ubiquitous skills and knowledge enough or do citizens need something more? If they do need more knowledge, then what sort is it and how much of it do they need and how can they acquire it? To pre-empt the later discussion we will argue that the co-operative, deliberative approach used in citizen panels or juries provides one answer to this last question. In arguing for it, however, we will also consider the more difficult issue of what, if anything, such citizen participation actually adds, and thus also argue that the emphasis on citizen participation needs to be matched by a more inclusive approach to expert debate.

Expertise and Participation

The commitment within STS to more participatory and deliberative processes is underpinned by the recognition that, because scientific disciplines are distinctive and specialist cultures, they provide a partial perspective. Including other voices, particularly those of lay people, in a decision-making process will improve it because new perspectives bring knowledge and values that differ from those articulated by scientists (cf. Schot 1996/1998; Rip et al 1995; Nowotny et al 2001). As Peterson (1984: 6) puts it:

substantial public input ensures a more thorough and open debate on questions of science and technology policy.

Whilst there is a seductive logic to this argument it is important to examine it critically. Although the importance of lay scrutiny is well established in the democratic tradition it does not follow that adding public opinion to a debate will lead to better decisions being reached (see e.g. Lawless 1977; Petersen and Markle 1979). On the other hand, there are cases where the 'public' appear to have been effective in challenging scientific claims. The sheep farmers (Wynne 1996) and AIDS treatment activists (Epstein 1996) are the typical examples, but a closer inspection reveals that these 'publics' may be more accurately understood not as lay citizens as critical sub-groups of un-recognised expertise. If this is the case, it suggests that championing the inclusion of 'lay citizens' may miss the point. Social and cultural innovation, particularly relating to science and technology, may come not from the centre of public opinion but from the un-recognised expertise at its periphery.

Acknowledging this possibility is important for two reasons. Within STS, it suggests that the boundary between expert and citizen is more important than the one between scientist and public. More importantly, as we explain below, it provides a point from which the ways in which both experts and citizens can contribute to debates about science can be re-configured.

Disaggregating Publics: Ignored experts and lay citizens

Arguments for increasing public participation start from the observation that there is often some significant expertise held within the category of the 'public(s)'. Although the temptation is often to emphasise the blurry boundary between scientist and public and thus argue against drawing any boundary around participation it is not clear that this either helps or makes sense. As Steve Miller (2001) has observed, the extensive of training and socialisation undertaken by scientists during their careers means that must be some differences between what they know as scientists and what lay people know. Of course, this does not mean they know everything, just that they know some things and not others, and that the things which they do know are not common knowledge. The key, however, is to see that the same argument applies equally well to any specialist experience. All expertise, and not just scientific expertise, comes with an opportunity cost and a value structure. Rather than seeking to deny the existence of knowledge deficits amongst non-scientists, a more consistent approach would be to emphasise the (different) deficits that exist everywhere. The important implication of this for participation is that expert status and citizen rights are not commutative – it is possible for all experts to be citizens but it is not the case that all citizens are experts in every domain (even though each one may be an expert in something).

The reason for emphasising that experts are a sub-set of citizens (albeit a heterogeneous one) is not to argue that decisions should be left to experts because they know best. Rather it is to question the purpose of participatory and deliberative processes within established democratic structures. Is the aspiration to accurately reflect the weight attached to different views within the society as a whole (a kind of direct

democracy), or is it to allow those with relevant expertise to express their concerns in a public forum (a more delegated kind of democracy)? Whilst both are desirable, and might even be pursued at the same time, it is unlikely that they can be achieved in the same forum or by the same people.

Different types of question: Expert/technical problems and Democratic/political choices

The distinction between promoting the articulation popular opinion or the elicitation of expert critique highlights the distinction Collins and Evans (2002) made between the expert/technical and the democratic/political phases of a decision.[14] The principal differences between these two aspects of the same decision can be summarised as follows:

1. The expert or technical phase to the production of reliable knowledge about the nature of the world. Although the canonical image of science provides an adequate model of what the aim of such a process should be, this is subject to two important caveats. The first is that, because science and technology are no longer seen as autonomous, the activities within this phase are subject to much greater control and oversight than the canonical model would suggest (see below). The second follows from recognising the constitutively social nature of knowledge: increasing the heterogeneity of expert participants may in practice change the ways in which technical questions are addressed by, for example, introducing new forms of evidence, new standards of proof and so on.[15]

2. The democratic or political phase refers to a much bigger problem than the expert/technical phase. It is concerned with the development of the policies and regulatory frameworks within which expert/technical debates are permitted to take place and through which they are held accountable. Its outcome is thus a strategy for action that sets out what should be done given the uncertainty and controversy exhibited in the expert/technical phase and, ideally, shapes what kinds of research are to be prioritised in response to these uncertainties. The outcomes would therefore range from making further research a priority to preventing it altogether.

The distinction between the two phases of a decision is particularly important in the context of complex and politically controversial sciences such as genetics. By highlighting how more inclusive decision-processes may be orientated towards radically different questions the distinction between expert/technical and democratic/political phases allows for a more differentiated response in which different types of question are addressed by different methods drawing on different blends of citizen and expert advice. In what follows, the expert/technical phase is discussed first, not because it is the most important but because understanding the limited domain to which it applies helps to underline the much broader range of circumstances in which the issue is better conceptualised as matter of democratic/political choice.[16]

Expert/Technical Phase

The limitations of the expert/technical phase of a decision process derive from its specificity. It is a process that seeks to arrive at an agreed understanding of some aspect of the natural world. Although this

may sound like a call for traditional scientific research the existing STS literature shows why more of the same will not do. Once the value-laden and partial perspectives provided by scientific disciplines are recognised, the rigid boundaries around science start to disappear and new groups of epistemologically similar counter experts become visible. Although these arguments are well known, their implications for 'participation' are often hampered by the false distinction between scientists and publics. Although some scientists and citizens will, by virtue or their work or biography, have sufficient expertise to contribute to such a process, many other scientists and citizens will not (and for exactly the same reasons). In such a context, widening participation in an expert debate would mean not including more scientists or including more citizens but including more *experts*. In other words, using the idea of the expert/technical phase decision identifies one aspect of the overall problem -- the production of robust knowledge – that may be prioritised and uses the idea of expertise as the principle through which participation should be orchestrated. Just what this might mean in practice is explained in more detail below.

Engaged citizens: enrolling expertise from society

The defining characteristic of the participants in the expert/technical phase of a debate is that they have some relevant substantive expertise.[17] Whilst we do not wish to dilute the category of expert to include every citizen, it is important that it is not restricted to qualified scientists either. The reason for this is that scientists are experts because of their sustained engagement with a particular topic or issue and not because of their qualifications. Although not backed by certificates, and thus typically discounted by established institutions, many of the claims to relevance and knowledge made by patient groups, social movements and other 'organic experts' (Plows 2003) are grounded in a similar sustained engagement and as such their claim to expert status should not be dismissed a priori.

Using experience as the criteria for participation means the traditional participants in 'expert' debates are complemented by new participants, some with scientific backgrounds and some without, but all drawn from groups that might (unhelpfully) be classified as 'publics'. These new participants will include those with science qualifications, perhaps even to a very high level, as well as those for whom expertise has been acquired in other ways. As a result, although there are activists with formal scientific training, there are many whose expertise has been acquired on-the-job. As the AIDS treatment activists described by Epstein (1995, 1996) demonstrated acquiring this knowledge is not an optional extra when dealing with existing institutions, as UK campaigners on genetics know only too well:

> [One difficulty] was definitely the language, and the feeling that we weren't experts: we had no right to speak on the issue, that they would always beat our argument; all those issues came in to it. And not quite knowing a sorted place to begin.[18]

As a result, the activists had to increase their knowledge in order to identify a way to engage effectively. They thus set about educating themselves:

> We got together and, as part of the process of educating ourselves, different people in the group wrote essays and did bits of research. So one lass, who's a doctor, did the basics on what genetics is, to get people au fait with the language. Someone else did one on transgenics, the use of animals in transplants … but the best thing, that we were most satisfied with, we met with a group of disabled activists who had already taken action against [the Centre for Life, in Newcastle][19]

Later on, the different essays were brought together in a booklet, which in turn informed a two day event attended by the activists and representatives of other groups at which issues around genetics were debated and the collective knowledge of the activist network consolidated.[20] Significantly, this attempt to gain substantive expertise included a wide range of sources including both formal, written knowledge and the informal, tacit knowledge gained through social interactions with experts including both the technical expertise of campaign groups like Human Genetics Alert and the embodied expertise of the disability rights activists.

Finally, it is important to remember that the activist and scientific communities do not exist in completely separate universes, with activists in particular tracking scientific innovations in a range of ways. In some cases, specialist organisations do the hard work of tracking research and policy, but for those who start with more scientific knowledge, continued engagement with the scientific community can also provide a valuable resource through which 'insider' knowledge filters back to the activist networks. Expert-activists thus act as 'boundary shifters' (Pinch and Trocco 2002), moving between different social networks and, sometimes, crossing these boundaries in unexpected places:

> I've got lots of informal ties with kind of – well, activists, scientists doing stuff at the [Research Institute], people in my old lab doing medical genetics. I'm also a life model as well and a lot of biologists and medics like to draw, and especially when they get older, because, they've always wanted to draw and paint. So, you know, they've headed labs and stuff all their lives and [then] they retire and keep a hand in at the lab and draw. And so I get kind of … chatting to these people, you know, you mention some place and he goes 'Oh yes, I used to be director of that!'[21]

This constant networking, dissemination and research is a key part of what activists do and viewed this way, the activist community is much like the scientific community – networks are very close, ties are invariably personal, the production and circulation of texts is endemic and there are regular collective where membership is displayed and confirmed. It is these specialist experiences, shared by both scientists and activists, that give both groups their participatory rights within the expert/technical phase. In saying this, we are re-iterating ideas that have been established elsewhere in a new form. Certainly the idea that there are experts outside the scientific community is not a new one. What perhaps is new, however, is the recognition that claiming citizens as experts restricts rather than expands their claims to relevance. In particular, if activists are experts just like scientists, does this mean that, just like scientists, they should be viewed just another interest group seeking to advance their influence?

Of course, it is important not to over-do the similarity between social movements and scientists. Even if it is accepted that campaigning activists belong to expert communities, it is quite likely that these communities will cohere around experiences and commitments that are different to those found in most mainstream science.[22] As a result, different groups of experts may well not only work with different evidence, or disagree about what is to count as a risk or a benefit, they may also prioritise different sets of values (Eriksson 2004). In other words, just as the critical account of science's claim to neutrality highlights the ways scientific disciplines pre-dispose those who work within them to interpret events and data in particular ways, so the cultures or paradigms of the activist communities also give meaning to their expertise.

The key difference, therefore, is not in the epistemological status of the knowledge or expertise put forward by different expert groups, but in the values and ideals embedded within that expertise. Thus, for example, whereas mainstream science might see genetic research as promising progress and benefits in the form of new treatments or tests, critics might see the same scientific and technological innovations as reproducing familiar threats to social and economic justice and thus as developments that need to be resisted if existing inequalities are not to be reproduced:

> We had a pre-existing group which formed on crops and genetics and when we heard about the Centre for Life coming to Newcastle, we thought we had to do something … At the time we weren't very sure what it was … [or] which ethical issues were going to be in the forefront, so we spent quite a lot of time just casting about for ideas really for what to do. We felt it was our responsibility to do something.[23]

In the case of genetics, it is clear that the kind of heterogeneous expert debate referred to here is taking place after much of the basic science has been done and the framework for developing applications has already begun to stabilise. This is an important point because it highlights that visions of the future do not come from the activist communities alone. As STS has shown, the existing structures of research funding and development themselves involve the envisioning and creation of particular social futures and the maintenance of specific forms of power, reward and stratification (e.g. MacKenzie 1993; Hughes 1983; Bijker et al 1987; Law 1986; Wajcman 2004). Although including activist communities in the evaluation of the technologies produced by existing research is an important means of ensuring that new techniques are subject to critical scrutiny, it also has the potential to raise much bigger questions too. Thus, activists often see themselves as working to challenge both the individual applications but the social institutions and structures that define the problems to which these technologies appear to be the solution. Thus:

> I mean, what is the problem? … you basically have an approach to medicine and health care which has been developed entirely focused on expanding the profits of an industry … But it doesn't in anyway address the needs of the poor and, in fact, it moves development of medicines

> and so forth away from addressing the real problems that the world has; whether it's, you know, the sort of awful diseases like malaria or African Aids [or] cholera.[24]

In this way, one contribution made by the activist communities is to bring into the open the ways in which 'matters of fact' are also 'matters of concern' about the way the social and technological world is ordered (cf. Latour 2004). In doing so they are not so much challenging the validity of the research itself but the utility of the research agendas and the futures they create.

Recognising that all the contributions to the expert/technical phase of a decision imply ethical judgements and value statements effectively highlights the limited legitimacy of this forum as a mechanism for resolving questions about the appropriate use of science and technology. Whilst expert debate can usefully try to develop robust knowledge about, for example, the relative importance of genetic and environmental factors in the development of specific diseases, they are not the best place for deciding whether or not this is the right question to be asking in the first place. Instead, such questions of resource allocation, social justice and future possibilities are more legitimately located within the political institutions of the wider society (even if, in practice, this appears to be a responsibility they are reluctant to accept). Many of the campaign groups are, of course, aware of this and work hard to put pressure on policy-makers by promoting awareness of their concerns within the public sphere:

> Each time the Centre for Life has had a big public event, we've always been there … When there was a royal visit, we went there with a double-headed Queen Mum … the banner said something like 'Best clone the Queen Mum before it's too late' … just to cause controversy really … We had some nice stickers as well, which we'd put up before, which said 'Campaign for real sex' … We had some quite good interviews with the local press, where they put in relatively accurately what one or two of our spokespeople said.

In is important to recognise what is happening in these actions. Activists and scientists engaged in such PR work are no longer seeking to persuade themselves or each other about the correct interpretation of a particular idea or experiment. Instead, scientists, their supporters and their critics are all speaking to those outside their communities in an attempt to enrol them and claim their voice in support of a view that has expert/technical backing ranged both for and against it. Such tactics have very little to do with establishing reliable knowledge and a great deal to do with building political coalitions and pressure in order to influence the social context within which scientific and technological research takes place. As such, the appropriate participants in the debate are no longer just the engaged experts, but the all citizens who will be affected by it. In short, the question is no longer being addressed as an expert/technical problem but as a democratic/political choice, with all the problems that 'doing' democracy implies.

Democratic/political Phase

The shift to the democratic/political phase of decision process marks a change in the status of expert knowledge. In general terms, the role of experts in the democratic/political phase is to provide evidence,

arguments and visions. It is not, however, to take decisions. Instead, elected representatives or citizens themselves must evaluate the evidence and reach a judgement about how to proceed. In practice, the degree of autonomy citizens have in making these judgements will vary, and may even be part of the problem that needs to be resolved. In some cases, the choice will rest with individuals; in others it may be managed via professional gatekeepers and/or (inter)national regulation. Clearly this is something that is particularly complex in debates around the development and application of genetic testing and screening but the main point – that these are debates about the kind of society we wish to live in – is simple enough.

As noted above, the traditional argument for valuing lay opinion in these arguments is that lay citizens typically bring a broader range of criteria to their evaluation:

> studies on risk perception indicate that lay people perceive risks differently from scientific experts … Experts tend to keep the problem in what they believe to be a purely technical frame, whereas lay people implicitly emphasise behavioural, cultural, social and economic aspects. (Torgersen et al 2003: 75).

Including lay citizens thus has the potential to broaden the debate in much the same way that broadening participation in the expert/technical phase achieves. The problem, however, is how to organise these contributions in such a way as to take account of the difference exemplified by the 'active participants' and 'Narrow but Deep' samples in the *GM Nation?* debate. If the democratic/political phase organises participation on the basis of citizenship rights rather than expert status, then the 'silent majority' is the crucial constituency.[25] The challenge is thus to include these voices – whatever they say – within a process that is both informed and representative despite the fact that such a sample will consist mainly of people whose knowledge of the specific issues will be relatively limited.

Making a virtue out of non-engagement

But is this really a problem at all? Accepting that lay people are not knowledgeable about many areas of innovative science seems like a heresy but it is little more than the symmetrical applications of the critique routinely made of scientists who stray outside their own discipline. Nevertheless, accepting that lay people lack knowledge is an important step towards resolving their role vis-à-vis expert knowledge within debates about the future direction and regulation of science and technology. In particular, it is only by resisting the temptation to elevate ubiquitous, everyday expertises into something more that a properly democratic dialogue can take place. Put bluntly, if citizens have a significant specialist expertise that is not ubiquitous then they are no longer 'merely' lay citizens but experts. As such, their ability to stand outside the committed knowledge cultures of both the scientific and activist communities and operationalise a genuinely 'civic epistemology' must be undermined. Paradoxically, therefore, the very non-engagement of lay citizens is their chief virtue and a quality that needs to be preserved.

The consequences of this are two fold. First, because the role of citizens within this phase of a debate is to articulate the ways in scientific and technical innovation are evaluated by those outside the established institutions and organisations, the individuals selected to participate and thus 'represent' the silent majority should, as far as possible, start from a position of open-minded neutrality, if not actual ignorance. Whilst they will inevitably have some knowledge of science (Kerr et al 19981, 1998b), the aim would be to avoid citizens with strongly held and well developed views, such as the 'active participants' in the *GM Nation?*. Second, if the opinions solicited from these citizens are to be informed opinions, then citizen participation cannot be a mass exercise (Evans 2004). Instead, as has been discussed extensively in the STS literature, the appropriate model is that of a deliberative process, such as citizen jury or panel(s) in which a representative sample of lay participants hear 'evidence' from a range of experts and analysts selected to represent a range of different views and stances (see e.g. Renn 1999). The citizens then discuss the evidence they have heard, together with knowledge they already have, and render a judgement or judgements that stands as a legitimate representation of the concerns of lay citizens and which can, therefore, contribute both to the immediate policy debate and (potentially) the framing of long-term research and policy agendas.[26]

By orchestrating participation in this way the aim is to retain the link between the citizens in the panels or on the jury and the wider society whilst guarding against the critique that citizens' views can be discounted because they are ill informed.[27] Whilst it is possible to discuss the change in citizen knowledge in terms of the kind of substantive expertise participants acquire, that is not the main purpose of the deliberation. Although one consequence of participation for those citizens selected to participate is that they will become more informed about a specific issue, the aim of the jury is not to contribute to the political judgements that cannot be delegated solely to the scientific community. In other words, the aim is not that the citizens would gain interactional expertise, although some may, but that they collectively develop the meta-expertise and knowledge needed to *do* discrimination. Viewed in this way the purpose of citizen participation within this framework is far from marginal. The aim is nothing less than to (re)introduce democratically mandated preferences into the framing and conduct of the research activities that take place within the expert/technical phase. As the activist communities realise:

> What we need to get to is not a new politics of genetics, or human genetics, or whatever. It's the politics of new technologies … I think we need to get past the naïve idea, which is very intentionally propagated, that technologies don't have politics. As soon as you get to a recognition that they're created in the same way as a policy … then we can move to a state where we can debate that and bring that under citizen control.[28]

To return briefly to the categories set out in the earlier table, the role of lay participants in the democratic/political phase – the members of the citizen jury or panels – would centre on the way in which they develop and use meta-expertises. All participants would begin with the capacity to make ubiquitous discriminations based on their everyday experiences of living in society, though these and the judgements they reached would no doubt vary considerably. Through their participation in the

deliberative process, they would gain knowledge that was more 'local' to the debate, both in terms of those speakers identified as 'experts' and from each other, which would, in turn, underpin their evaluation of the claims made by the various witnesses. The alternative is to continue with the present approach, in which publics have little direct influence and are forced to make judgements about new technologies after many of the key decisions have been taken and to rely on knowledge acquired through haphazard combinations of life chances, social networks and media values.[29]

Democracy, Representation and the Problem of Extension

Clarifying the role of lay citizens in providing an informed and socially legitimate input into the strategic direction and regulation of science is an important task. Whilst calls for more participation are almost de rigueur the real problem is how to put them into practice, which in turn requires clarity about the purpose of participation. In the expert/technical phase, the purpose of participation is to promote high quality scrutiny and testing claims about the how world is (propositional knowledge). In the democratic/political phase the aim is to promote informed debate about the consequences of different choices and their perceived desirability within the wider society. With this latter model of an informed direct democracy in mind, we can see that, in the case of the *GM Nation?* debate, 'the public' was better the 77 who made up the Narrow but Deep sample than the 16,000 who attended the public meetings. The idea of 'co-operative discourse' organised through citizen panels recognises this and thus emphasises the importance of a representative samples in soliciting views that have some legitimate connection back to the wider society they are supposed to represent. Of course, this is not to say that citizen panels should be the only factor in a complex decision like the regulation or funding or regulation of medical genetics. Nevertheless, if a representative group of citizens considers the issue carefully and reach a clear and informed judgement about what is appropriate given the current state of knowledge and the implications of different developments, then a government choosing to act differently would at least be doing so in the full and public knowledge that their citizens would have preferred something different.

Summary and Conclusions

In emphasising the difficulty of separating facts from values the STS literature has been highly effective in reducing the authority of science and highlighting its social commitments. Now, however, the problem is different: the choice is not so much between different knowledge claims as between the different sets of values and commitments they reflect or embody. In this paper, we have shown how distinguishing first between experts and citizens and then between expert and democratic processes allows debates about controversial science to be analysed in a way that avoids the false oppositions created by the terms 'scientists' and 'publics'. Instead we have argued that processes that support both expert critique and democratic scrutiny are necessary but that they need to be separated if they are to remain true to their own distinctive, but very different, standards.

Whilst this may seem to reintroduce the privilege given to science it does not. Even if it is conceded that there are questions of fact that matter, and that these are best left to experts to investigate, this in no way exhausts the debate. Expert debates invariably raise questions that are more accurately conceptualised as being moral or political in nature and thus as being more appropriately addressed through institutional

practices that seek to reduce the autonomy of science and give lay citizens the opportunity to exercise the common sense for which they are generally celebrated. Promoting diversity within expert debate at all stages of the innovation cycle thus increases the likelihood that questions about values and priorities will be raised. It does not, however, imply that experts alone should decide which values and priorities should be acted upon.

That said, however, it is important not to overlook that some subject specific knowledge is necessary for lay common sense(s) to be applied meaningfully.[30] Thus, whilst we might expect that citizens are able to decode and evaluate the social, cultural or political stakes that are implicitly contained within debates that are ostensively framed as 'technical', we might also expect that their capacity to do this would be enhanced by some additional information about how the competing claims were produced, who was making them and how others were critiquing them. In this way, citizens exercise their judgement not on some random or (worse?) selection of material made available by the media or campaign groups, but on evidence that is selected according to criteria that put some notion of representativeness at the centre of the process.

Finally, in seeking to retain the desirable qualities of citizens in such a process, it is important to remember that all knowledge is interested and that the participatory processes cannot be managed so as to ensure that they reach the 'right' decision. Instead the aim must be to develop the best process, which means ensuring that people are called upon to act in a role that makes the most of the abilities and skills they do have and, if necessary, provides the opportunity for them to acquire new information. The paradox of this insight in the context of debates about science is that the more individual citizens participate in esoteric science – that is, the more engaged they become – the less normal and ordinary they are. In other words, if citizens are to be free of prejudice and not co-opted by interest groups on either side, then public disinterest in the esoteric details of science is a virtue that needs to be nurtured.

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[1] Lord May of Oxford, President's Anniversary Day Address, Royal Society, 2001. Quoted in Royal Society Science in Society Report 2004, p. 7. Note how this emphasises the reciprocal nature of facts and value judgements about them. Science probably needs to be replaced with expert knowledge to make it really work, but idea that as what we take to be reliable or unreliable changes so should our concerns and ambitions for the future change seems reasonable.

[2] One recent example of this is the area of nano technology, in which the '21st Century Nanotechnology Research and Development Act', which was signed by President Bush in December 2003, requires 'public input and outreach to be integrated into the Program by the convening of regular and ongoing public discussions, through mechanisms such as citizens' panels, consensus conferences, and educational events'. Source: http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=108_cong_public_laws&docid=f:publ153.108 [Accessed 6 January 2005].

[3] This is meant as a normative rather than descriptive question. It is clearly the case that, under current decision-making processes, certain types of knowledge are obviously more equal than others (e.g. Irwin and Michael 2003; Fischer 2000). Our concern here is with whether they should be.

[4] Of course, we are not the first to make this observation.

[5] In saying this we are therefore not making the distinction between 'contributory' and 'experiential' expertise introduced in Bal, Bijker and Hendricks (2004).

[6] Whether this could actually happen in the GM case is a moot point. The legislation referred to in the letter from Margaret Beckett defines scientific evidence as the only legitimate basis for regulation to prohibit commercial growing of GM crops. The implication is that, in the absence of such evidence, there is no basis for a ban and companies should be allowed to grow the crops. Of course, they may choose not to do so, perhaps because they feel there is no market for them, but that is a commercial decision not a regulatory one.

[7] The evidence for the first of these claims comes from interviews with activists reported in the main body of this paper, many of whom felt that GM Nation debate format was more suited to established and institutionalised NGOs than allowing more radical critique to emerge. The criticism of stimulus material is made in Horlick-Jones et al (2004)

[8] In general terms, the Narrow but Deep sample were both less hostile to GM crops and less knowledgeable about them. The views they expressed were, however, more or less in line with surveys based on larger, more representative samples. Ref to final report and/or paper by Nick Pigeon here

[9] This problem is captured in a cartoon included in the *GM Nation?* report, which shows a map of the UK with various scientists, farmers and other engaged citizens dotted around the edge and engaged in a clearly vigorous debate that is occurring literally over the heads of another set of clearly ordinary citizens who are depicted going about their everyday lives completely disinterested and unengaged in this argument.

[10] For a discussion of the different ways in which expertise is used within liberal democracies, see Turner (2001).

[11] Although the example of science was implied in the paper, the approach applies equally well to expertise about cookery, Buddhism or driving a car.

[12] Another way of phrasing this is to say that interaction expertise includes only those skills related to linguistic interactions, whereas contributory expertise would include practical and craft skills as well. More prosaically, interactional expertise means being able to 'talk the talk', whereas contributory expertise means being able to 'walk the walk',

[13] See Healey (2004) for more on the idea of the scientific connoisseur.

[14] Although expert/technical debates are being presented first, this should not be taken to mean that they are either chronologically prior to political/democratic debates or more important than them. The term 'phase' is perhaps unfortunate here, as it implies a time dimension, when it is being used in the physical science sense in which the same material (e.g. water) can exist in several different phases (ice, water, steam) depending on the external conditions (temperature, pressure). See http://en.wikipedia.org/wiki/Phase_(matter) [accessed 21 October 2004] for more details of this concept, though readers may want to check that this entry is right, given non-peer reviewed status of the encyclopaedia! Reflexivity and expertise!

[15] Epstein (1995) illustrates the point in some detail, while Shapin (1995) notes the same claim as part of the sociology of science more generally.

[16] Although not ideal, one metaphor that might illustrate the underlying ideas is that, just as water shifts between solid/liquid/gas phases as a result of different combinations of temperature and pressure, so decisions shift between technical/democratic phase as a result of the differing degrees of knowledge certainty and political stakes. Phrased like this, there are obvious similarities with the idea of post-normal science (Functowicz and Ravetz 1993).

[17] It is often suggested that the idea of relevance is a problem. In some sense this is true, though it is only significant if the assumption is made that all relevant experts have to be identified in advance. Given the impossibility of predicting the future, what really matters is that the process remains open to the inclusion of new expertises as and when they become identified as relevant.

[18] Need to add reference for interview quote

[19] Interview with M1, p. 1-2

[20] Within the activist communities, however, there is some debate about the usefulness of this attempt to acquire scientific knowledge and the extent to which campaigns, particularly those that are motivated by more humanitarian or anti-capitalist agendas, are helped by this approach and its implicit acceptance of the scientific framing as the legitimate one.

[21] Interview with A1, pp. 31-32.

[22] For example, whereas 'career experts' such as scientists typically have a fairly smooth career trajectories, 'activist experts', as illustrated in the quotes above, often have fractured and multiple career paths.

[23] Interview with M1, p. 1

[24] Interview with M1, p. 28

[25] We can see that being both informed and representative matters by imagining the alternative: if all that was at stake was estimating how many people would support a particular policy based on common knowledge, then an opinion poll based on a representative sample will give a reasonably accurate estimate. To the extent that we disagree with this approach, it must be because we are concerned with soliciting an informed opinion and recognise that it is important that participants are, in some sense, knowledgeable about the topic.

[26] It has been suggested that using citizen juries in this way has some similarities to the Science Court idea piloted in the US, but there are important differences. In particular, Science Courts were designed to resolve scientific controversy, and thus correspond (if anything) to the expert/technical decision, the democratic/political decision-making of the citizen participants is not about resolving scientific uncertainty but deciding what would be an appropriate response faced with conflicting scientific evidence.

[27] This is clearly a fine line to tread and there will no doubt be pressures from all sides to sway the Panel one way or the other. Nevertheless, however, this does not really argue against the principle.

Within the legal system, juries take complex decisions under difficult circumstances because their legitimacy is culturally accepted. If citizen juries lack this authority it is a reflection of the political culture in which they operate, not the capacities their members.

[28] Interview with M1, pp. 55-57.

[29] Of course, there is no guarantee that assisting a small number of participants to acquire extra knowledge will make the participants in the science jury any more supportive of medical genetics in general, or of a particular application. To assume that would be to re-introduce the deficit model in its crassest from. Instead, if there is any expectation, it is that participants in such a process would become ambivalent, seeing both positive and negative aspects of the technology, and thus recognise that any decision they recommend relies not certainty but on a complex balance of probabilities, ignorance and preferences.

[30] For example, in the GM Nation debate, there was a change in the attitudes of the Narrow but Deep groups as they engaged more with the material and issues. In this case, their attitudes tended to become more sceptical and cautious, negating a simple deficit model, though they tended to remain less hostile than those who actually attended the meeting.