Science and Public Policy, 35(7), August 2008, pages 489–499
DOI: 10.3152/030234208X329086; http://www.ingentaconnect.com/content/beech/spp

The bottom-up meanings of the concept of public participation in science and technology

Ulrike Felt and Maximilian Fochler

If the rhetoric pervading much of recent academic and policy discourse is to be taken at face value, engaging the public in the governance of science has become a kind of gold standard. However, very little is known about citizens' perspectives on public engagement in the governance of science, let alone about the social processes and the meaning participation acquires within actual engagement exercises. This article analyses the bottom-up meanings of the concept of public participation in a public engagement exercise in Austria, and traces the variety of connotations and implications that this term was given by the participating citizens and scientists.

If the rhetoric pervading much of recent academic and policy discourse is to be taken at face value, engaging the public in the governance of science has become a kind of gold standard. The editor of *Science* calls for scientists to 'engage the public in a more open and honest bidirectional dialogue about science and technology and their products, including not only their benefits but also their limits, perils, and pitfalls' (Leshner, 2003: 977) while the European Commission (2001) stresses that 'legitimacy today depends on involvement on participation' (11). These contributions often more or less explicitly assume that participation *a priori* is to be seen as a positive development, and hence will be asked for and welcomed by citizens. However, more critical commentators have argued that participation might also be seen as an element of a neo-liberal mode of governance, if this instrument is used to shift the decisions and responsibilities of government to citizen groups. In the context of development aid, this has been captured by the phrase 'participation as tyranny' (Cooke and Kothari, 2002).

Without entering into a detailed analysis of the semantics of these discussions, three crucial points characterising them may be made. First, not only the political but also much of the academic debate seems to struggle with a fairly high load of unreflected normativity (Irwin, 2006; Bora and Hausendorf, 2006) both concerning participation itself, its means and ends, as well as the identities of those to be involved, e.g. as 'innocent citizens'.[1] Secondly, the term participation is often used in a very general fashion, and is presented almost as an end in itself (Jasanoff, 2003), without any critical discussion of the precise aims to be achieved and the methods to be used to achieve these ends. Thirdly, the meaning of participation is mostly defined top-down, by (social) scientists and policy makers alike. However, very little is known about citizens' perspectives on public engagement in the governance of science, let alone about the social processes and the meaning participation acquires within actual engagement exercises.

Ulrike Felt and Maximilian Fochler are at the Department of Social Studies of Science, Sensengasse 8/10, 1090 Wien, Austria; Emails: ulrike.felt@univie.ac.at, maximilian.fochler@univie.ac.at; Tels: ++43 1 4277 49611, ++43 1 4277 49613; Fax: ++43 1 4277 9496.

This research was supported by a grant from the Austrian Federal Ministry of Education, Science and Culture within the GEN-AU program. We would like to thank the 14 citizen participants as well as the genome researchers who have spent so much time with us at the Round Table, shared their thoughts and convictions and offered us extremely valuable insights. Furthermore, we want to thank the invited experts of the Round Table for discussing so intensively with the group. Finally, special thanks goes to our colleagues, friends and collaborators: Marcus Düwell, Priska Gisler, Michaela Glanz, Sandra Karner, Astrid Mager, Annina Müller, Silke Schicktanz, Michael Strassnig, Rosmarie Waldner, Bernhard Wieser and Brian Wynne who have in many different ways been essential in carrying out the project and discussing our ideas with us in different stages of the project.

0302-3427/08/070489-11 US$08.00

Ulrike Felt is Professor for Social Studies of Science and Head of the Department for Social Studies of Science at the University of Vienna. She was until recently a member of the European Research Advisory Board (EURAB) of the European Commission and a member of the EU 'Science and Governance' expert group. From 2002 to 2007, she was editor of the journal *Science, Technology, & Human Values*. Research foci include: technoscience and forms of public engagement, the politics of knowledge and institutional settings of technoscience.

Maximilian Fochler is a post-doctoral researcher at the Department of Social Studies of Science and a lecturer at the University of Vienna, and the Vienna University of Natural Resources and Applied Life Sciences. His main research interests are: the relations between technosciences and their publics, especially mechanisms of public engagement with science and technology, 'new' contexts of knowledge production, and the sociology of medical science and technology.

This article aims to address this lacuna, and to make a contribution to the move 'away from the orthodox science and technology studies (STS) defence of public participation [...] towards an analytically sceptical (but not dismissive) perspective on the 'new' mode of scientific governance' (Irwin, 2006: 300). To do so, we will build on an experiment in public participation we conducted in the Austrian context, a 'Round Table' which brought together citizens and genome scientists over a period of about a year for six whole days to discuss ethical and social dimensions of genome research as well as to reflect on the meaning of public engagement. Building on this material, we will analyse how the governance of science was debated by citizens and scientists, and which connotations public participation was given in this context. In doing so, we will show the heterogeneity of perspectives on participation and governance, and argue that the respective meanings of 'participation in particular' — as opposed to 'participation in general' which is often staged as 'evidently positive' without specifying its means and ends — are inextricably linked to specific assumptions about the science under discussion in its relationship to society, as well as on the processes of its governance and the actors involved in it.

As a background to our empirical analysis, the following sections will briefly outline the recent shifts in the relationship between science and society as a challenge to governance, as well as some central trends in the practice of public engagement exercises. Further, we will reflect on the performativity of staging public engagement and describe our own setting and methods.

A 'Round Table' brought together citizens and genome scientists for six whole days, spread over about a year, to discuss the ethical and social dimensions of genome research and to reflect on public engagement

From segregation to integration, and from risk to innovation governance: changes as challenges to governing science

Any statement on, or theory of, governance must build on assumptions concerning the entities to be governed and their relations. For the governance of science and public participation in it, the central issue is the relation between science and society. Many recent diagnoses have argued that these relations are shifting. Focusing on two central contributions, we will shortly sketch these transitions and comment on their implications for the debate on governance and public participation.

In the classical sociology of science, Merton (1973 [1942]) conceptualised science as governed by a system of norms and values autonomously defined by science. His key term is the scientific ethos as an affectively toned complex of values and norms, which is held to be binding by an individual scientist. It is legitimised by values defined, institutionalised and reproduced by the central institutions of science itself. The four key values Merton describes (universalism, communism, disinterestedness and scepticism) to different degrees all build on the assumption of a strict segregation of the epistemic core of scientific knowledge production from society. While this assumption has been deconstructed in most of the STS literature published since the 1970s, it is revealing that the basic ideas embedded in the four norms are strongly alive in discussions within the scientific community: both as a myth of the past but also as an ideal to aim at.

One central core of the STS literature elaborating on the ever stronger intertwinedness of science and society runs under the heading of 'mode 2 science' (Nowotny *et al.*, 2001). Using the term 'co-evolution' Nowotny *et al.* (2001) argue that different societal subsystems become increasingly transgressive, leading to mutual interdependencies between science and society and to the reflexive change of institutionalised roles and norms such as the scientific ethos. They claim that scientists have (to) become more reflexive about the social impacts and implications of their research, and publics have (to) become more conscious of the ways in which science and technology affect their lives. Hence, the epistemic core of science is increasingly entered by societal actors and rationales.

This implies that the science system itself is seen as progressively changing from a 'segregated' model of internal organisation to an 'integrated' model. New forms of co-operations emerge, such as those between patient organisations and medical researchers

(Rabeharisoa and Callon, 2004). But science not only co-operates with new partners, the more traditional bonds such as those with the economy also intensify, with probably even more important structural consequences than the new co-operations mentioned above, as visions of economic applicability enter the epistemic core of knowledge production at ever earlier stages.

Hence, under the conditions of co-evolution, an approach to governing science which externalises the mutual influences between science and society, as the Mertonian ethos does, seems out of place. The challenges to a self-governance of science multiply. It can no longer be only about the 'correct' production of scientific knowledge that the Mertonian norms were thought to guarantee. Rather science is challenged to not only consider the societal impacts the knowledge produced, but even reflexively take into account the influence society has on the production of knowledge. New modes of governance seem needed, in which scientists may become more attentive to their societal context, to the societal influence on, and their own responsibility for, the societal consequences of their work. As a *Science* editorial has put it: 'The centrality of science to modern life bestows an obligation on the scientific community to develop different and closer links with the general population. That convergence will help evolve the compact between science and society so that it will better reflect society's current needs and values' (Leshner, 2003: 977).

This resonates with the debate around upstream engagement (Wilsdon and Willis, 2004; Burgess and Chilvers, 2006) and the call to move away from a mode of governance which focusses on issues of risk and safety to a governance of innovation, which addresses the way innovations develop, and how they are co-produced with the imaginations of the society in which they are supposed to be embedded (Felt and Wynne, 2007). STS work has shown (e.g. Marris *et al.*, 2001) that citizens are not narrowly concerned about risk, but that their concerns should be seen above all about innovation as a broader process including its social purposes and priorities. Accordingly, an engagement of the public in an innovation governance would need to ask not only about the risks of technoscientific discoveries, but also to discuss the more basic values, social assumptions and visions of society driving this very innovation process.

Public participation: between standardised best practice and collective experimentation

The increasing emphasis on dialogue between science, science policy and society has created a demand for ways to enact these new forms of governance, and has spawned a number of experiments in participatory engagement with science and technology (Steyaert and Lisoir, 2005; Hansen, 2006). However, it is interesting to note that the growing attention given to public participation has not induced much theoretically informed reflection on the role of these processes in governing science. On the contrary, quite technical considerations and comparisons of the pros and cons of single methods play an important role in the debate, as well as efforts to find common definitions and standards for evaluating participatory events (e.g. Rowe and Frewer, 2004). While some programmatic academic contributions to this discourse call for more attention to be paid to the relationship between participatory methods and the contexts in which they take place (Rowe and Frewer, 2005), only a very few case studies have developed this aspect, and it is hardly ever an issue in policy debates. Especially in the European policy arena, there is an attendant increase in discussions about best practices, and quite some political effort to arrive at stable standardised solutions.

These efforts to 'benchmark' participatory methods run in parallel with an increasing dominance of single methods such as the consensus conference. The strong use of the consensus conference and the 'methodological authority' assigned to it, sidelines other available methods, and hence reduces practical experiences with other designs. The resulting lack of visibility of different approaches may in turn be read as decreasing these methods' chances of future application, ultimately leading to a reduced repertoire of available designs.

Hence, much of actual public engagement practice seems characterised by a focus on a relatively small toolbox to repair and maintain the relations between science and society. However, a reductive framework relying on the routine application of standardised methods is ill-equipped to meet the challenges public participation faces. Taking into account the techno-political culture in which an engagement design takes place is of central importance (Jasanoff, 2005; Bora and Hausendorf, 2006). Experience with transferring the consensus conference model to other national contexts such as France showed that the assumptions concerning the relation between science, the public and the policy sphere implicit in the standardised version of the design may not apply in all European contexts (Felt *et al.*, 2006). This suggests that efforts to determine best practices and benchmarking criteria for public participation at the European level (European Commission, 2002), may not be the expected solution to context-dependent negotiations on technoscience.

Further, it may be demonstrated (Felt *et al.*, 2008) that the technology or more generally the domain of technoscience an engagement design is concerned which has strong influences on the constellations of governance conceivable by the participants, and hence on the meaning of public participation. Thus, standardised best practice methods are all too frequently insensitive to at least two crucial dimensions of difference in engaging with technoscience: technopolitical culture and technological context. More differentation, both in the theoretical reflection and the actual practice of participation seems to be needed, and thus also more collective experimentation with participatory approaches to governance, also involving those who are meant to participate.

Enacting community: the performativity of engagement

The increasing significance of public engagement has opened an entirely new line of business in conducting these events as well as giving rise to a new type of expertise, whose practitioners have been termed 'experts of community' (Rose, 1999). These experts of community voice and represent public opinion by organising and facilitating a range of different methods of public engagement (Irwin, 2001). They 'not only invent, operate and market these techniques to advertising agencies, producers, political parties and pressure groups, but [...] also have formalised their findings into theories and concepts' (Rose, 1999: 189). Some of them come from a STS background, but many are communication and public relation experts who moderate these interactions 'by the book', using the 'best practice' proven designs described above. How these experts of community conduct their expertise will have a crucial effect on how public engagement is played out, and whether it might contribute to a more democratic/inclusive dealing with technoscientific innovation or whether it remains a purely legitimising effort, mainly shifting responsibility, which raises more questions than it solves.

Following Law (2004), as in every other form of expertise, this social science expertise and its methods also plays a crucial part in producing the 'realities' it represents. In Law's argument, method is not to be seen as reducible to a technical set of procedures representing a single reality, in the present case of public opinion. Rather, they 'craft arrangements and gatherings of things — and accounts of the arrangements of these things — that could have been otherwise' (Law, 2004: 143). This does not imply pure social constructionism. Rather, while there is a resistance of the natural and social world to be grasped by method, at the same time there is a contingency of 'varieties of truth' in their representation (Law, 2004: 66). In which precise way reality is enacted depends on the methodological design and the experts who are involved, as well as on their respective epistemological and methodological backgrounds. Building on studies of engagement efforts in the British context, Irwin (2001, 2006) has argued that participatory designs embody tacit assumptions about the nature of the governance process they are supposed to contribute to, and about the role of the participating citizens in these 'formalized mechanisms of voicing' (Michael and Brown, 2005). As exemplified by this latter term, however, critical studies in this domain often focus on the performative character of the design itself and pay little attention to the agency and self-conceptualisation of the participants.

'Let's talk about genomics': setting and method

The basic idea of the project this paper is based on was to stage a 'collective experiment' in public engagement with the ethical and social dimensions of genome research. It was an 'experiment' since our explicit goal was to selectively modify a number of the key elements and dimensions of classical participatory designs to investigate several hypotheses about participatory events.

One thesis, maybe the most central of our theses, was that even though it is often stressed that public engagement aims at a 'true dialogue' between scientists and citizens, scientists are often involved in public engagement designs in very reductive roles. In many classical engagement models (e.g. consensus conferences) the idea of the public 'talking back to science' is taken so far that there is actually very little room left for scientists to take part outside of their role of providing expertise. Hence, a first central objective was to allow the citizens and the scientists to engage in the process on an equal footing.

This leads to the second important point: the length of the engagement process. Our assumption was that in order for mutual comprehension to become possible, citizens and scientists would need more time to interact as well as to reflect on the discussions in the time span between the single discussion parts. In this way, we hoped to be able to observe how social relations between scientists and citizens would develop, and how, for example, they would impinge on the citizens' assessment of the ideal of scientific self-governance that scientists put forward, or on the scientists' view on the idea of public participation. Furthermore, the length of the process would also allow participants to collectively shape the process of interacting with each other.

Thirdly, our objective was to situate the discussion as far 'upstream' as possible. We were interested in how the participants would discuss typical 'upstream issues', such as the values underlying specific technoscientific trajectories, and how they would imagine the possibilities and limits of governing them.

To fulfil these 'experimental parameters', we chose to adapt a design of the Swiss foundation *Science et Cité*—the Round Table.[2] Its basic principle is to have a group of citizens accompany a topic over a longer period of time. The Round Table is strongly process-oriented and the precise structure of the engagement design is not pre-defined, but may and should be developed by the participants in the ongoing process. Further, no output is pre-defined in order to keep the discussion as open as possible without creating pressure to narrow down issues for a final consensus statement.

In our project the Round Tables brought together 14 citizens with genome researchers from a large research consortium working on lipid metabolism associated disorders. Their research project served as 'anchor' and example to discuss the social and ethical aspects of genome research. It fulfilled our requirements as it had clear and explicit visions of the societal problems to be addressed (obesity, diabetes) but still was quite far from any possible clinical or other application. Thus, the genome research project was, as a 'basic research' project, situated quite far 'upstream' of the possible development of an application while at the same time already incorporating, even though very vaguely, promises for the future.

The citizens were selected from a nationwide call for participants. Our 'technology of representation' mainly focused on achieving as much heterogeneity as possible concerning the experiences people brought with them and the way they related to the topic of the Round Table. We aimed to capture a group of approaches to the issue that was as heterogeneous as possible, while paying attention to an even distribution in terms of gender, age and formal education. The recruited group had a very even distribution concerning gender and age, however, quite some bias towards higher educational levels.[3]

The participating scientists were 'recruited' via a project internal call. In total, 13 scientists participated, eight of them on a regular basis. All hierarchical levels from doctoral students through post-doctoral researchers to project leaders were present.[4]

The actual Round Tables were whole-day discussions, which took place in a reconfigured seminar room of the researchers' laboratory. A series of six meetings was held over a period of about eight months. The first three were dedicated to discussing the different sub-projects of the genome research project itself including a laboratory visit. During these Round Tables the participants collectively identified topics to be discussed in the remaining meetings: (1) science and the media; (2) ethical issues of genome research; and (3) regulatory issues. A specific expert was invited for each of these thematic discussions (respectively, a journalist, an ethicist, and a representative of a state regulatory body). A seventh meeting was organised for the lay-participants to reflect on their experiences on a broader level.[5] The Round Tables were facilitated by an STS researcher, who was not part of the project team. Generally, discussions took place in the plenary, however, at some Round Table meetings, small group discussions were included in the design to allow for a different discussion dynamic, or to develop inputs to the plenary in a smaller setting.

Qualitative interviews were conducted with all participants before the first and after the last Round Table to trace potential changes in the participants' positions and opinions. Along with a number of other topics, perspectives on governance and public participation were an explicit topic in both rounds of interviews.[6]

All discussions and interviews were taped, transcribed and coded with ATLAS.TI software. The analysis was carried out using a grounded theory approach (Strauss and Corbin, 2000).[7]

Of mice and obesity: debating governance at the Round Table

In the vast field of issues raised and discussed at the six Round Tables, which major tensions concerning the governance of science were discerned in the debate between scientists and citizens? Two sets of issues were most vividly discussed again and again, from the Round Table discussions to the concluding interviews: the practice of using mice in research, and the future effects of the knowledge produced on society. In this paper, we will use both issues as examples to trace the debates which the citizens and scientists had about governance.

Many of the research groups involved in the genome research project under discussion, in particular, many of the junior researchers present, were working with mice. This essentially means to breed, genetically modify and in the end to kill or 'sacrifice' the animals. Whether this is permissible and morally legitimate, and if so to what extent and for what ends, was a burning issue to many citizens (and also to some researchers, although they were less outspoken on the subject). They were interested in the practices connected to these issues within the project, as well as very strongly interested in how they were governed. This implied inquiring into the conditions under which the animals were kept, how many of them were used for which experiments, as well as how and by whom this was decided and monitored.

The second set of issues, which addressed future effects of knowledge, was mainly related to the researchers' presentation of their project in the discussions, during which scientists would regularly refer to the 'obesity epidemic' in the Western world and the related rise of diabetes and cardiovascular diseases as the background of their work. Hence, to them, the future effect of the knowledge they produced on society would be to contribute to the understanding and thus indirectly, in a long-term perspective, to the treatment of these diseases. The citizens, however, attempted to broaden the discussion beyond these aims to also

Two sets of issues were repeatedly discussed: the practice of using mice in research, and the future effects on society of the knowledge that science produced

include unintended and possibly negative consequences. They raised the issue of whether or not this research might contribute to the medicalisation of 'being overweight', and they asked whether a resulting treatment might not increase the pressure on people to conform to implicit societal norms and even lead to a compulsory use of medication to save health care costs. Whether a technological fix offered by genome research was the only approach to 'solve' this problem and how it related to other, e.g. psychological approaches was also questioned.

While the topic of animal experimentation was mostly discussed quite directly, the issue of future consequences of the knowledge produced followed more complex discursive patterns. Two main forms were used to grasp the inherent uncertainty of discussing the possible trajectory of the project's knowledge to application in society. On the one hand historical analogies, such as the path from research into the basic structure of the atom to the fission bomb, were deployed especially to address issues of responsibility. On the other hand, the citizens constructed an imaginary product, the 'fat pill', to be able to enact and test scenarios on the possible impacts of research on society.

Comparing the ways in which both topics (animal experimentation and the societal consequences of the project's knowledge) were addressed allows interesting analytical insights, as both raise very different challenges to the government of science. Animal experimentation as discussed at the Round Table seemed mainly to concern the epistemic practices within science itself and thus largely shows the image of a science 'segregated' from society. The impact of the knowledge produced on society, however, is an issue in which science is seen as genuinely intertwined with society. Hence, the challenges for governance were perceived as very different, and so were the dynamics of the discussion.

The limits of the ivory tower: boundary work and the self-governance of science

Which issues science may govern itself, and which need to be related to other societal actors, strongly depends on where the boundaries of science and society are assumed to lie (Gieryn, 1995). The scientists present at the Round Table would argue that their research is 'pure basic science', which primarily aims at producing knowledge, not applications. The project leader would even regularly refer to their work as a 'cultural effort' to be valued for its own sake rather than for its societal use. This boundary work strategy, and its contestation by the citizens, is of key importance for understanding the dynamics of the debates about governance at the Round Table.

With respect to animal experiments, the scientists referred to two central elements regulating their conduct: their own ethical sensibility and government regulation via the animal experimentation board.

In talking about their work with the animals, most of the scientists showed some degree of involvement and stressed the emotional suffering which went with this practice. One researcher talked of the transgenic mice he bred, experimented with, and thus also killed, as his 'family', describing in detail how cute they looked. In the scientists' narrative, this suffering is implicitly framed as necessary to ensure the ethical integrity of the experimentation. More explicitly, the researchers even argued that a person who had no emotional problems with killing, let alone actually enjoying it, should not 'be part of a lab' (S8m, RT1/2/103).[8]

References to the government board regulating animal experimentation were generally only employed as defensive arguments against open criticism by the citizens. For example, referring to the scientists' self-description as purely being curious in nature, a citizen would provocatively state that he would find it quite hard to 'justify the killing of animals [...] for only the end of quenching the human thirst for knowledge' (C13m, RT5/4/313). In her own defence a scientist would stress that 'there are regulations' and that one does not 'get a free ticket to do all animal experiments' (S6f, R5/4/315*),* but has to argue why one needs to do it. When asked what the criteria for evaluating the proposals are, however, she frankly admits to 'have no idea' (S6f, R5/4/315).

In this exchange, the scientist uses governmental regulation as an external legitimisation of their practice. Interestingly though, scientists would quite openly admit their ignorance about the details of this regulation. Implicitly, regulation is presented as a black box, whose contents would only come into play in the case of severe ethical misconduct. That this misconduct will not happen, however, in the scientists' general line of argumentation is not so much guaranteed by government regulation, as by the ethical sensibility of the researchers and the values institutionalised in the research group in particular, as well as in science in general.

On this issue, the citizens mostly expressed trust, not on the ground of the black-boxed formal regulation, but rather in the self-governance of scientists. Indeed their assessment of the scientists' authenticity in talking about their work played a crucial role in this. They did so only after they had continually 'tested' the scientists throughout the discussions. They insisted on seeing the 'real labs' scientists worked in (explicitly rejecting the idea of having a tour through 'proxy labs' made to show to visitors) as well as the mice stables, and they were rather suspicious of those scientists who to them seemed to show too much 'rhetorical façade', while they sympathised with those who seemed to let them have a glimpse into their inner struggles with their practice. In a way, the citizens were probing the scientists about how they handled the contradictions inherent in their work. While a too smooth façade and the assertion that there were no contradictions created distrust, a readiness to talk about one's inner struggle and emotional involvement signalled authenticity and created trust, because it simultaneously conveyed the presence of an internalised ethos in terms of which these struggles were resolved. Hence, the key question around which the debates on this issue of governance revolved was that of the self-governing ethos of the participating scientists, in a nearly Mertonian sense.

This ethos also played a key role in the discussions about the responsibility for, and the governance of the consequences of, the knowledge produced for society. While scientists considered the duty to contribute to a responsible governance of animal experimentation as part of their ethos, they more or less explicitly rejected taking responsibility for any consequences of the knowledge they produced beyond quite narrowly defined imminent risks arising from their work (such as transgenic mice escaping from their lab). Taking any role in the governance of these consequences was not part of how they envisaged their professional role. Their argument for not doing so was to be only doing basic research, without any concrete focus on application. Any applications would need to be developed by other actors at a later stage, and such implications would then have to be decided 'by society'. In this line of argument, the scientists were quite strongly using a linear innovation model (Godin, 2005) while simultaneously engaging in quite complex boundary work. Based on the assumption of the segregated nature of their work, they displaced any responsibility for governance temporally, and they externalised this governance to a society, which they implicitly considered themselves not to be part of.

Other than for the topic of animal experimentation, the majority of the citizens did not accept the argument put forward by the scientists that they were not responsible for the consequences of the knowledge they produced. Much more, they were disconcerted, if not even 'shocked' by the scientists' refusal to consider this issue in any detail. This disconcertment was augmented by the fact that most citizens did not accept the scientists' assertion that societal applications would play no role whatsoever in their current research. Citizens pointed to the dense array of arguments of economic and societal relevance scientists had used in other segments of the debate, such as for example in their project presentation. And they suspected the project and the involved scientists to be more or less directly influenced by other societal rationales than the pure quest for knowledge, even though they found it quite hard to pin point the precise nature of these connections or the actors involved.

Hence, for this topic, self-governance of science proved not to be a viable model in the debate, neither for the scientists nor for the citizens. However, while this issue was not that disturbing for the scientists, because they only felt marginally concerned by this question, many citizens were quite upset by the scientists' refusal to consider their responsibility as an issue to reflect on, and tried to discern not only how the practice of, but also the implications of, scientific knowledge production might be governed.

And the state? On the weaknesses of government

In virtually all of the debates described in the preceding sections, the state only played a minor role as an actor in the regulation of genomics. In the discussion about animal experimentation, government regulation was seen as an element to be considered. However, the decisive factor in the system of governance was clearly the self-governance of science and the internalised ethos of the scientists. Without this ethos, scientists and citizens implicitly agreed, government would not be able to effectively regulate experimental practice, because 'you can't place a policeman behind every researcher' (S8m, Rt6/2/127). Hence, government was first, not attributed the power to set norms which would be adhered to without direct surveillance, and secondly, it was also seen to be structurally unable to provide this necessary surveillance in the absence of the scientific ethos.

Thus, government was seen as a weak actor in the regulation of science. Scientists repeatedly underlined the state's limited ability to govern science in comparison to the self-governing capacity of science. A first reason they gave for this was that government regulation would always lag behind science in its ability to recognise and address any dangerous developments within science. To underline this argument, they cited examples such as the Asilomar moratorium on recombinant DNA-research.[9] Secondly, the state's ability to regulate and especially to sanction deviant behaviour in science was seen as inherently limited because science was seen as acting globally, while the agency of any state remains limited to its national territory. Hence, experiments considered morally inappropriate may be conducted in other national contexts, such as 'in China', as has frequently been stated. Science as a system, however, would be able to sanction such experiments by denying their publication in respected international journals.[10]

> S3m: [...] theoretically only one loophole remains — to publish it in a Chinese journal [...]. But in practice this is of no importance these days, because nobody reads those journals anyway. (RT6/3/188)

Mostly, the citizens did not contest these arguments put forward by the scientists: they implicitly or even explicitly agreed to them for the animal testing case. However, their central concern was the limited role of the state in governing the consequences of the knowledge produced by science. They saw no possibility of influencing either the production of scientific knowledge or its utilisation in society. In the course of this argument reference was made to the assumed properties of scientific knowledge itself, and patterns of its societal uptake. Knowledge was conceptualised as fluid, moving rapidly and hence as very likely to be taken up by other actors even if its development were discontinued at a specific location. The uptake of scientific and technological knowledge was seen as a process, which is too complex and dynamic to be steered by government. As one citizen put it:

> C10f: That's like setting some kind of machine in motion, and there are incredibly many gears in motion. To stop that again, that is pretty difficult or impossible. [...] Because you don't know who will acquire that knowledge, how people are going to handle it, and what is going to happen then. You can't prevent that. Except by legal restrictions. But again, those will possibly be broken. (PI, 271)

Many of the citizens saw government as well as science as actors among many in an opaque and decentralised network of governance. They were often unable to discern either the precise actors involved, or their interests and rationales. However, they assumed that these actors were mainly concerned with following their own interests, and were neither able nor especially interested in regulating the development of the system as a whole in a direction that would reflect broader public interests. Thus the situation was perceived as somewhat chaotic and potentially threatening. As one citizen put it:

> C6m: There was no [actor, authors] who felt responsible to decide what will be done or what will not be done, [...] to take responsibility for the fact that the consequences are more or less closely related to himself. Neither have we found any kind of structure which might be the ultimate regulatory entity [....] Somehow there was no one, who could have said, it's our fault, that this is being done, or we are the ones to prevent this being done. But everyone pointed to someone else. And for me actually the answer is that in essence we are unable to prevent such a development [of negative effects of obesity drugs on society, authors]. (RT7/1/202)

Struggling with the meanings of public participation

We had defined one of the aims of the Round Table debates to be reflection on the possibilities and limits of public participation in negotiating the relations between (genome) science and society. At a general level, as for example in the preceding interviews, most citizens and scientists would welcome the idea of public participation. Beyond this, however, all participants, but especially the citizens found it hard to grasp what this idea of public participation might actually mean, to them, in the specific setting, as well as in the Austrian context more generally. This is to be understood in the context of the Austrian technopolitical culture which, in comparison to other European countries, has very little tradition of public discussions on science and technology policy in general, and also very little track record in terms of publicly visible engagement events. Thus the participants gave very different meanings to participation. On the one hand these meanings were tied to the topic debated: animal experimentation or the consequences of the knowledge produced. On the other hand, these models of participation and especially their evaluation by the participants were inseparably connected to their perceptions of the processes and actors involved in the governance of science described in the preceding sections.

Four models of public participation with different meaning and ends were referred to in the discussion. For those who shared a strong belief in the self-regulating capacities of science, the aim of the Round Table and their participation was mainly educational. As described above, especially the scientists saw science's self-governing abilities as superior to that of government regulation. To them, their arguments on the locality and limited foresight capacity of the government regulators applied even more so to the public, which was seen as lacking adequate knowledge to play an important role in a governance of science. However, public participation was still seen as worthwhile, as a way to inform the public and thus to create the trust and (ideally silent) public support on which any self-governance of science must ultimately rest. For the scientists this model was applicable to both the issue of animal testing, and the consequences of the knowledge produced, as long as the latter were framed in terms of quite imminent direct risks, and not in terms of long-term societal impacts, for which they did not feel responsible. However, this quite classic enactment of the deficit model found only very limited resonance with the citizens. As sketched above, for them trust was not built on the basis of information, but much more on the conduct of the scientists and their convincing demonstration of an ethos governing their actions. Hence, they questioned the sense of a scientist communicating with 'the public', while at the same time rejecting any responsibility for the future consequences of the knowledge produced.

On these grounds, the majority of the citizens argued that in their view the aim of public participation would be to act as an instance of feedback and supervision to science, in order to assure and co-develop the ethos, which was so central to their evaluation. For them, the public's role should be to raise the scientists' awareness with regard to ethical and social responsibility, which they saw as often sidelined in the routine business of research:

> C7f: I believe that the scientists are so much into their field that they can't be objective about it anymore. And the public may raise many questions, and also opinions, which they cannot even imagine. (PI, 275)

This type of argument was frequently related to issues of ethics and governance of (animal) experimentation and less to the responsibility for the implications of the knowledge produced. Overall, it seems remarkable that this version of public participation very often focused on concrete interactions between scientists and members of the public, almost completely bypassing any institutional arrangements and dimensions. Partially, this may be seen as rooted in the specificity of our setting with its emphasis on the interaction between citizens and scientists. However, it might also indicate the perceived opaqueness of the actor constellations that citizens imagined were governing genomics: gaining unmediated access to scientists was seen as a way of having at least some influence.

Indeed, as discussed above, for a number of participants, the governance dynamics of genomics did not so much resemble an ordered network of actors and processes with government and science playing central roles, but was rather more opaque, chaotic, and de-centred, with a range of different actors each following their own interests and rationales. This perceived lack of a centre also signified a lack of possibilities to control or govern the development of the system as a whole. This perspective was almost exclusively addressed in the context of governing the consequences of the knowledge produced, and it was seen as especially threatening because it implied that the inscription of new knowledge and technologies into society was ultimately uncontrollable.

This perception of the situation led some citizens to voice a strong interest in re-installing means of co-ordination. They argued that participation may contribute to this co-ordination of different societal actors and interests, if it goes hand in hand with a broader public discussion. In these public discussion fora, they argued, the de-centralised interests could be brought to the table and the actors connected to them would be coerced to at least implicitly consider the other rationales, and hence some self-organising capacity of this seemingly so disordered system might be developed. As one citizen put it:

> C1m: The more transparent something is in different areas of society — I mean science, politics, the public, funders — the more this will maybe just govern itself somehow. (PI, 559)

The role of the public in these fora would be one of critical surveillance and of the expression and translation of different interests. It is worth noting that their argumentation assumes that the public is somehow more 'neutral' and carries less interest of its own, an assertion which from an STS perspective might turn out highly problematic in any consideration of the issue of the responsibility of science, which is so important to them.

This leaves the fourth model of participation to be discussed, a model which was not so much referred to by the participating scientists or citizens, but mostly introduced by us facilitating social scientists: participation as a contribution to classical political decision-making. Virtually all of the scientists and a majority of the citizens were reluctant to support this model, each for different reasons grounded in their respective visions of the governance of genomics. For the scientists, as discussed above, government regulation was inferior to scientific self-regulation, and any involvement of the public even more so. Against this background, public participation in political decision-making on technoscience did not make much sense to them. Interestingly, most citizens also refuted the idea, for two connected reasons. First, as they perceived government as only one rather powerless actor in an opaque governance network, they were unsure in which ways participation could and would feed into this system of governance. They did not seem to have any trust that government would take up their advice and act according to their interest, but rather feared that they would only play a legitimatory role and their statement might be 'misused' by other actors. Secondly, they felt very reluctant about the fact that a necessarily small group of people included in a participatory design might be taken to represent the public. They argued that even if they were to give a statement to feed into a policy process, they would not want this statement to deprive any other groups or members of the public of their right to be considered and participate in the policy process.

Conclusions

The aim of this article was to analyse the bottom-up meanings of the concept of public participation in a public engagement exercise. In the preceding sections, we have sketched the variety of connotations and implications that this term was given by the participating citizens and scientists, and we have tried to show that the precise situated use of the concept in the discussion was strongly tied to, and is to be understood against, the background of quite nuanced and heterogeneous visions of the governance of science in society in a particular national context.

One of the most central characteristics all of these visions shared was the assumed weak role of government both as an actor and as a mode of governing. Instead, the two main reference points in the debate were: a self-governance of science, and a distributed network-shaped form of governance involving a number of different actors. The reference to these two visions was unequally distributed between citizens and scientists. The latter more strongly referring to science's self-governance while the former were more likely to assume that governance took place in a de-centralised network. But the use of these reference points also varied according to the topics and challenges for governance being discussed. While for animal experimentation, a self-governing of science with limited roles for the public and government was nearly consensual, the governance of the future consequences of the innovations produced in the project at hand and in genome research in general was highly controversial, especially concerning the role and responsibility of science and scientists in these processes.

As a first conclusion, we may offer the thesis that this difference in how governance and hence also public participation was discussed is linked to the fact that the two topics triggered very different framings of science in its relation to society. For animal experimentation, science was seen as an autonomous and largely self-governing system segregated from society. Therefore the possible negative implications of this practice for society were framed either as deviations from norms set and policed by the scientific ethos (the 'mad scientist'), or as localised short-term risks ('the escaped mutant mouse'). The topic of the possible long-term consequences of the knowledge produced raised by the citizens implies a very different, much more integrated vision of science in society. Consequently it was much more strongly discussed in terms of different possible trajectories of innovation ('the fat pill') than in terms of risk.

In relation to the debate around upstream engagement, it is interesting to note that the latter discussion about innovation governance was perceived as rather frustrating by the participants. On the side of the citizens, this was mostly due to the impression of an intricate innovation process and the multiple actors associated with it, and, more concretely, to the refusal of the scientists to perceive themselves as central agents in this process. This refusal can be described as two-fold. First, referring to a nearly Mertonian ideal of a segregated science, they rejected any responsibility by science and themselves as scientists for the long-term implications of the innovations their work may spawn. But secondly, they did not take any position on these issues in their role as citizens.

Connecting these observations to the issue of public trust in science, it may be argued that setting our trust in the governance of science was contingent on the scientists' authentic[11] display of a scientific ethos which encompassed the respective challenge for governance at hand. This allows two kinds of conclusions. First, an engagement with the scientists actually doing the research may be crucial for building sustainable relations between technoscience and the public. Proxy labs and public relation experts will not suffice, because they do not allow the public to test whether the ethos displayed by these 'facades' is actually 'incorporated' by the researchers themselves. Secondly, if science is to meaningfully contribute to the growing debates on the regulation of innovation, it will have to adopt a more integrated vision of science's role in society. For an individual scientist, this may imply more actively taking the hybrid role of the scientist/citizen concerned about the impacts of scientific knowledge beyond the narrow short-term risks of his or her own work.

What does this imply in terms of public participation? The assumption, so strong in the academic and political debate, that participation will *a priori* be welcomed by citizens, only partially stood the test of our empirical experiment. It did so only on a very abstract level, for 'participation in general', which means for the abstract idea of 'the public' 'participating' 'in science'. However, as we aim to demonstrate, as soon as any of these three black-box terms became more concrete in the interaction, a variety of versions of 'participation in particular' came to the table. These are much more diverse and controversial than their general counterpart and may acquire different meanings such as: 'educating/being educated', 'supervising', 'co-ordinating' or 'co-deciding'. But the notions 'the public' and 'in science' also take on very different meanings for the different topics discussed.

Again, these different connotations were inextricably tied to the perspective of the speaker (as scientist or citizen) and most of all to the respective vision of governance for the issue discussed. Hence, in order to enable participants to engage with the respective technoscience/governance organisers of 'invited' forms of public participation would need to consider two central issues. First, the differences in the meanings of governance and public participation we have described imply that in a concrete setting it is necessary to develop a common vision of the aims as well as the governance system participation is meant to contribute to. In this, it is crucial to reflect that very often classic models of government are not seen as the main reference point by citizens, especially in upstream engagement. Hence, more complex visions of governance than simply producing a formal input to the government policy process need to be envisaged. Secondly, it is central that invited participation is not seen as an exclusive representation of the public. Uninvited forms of civic engagement also need to be considered as integral parts of governance. Indeed our participants voiced a deeply felt uneasiness that they, or any other group of citizens, might be seen as 'the' representatives of the public and hence possibly as silencing others who wish to make their own voices heard.

Going beyond our experiment in participation, it seems essential to observe a growing community, a market, of staging participation and to ask for the meaning of STS knowledge and know-how in this context. Indeed, it becomes obvious in studies like the one presented here that the expertise required for conducting such participatory exercises needs to be both conscious and critical of the visions of science, society, governance and participation it stages, and that it needs to take the performativity of these methods seriously rather than being committed to a naïve ideal of neutrality. Thus, the effort to develop more substantive modes and formats of engagement needs to be accompanied by a critical debate on the expertise of the community (Rose, 1999).

Notes

1. Engagement designs such as the consensus conference may be shown to make quite strong implicit assumptions on the identities of those expected to participate (Irwin 2001, 2006; Michael and Brown, 2005).
2. Available at <http://www.science-et-cite.ch/projekte/tableronde/de.aspx>, last accessed 8 February 2007.
3. Gender distribution was even. Age: out of a total of 14, four participants were 18–30; five were 31–45; four were 46–60; and one above 60. Education: university degree, 8; A-level equivalent, 5; below A-level, 1.
4. The gender ratio not surprisingly showed a strong negative correlation with the hierarchical position: all project heads were male and nearly all doctoral students female. These hierarchies were reflected in the discussion: the younger scientists were much less likely to contribute without being explicitly addressed than were their senior counterparts.
5. The level of participation at the single Round Tables was generally very high, the lowest number of participating scientists at a discussion being five, and the lowest number of present citizens being 12.
6. The interviews were conducted by members of the project team using an interview guideline.
7. Coding was done in two steps. First, discussion and interview segments relevant to the overall topic of this article were identified and coded using ATLAS.TI. Secondly, these segments were subjected to a fine-grained analysis using open coding.
8. Speaker codes consist of the following elements: *C* or *S* indicates citizen or scientist, the number is to identify the speaker, and *m* or *f* stands for male or female. The second code indicates the source of the quote: AI for ex ante interview, RTx/x/x for Round Table Number x,/number of the discussion section/line of the ATLAS-TI printout and PI for ex post interview. All quotes have been translated by the research team, respecting the original German word order wherever possible. We give references for quotes longer than three words.
9. At the Asilomar conference in 1975 leading bioscientists gathered and decided on a self-regulation of recombinant DNA experiments, including a moratorium on some experiments.
10. From an STS-observer's perspective, given cases such as the scandal around Hwang, the Korean stem cell scientist, this seems a highly questionable assumption.
11. For a related discussion of the role of authenticity in the governance of biotechnology, see Brown and Michael (2002).

References

Bora, Alfons and Heiko Hausendorf 2006. Participatory science governance revisited: normative expectations versus empirical evidence. *Science and Public Policy,* **33**(7), 478–488.

Brown, Nik and Mike Michael 2002. From authority to authenticity: the changing governance of biotechnology. *Health, Risk & Society,* **4**(3), 259–272.

Burgess, Jacqueline and Jason Chilvers 2006. Upping the ante: a conceptual framework for designing and evaluating participatory technology assessments. *Science and Public Policy,* **33**(10), 713–728.

Cooke, Bill and Uma Kothari 2002. *Participation: The New Tyranny,* London: Zed Books.

European Commission 2001. *European Governance: A White Paper,* Brussels: European Commission.

European Commission 2002. *Science and Society – Action Plan,* Luxemburg: Office for Official Publications of the European Communities.

Felt, U, M Fochler and A Müller 2006. Sozial Robuste Wissenspolitik? Analyse partizipativ orientierter Interaktionen zwischen Wissenschaft, Politik und Öffentlichkeit im österreichischen Kontext [A Socially Robust Politics of Knowledge? Analysing Participatory Interactions between Science, Politics, and the Public in the Austrian Context]. In *Technik- und Wissenschaftssoziologie in Österreich: Stand und Perspektiven [The Sociology of Science and Technology in Austria: State and Perspectives],* E Buchinger and U Felt eds., pp. 103–130. Wiesbaden: Verlag für Sozialwissenschaften.

Felt, Ulrike, Maximilian Fochler, Astrid Mager and Peter Winkler 2008. Visions and versions of governing biomedicine: narratives on power structures, decision-making, and public participation in the field of biomedical technologies in the Austrian context. *Social Studies of Science,* **38**(2), 233–258.

Felt, Ulrike and Brian Wynne 2007. *Taking European Knowledge Society Seriously. Report to the Expert Group on Science and Governance to the Science, Economy and Society Directorate, Directorate-General for Research, European Commission,* Brussels: European Commission.

Gieryn, Thomas 1995. Boundaries of science. In: *Handbook of Science and Technology Studies,* S Jasanoff, J Markle, J Petersen and T Pinch eds., pp. 393–443. Thousand Oaks, CA: Sage.

Godin, Benoit 2005. The linear model of innovation: the historical construction of an analytical framework. *Science, Technology, & Human Values,* **31**(6), 639–667.

Hansen, Janus 2006. Operationalising the public in participatory technology assessment: a framework for comparison applied to three cases. *Science and Public Policy,* **33**(8), 571–584.

Irwin, Alan 2001. Constructing the scientific citizen: science and democracy in the biosciences. *Public Understanding of Science,* **10**(1), 1–8.

Irwin, Alan 2006. The politics of talk: coming to terms with the 'new scientific governance'. *Social Studies of Science,* **36**(2), 299–320.

Jasanoff, Sheila 2003. Technologies of humility: citizen participation in governing science. *Minerva,* **41**(3), 223–244.

Jasanoff, Sheila 2005. *Designs on Nature: Science and Democracy in Europe and United States,* Princeton: Princeton University Press.

Law, John 2004. *After Method: Mess in Social Science Research,* New York and London, UK: Routledge.

Leshner, Alan 2003. Public engagement with science. *Science,* **299**, 14 February 2003, 977.

Marris, C, B Wynne, P Simmons and S Weldon 2001. *Public Perceptions of Agricultural Biotechnologies in Europe. Final Report of the PABE Research Project.* Available at <http://csec.lancs.ac.uk/pabe/docs/pabe_finalreport.pdf>, last accessed 31 July 2007.

Merton, Robert K. 1973 [1942]. The normative structure of science. In: R K Merton *The Sociology of Science: Theoretical and Empirical Investigations,* Chicago, IL: University of Chicago Press.

Michael, Mike and Nik Brown 2005. Scientific citizenships: self-representations of xenotransplantation's publics. *Science as Culture* **14**(1), 39–57.

Nowotny, H, P Scott and M Gibbons 2001. *Re-Thinking Science: Knowledge and the Public in an Age of Uncertainty,* Cambridge, UK: Polity Press.

Rabeharisoa, Vololona and Michel Callon 2004. Patients and scientists in French muscular dystrophy research. In: *States of Knowledge: The co-production of science and social order,* S Jasanoff ed., pp. 142–160. London: Routledge.

Rose, Nicolas 1999. *Powers of Freedom: Reframing Political Thought.* Cambridge, UK: Cambridge University Press.

Rowe, Gene and Lynn Frewer 2004. Evaluating public-participation exercises: a research agenda. *Science, Technology, & Human Values,* **29**(4), 512–556.

Rowe, Gene and Lynn Frewer 2005. A typology of public engagement mechanisms. *Science, Technology, & Human Values,* **30**(2), 251–90.

Steyaert, Stef and Hervé Lisoir eds. 2005. *Participatory Methods Toolkit: A Practitioner's Manual.* Available at <www.viwta.be/files/30890_ToolkitENGdef.pdf>, last accessed 3 January 2008.

Strauss, Anselm and Juliet Corbin 2000. *Basics of Qualitative Research: Techniques and Procedures,* Thousand Oaks, CA: Sage.

Wilsdon, James and Rebecca Willis 2004. *See-through Science: Why Public Engagement Needs to Move Upstream,* London, UK: Demos.