Technoscientific Dialogues

Expertise, Democracy and Technological Cultures

Wiebe E. Bijker, Paolo Volonté and Cristina Grasseni

Abstract The role of experts and their competencies in contemporary society are at the core of current debates in democratising technological cultures and establishing innovative forms of responsible dialogue within society. This section offers a reworking of the materials presented during the seminar hosted by "Giannino Bassetti" Foundation in Milan on May 3, 2010. The first article is part of the keynote speech given by Wiebe Bijker, one of the founding scholars of STS in the European scene. He draws from ethnographic results of his research on the Dutch Health Council and the risk governance of nanotechnologies. Two comments follow. The first one, by Paolo Volonté, focuses on the relationship between democracy and scientific knowledge, as well as the subtle ambivalence of democratisation starting from the intrinsic undemocratic character of scientific authority. The second comment by Cristina Grasseni emphasises the implications of a committed engagement of citizens in shaping forms of responsible innovation, when taking the science governance seriously.

Keywords expertise, democracy, technological cultures, responsible innovation, nanotechnologies

Different Forms of Expertise in Democratising Technological Cultures

Experiences from the current Societal Dialogue on Nanotechnologies in the Netherlands

Wiebe E. Bijker

We live in technological culture. That is my one-line summary of the opportunity and the problem of the world we live in. It has a message to my colleagues in the

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social sciences and it has a message to my colleagues in engineering and the natural sciences. I am trained as an engineer, as a physicist. I now have a chair in sociology. So I have some obligation to talk to both worlds[1].

To my social science colleagues I say, "Don't think that you can ever understand our current society if you do not take into account the role of science and technology". I would go as far as making the claim that you can't understand modern poetry if you don't understand the role of science and technology in the way metaphors are shaped. You can't understand modern classical music and you can't understand pop music, if you do not understand the technology: not only the technology on stage but also the digital technology that creates music. And, then, of course, the web-based iTunes distribution. And then the mirror image: engineers and scientists, don't think that you can ever create innovations that work if you don't think of how they are embedded in society, if you don't think about the social, cultural, economic variables around that technoscientific innovation.

Now, based on that diagnosis of our current society, my main question, the main question of the book (Bjjker, Bal and Hendriks 2009) is: how can we democratize that technological culture? How can we do that by building on the insights of STS, the sociology of scientific knowledge, the social construction of technology, boundary work? In one line, is there still a place for scientific advice in our technological culture?

Sociology of scientific knowledge has been arguing now almost 30 years that scientific knowledge is socially constructed. Scientific knowledge is not discovered literally by taking away the cover, by peeping through the hole and seeing the facts laying down there. It's not like that. It's very much a social process, and in that social process, scientific knowledge is created. The implication is that there is no a priori special status for scientific knowledge. Scientific knowledge is socially created like religious knowledge is socially created or legal knowledge is socially created. Why bother specifically about scientific knowledge? Social construction of technology makes a very similar argument. The working of a machine is the result of a social process. It's not something that is dictated by nature, by economic laws, by physics laws. No. Some technologies work in certain social contexts. They don't work in other social contexts. So, machines do not have their own intrinsic workability. They're made to work by a particular social context. Now, these two statements have been read erroneously: that technoscience doesn't need any special attention. Technology is socially constructed. Scientific knowledge, religious knowledge, experiential knowledge – these are all socially constructed, so why bother about science and engineering? So that is the kind of agenda that is set by the very successful early work of STS. I very much believe in that work, but the

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[1] I am grateful to Giuseppina Pellegrino for her help in changing the presentation into a paper.

implication that scientific and engineering expertise is unimportant, that's a completely wrong implication. I want to argue why specifically scientific and technological expertise are important, and make that argument by building on the constructivist view of knowledge.

1. Case-study: The Health Council of the Netherlands

Now, my case study: the Health Council of the Netherlands. This advisory body in the Netherlands is a strategic research site for this kind of research. It's a gold mine if you're interested in the type of questions that I just outlined. The Health Council is very much at the crossroads of science and policy; at the crossroads of the general public and the politicians; at the crossroads of medical, scientific and technical professions. It's at all those crossroads. Moreover, it's a highly respected body. When the Council celebrated its hundredth anniversary in 2002, the Queen was there to receive a copy of the Dutch version of our book. The Dutch Queen only shows up if it's really important, so this testifies of the importance of the Health Council and of its status in the Netherlands.

But was this not a weird occasion? I actually asked Her Majesty whether we weren't at the wrong celebration. Shouldn't we be burying that old dinosaur of the Health Council? How could we think that something that was created 100 years ago is still working well? Think of how the world changed in the last century! And we still listen to that advisory body? That by itself is a small paradox.

Now, the bigger paradox is that we live in this technological culture (a world that is permeated by science and technology), but at the same time observe that the authority of scientists, engineers, medical doctors has gone down. If there is scientific report presented to Dutch Parliament, within 24 hours there will be some random member of Parliament who says, "oh, well, it's just one opinion; let's ask for another opinion". The recent debate about the International Panel on Climate Change is another indication of the erosion of scientific authority: the finding of small errors (and I don't want to diminish the importance of avoiding errors) too easily was taken to undercut the whole scientific body that supports climate change thinking. So, this big paradox generates the following important political question: how to have authoritative scientific advice in this technoscientific culture in which scientific authority is generally eroding? And that is why the Health Council is such a strategic research site, because they have to work around that paradox in every advice they give.

I now want briefly, more or less as a footnote, explain how we designed the project. The original question that we were asked when granted this project, was to measure what the societal impact of the Health Council is. I'm sure that they were hoping to get graphs of influence, nice pie charts that would map in a quantitative sense the impact of the Health Council on Dutch politics, on Dutch society. We, to be honest, didn't really believe that something like that would come out of it. But we said "okay, let's try that". We made a nice design. We were quite proud of the kind of properly scientific design: a comparison of five successful advisory reports

and five failed advisory reports. They liked that. Then we asked the scientific staff of the Health Council to identify for us those case studies. (There are about 40 scientific researchers in the Health Council's secretariat; all with a PhD). We asked them to list the three most successful scientific reports, and the three biggest failures. Almost all of them responded. And then, exactly as we had expected (if I'm naughty, I would say hoped) did happen. Some of these advisory reports were listed as extremely successful by some staff, and as utter failures by others. So, evidently even amongst the staff of the Health Council itself, there was no agreement about how to measure the size of the success and impact of the Council. Some would place something completely on the success side and others would place the same advice on the failure side of the measuring scale. Now that is exactly what we, in a way, had hoped for in order to argue that a quantitative approach would not work. Instead, we proposed, let's try to understand in what way success is created, or in what way failure results from social processes. So we used our failure to produce a quantitative project design, to argue for a more ethnographic design. The leadership of the Health Council was perhaps not completely happy with this plan, but they did not see an alternative. (Now, by the way, they are very happy with the results). This is how we turned the quantitative study into an ethnographic study.

Very briefly then, about the Health Council of the Netherlands. Officially, in the law, it is specified that the Council's task is to advise the Dutch government on the state of scientific knowledge concerning public health. Public health is taken quite broadly: from ecology to medical equipment. The Health Council was established in 1902. It works mainly through a committee process: for every specific scientific advice one committee is formed from professors from Dutch universities, sometimes from foreign universities. The Health Council is, as I already mentioned, highly respected, also internationally.

The rest of my contribution will be in three parts. First a summary of our theory of scientific advising. Then a closer look into risk governance as an example of using that scientific expertise. And finally an on-going experiment with democracy in the Netherlands at this very moment.

2. A theory of scientific advising

This theory of scientific advice, then, has three elements: the *product* of scientific advising; the *work* that goes into making that product; and the wider *process in society* in which that advisory product plays a role.

First about the product of scientific advising, the advisory report. It comes as a nicely produced book, and you can download it from the Council's website. It is very much a front stage thing. It is public and they are proud of it. And it's very scientific. But it's not scientific in the same way as a scientific article, reporting on laboratory work. It is, with a term coined by Sheila Jasanoff, a kind of scientific work that offers not just truth but a kind of "serviceable truth". It is truth that is

specifically meant to serve policymaking, to serve political discussions. It is serviceable to that external, non-scientific goal. That's front stage[2].

Backstage the world is completely different. There, the scientists, the staff of the Health Council, know that they have to juggle many more variables than only a narrow textbook form of science. They know that they have to engage in what Tom Gieryn (1999) and David Guston (2001) have called "boundary work". They used the term 'boundary work' to talk about the boundary between science and policy. We add several extra dimensions to the original boundary work. One addition is a social dimension. While in the original usage, "boundary work" is rhetorical (it is about text and how you use certain vocabularies), for us boundary work also involves social engineering, inviting people, excluding other people, setting up certain institutions, changing institutions. The next step is to recognize that it is not only about drawing a boundary and separating, for example, policy from science. After drawing the boundary, it's also about reconnecting the two, but reconnecting them in new ways, organizing the interaction between the two. Hence we are using the term "coordination mechanism", rather than boundary mechanism". We identified a series of coordination mechanisms in the work of the Health Council.

Third step in the theory: to relate the (backstage) advisory work and the (front stage) advisory product to the wider process of democracy. The question is how to position that scientific advice in the larger framework of democracy of technological cultures. I will illustrate this with the case of risk governance of nanotechnologies.

3. Risk governance of nanotechnologies

Before going into the example, I want to make a step back and broaden the agenda by picturing the debate about nanotechnologies in a wider discourse on the vulnerability of our modern societies. I'm doing that to re-shape the agenda of risk studies a little bit, to widen the scope of those issues. I want to make two points about the vulnerability.

The first point is that vulnerability is very much a characteristic of these technological cultures that I'm continuously talking about. In two ways. On the one hand vulnerability is often caused by science and technology or at least mediated by sci-

[2] Very briefly on the distinction front-stage/back-stage. Think of a restaurant: the menu and the plate, those are front stage. That is publicly on display. In most cases, you do not want to see what is happening backstage...! But of course, the front stage meal wouldn't come if there was no backstage work. So the backstage is crucial to produce the front stage. But there is a distinction; there is a door at least. So if we want to understand how these reports appear front stage, we have to move backstage. If we want to understand the cooking, the work, then we have to go backstage.

ence and technology. (Of course, hurricanes are not science and technology. But the dikes that we build to create an illusion of safety in New Orleans are technology; and the illusion of having firm forecasted knowledge about where the hurricane lands and how strong it is, derives from science). On the second hand, we typically use science and technology to defend ourselves against these new vulnerabilities. (We build higher dikes. We develop better meteorological programs to forecast hurricanes. We use sophisticated econometric statistics to help insurance companies not go bankrupt when risky areas are flooded). Whatever way you look at it, vulnerability is a key characteristic of modern societies.

The second point is that vulnerability is inevitable. It would indeed be foolish to think of a society that would not be vulnerable. Try to imagine a world that is completely non-vulnerable. That must be worse than the worst Stalinist dictatorship. It's a world where nothing can change, where no learning happens, where no development is possible. All development and learning involves risk, inevitably. So if you want to live in a developing society, where we have innovation, where we improve things, then we should also allow for some mistakes, some vulnerability. So, vulnerability is inevitable as an unintended consequence of science and technology. And I will go one step further. Vulnerability is a prerequisite for modern societies. If we don't allow for some vulnerability, we don't allow ourselves to learn and to develop and to change society. So that is why, for me, vulnerability is such a key issue now.

Now, with that in mind, let's briefly stop to make a footnote about risk. The one-sentence summary of my point is: risk is more than a number. Risk is more than only a quantitative analysis of effect and chance. Risk depends on how you define problem situation. Perceptions also vary a lot. People living next to an industrial plant, and also being employed by that plant, do assess the risks of that plant lower than those not employed by the plant. Risks are value-laden. They are not independent. If you're really a mobile person and you like to live in an individual way, you will perceive the risk of car driving as being smaller than if you have a different style of mobility and prefer the train.

If risk is more than a number, then the idea that we just would need to better communicate risks to the citizens is not enough. We really should try to think of new democratic ways of governing risks. The implicit assumption behind 'risk communication' is often that we, the scientists, know the risks and they, the citizens, don't. Basically those citizens are stupid; if they would just better understand, the whole problem would be solved. Now, my argument is that it's not that easy: because of the value-leadenness, because of the context dependence, because of the different perceptions. It's not just a matter of getting the numbers across. So we need much more two-directional communication, and new forms of democracy to deal with risks. That ends the footnote.

Now I'll get to the risk governance example of nanotechnology. The core idea is to identify different risk situations and then try to be specific for every risk situation: a specific approach for each risk situation. Depending on the risk situation then, other experts, action groups, stakeholders, and citizens will be invited to par-

ticipate, and at the end of the story there is a whole array of policy instruments that can be called upon for each situation.

Nanotechnologies are everything that happens on a scale of 1 to 100 nanometers, 10-9. There are two ways of understanding it. There is the top-down movement in nanotechnology: making things smaller and smaller. The transistor, then the integrated circuit, and then still smaller and smaller. That's one way to get to nanoscale. The other way is to get up from the molecular level using clever instruments to combine molecules and build nanostructures like that. The current state is that there are very high expectations. There are a few but increasing number of applications. If you use a sun lotion, it probably contains nanotechnology products. All our car tires contain nano particles to strengthen the rubber. It is very difficult to find a field in the scientific and technological world that is not touched by nanotechnologies.

Now, the question is, some people say, "well, it's nothing new, it's just small; all our existing rules and regulations should work". Others say, "no, there is something fundamentally new going on, and we need a completely new style of governing this technoscience, these innovations". You'll see that the Health Council advice is in the middle position here. Why is this so important? It is important because nanotechnologies promise huge benefits and at the same time seem to create new risks. One beneficial example would be a nanotechnological drug delivery systems that would deliver chemotherapy exactly at the cancer place and not all over the body; then you wouldn't have all the awful side effects that we now have with chemotherapy. An example of a risk is the toxicity of synthetic nano particles. These risks we do not completely understand yet. And thus it is unclear to what extent the current regulations for chemicals, for example are applicable, or that we should conceive of completely new rules and regulations. The option of completely stopping - a moratorium on nanotechnologies - is not acceptable either, because of the promising benefits. So here is the true democratic problem. I will argue to not leave it completely to the experts, but also I do want input from the experts.

When the bad effects and the benefits of a new technological development have become clear, then quite often the development has gone so far, that it is difficult to change its course and steer that technoscientific development. On the other hand, at the moment we can still easily steer the development, we don't know the benefits and the risk. This is called the Collingridge dilemma. Do we wait until the problems surface, but then we might not be able to regulate and to steer; or do we now steer, but then we do not really know what we are doing. That dilemma is another fundamental dilemma in governing risks and benefits of new technologies like nanotechnologies.

We distinguish four risk situations. (1) *Simple* risk situations are situations where scientific evidence is completely clear. In the case of nanotechnology an example are the degradable nano particles. Another example would be asbestos or radioactive radiation. So 'simple' does not mean that it cannot kill you. But it means that scientific knowledge is quite certain and complete, and it thus is possible to design regulations and safety measures. You know exactly, for example, how much lead you have to hold between the X-ray equipment and the nurses that

handle the equipment. (2) *Complex* problems. We're still talking about a world where scientific knowledge is pretty complete, but the problem now is so complex that scientific knowledge isn't quite enough to formulate a policy. An example is the way that nanotechnologies would affect sustainable development. There is a lot of knowledge about how, for example, biotechnological developments influence food processing and agriculture. But how everything hangs together with international trade, social reform, financing schemes to possibly produce a more sustainable agriculture: that is so complex a problem that it cannot be solved as a straightforward scientific puzzle. (3) *Uncertain* problems are radically different. That is the kind of problem where scientific knowledge is not complete and not certain enough. An example is the following. We all learned in chemistry class that gold and silver are inert and thus do not react with other chemicals. They are not toxic and we wear them as jewelry. At a nano scale, gold and silver suddenly seem to turn highly toxic. Now that's worrying. There is solid scientific evidence that there is a problem with nanoparticles of gold and silver. But the scientific evidence it not complete yet. There is no complete understanding of nanotoxicity, as it is called. This thus is a different class of problems: we know that there is a risk, but we don't understand it as well as the risks of radioactive radiation or asbestos. (4) *Ambiguous* problems are yet of a different character. In the nanotoxicity case we at least know in which direction we want our society to move: towards a world without toxic materials, to put it briefly. In ambiguous risk situations we do not even know that. The nanotechnology example here is a memory chip implanted in my brain. This would help me to memorize the big family that my wife has, and better survive birthday parties and funerals where I meet all those uncles and aunts. But I suppose that in Italy as much as in the Netherlands there are fundamentalist Christian groups who would consider this as tinkering with God's creation and as the last thing that they would want our society to move to. Ambiguous risks thus are about situations where not only the scientific knowledge is uncertain, but where it is also unclear in which direction we want society to move to. There is disagreement about the fundamental values and aims for policy in society.

The next step - but I will not discuss this in detail - is that for each of those four risk situations we can specify a different style of risk governance. Also there is a different sector of people to be invited into the process of deliberation about these risks. (1) In the case of *simple* problems, regular university scientists are all we need. There is no reason to bother other people to take a vote on 2 + 2 = 4. I don't want lay persons to meddle around with the toxicity of asbestos. I trust scientists to do a proper job on defining the rules and regulations for the toxicity of small particles of asbestos. (2) In the case of *complex* risk situations, it is still a completely scientific issue. But it's important to recognize now that science is not neutral, that also scientific knowledge depends on the perspective that scientists have. So here it is important to also invite scientists from the pharmaceutical industry, from Greenpeace, from stakeholders and action groups. (3) For *uncertain* risk situations we really need something more. By definition, these are risk situations in which scientists do not know enough. So we need stakeholders to sit at the table and participate in the deliberations. In that way the balancing of economic, health, ecolog-

ical and other kinds of values can weigh into the negotiations and decision making. (4) In *ambiguous* risk situations, there is no other way than also to include the citizens. Here is at stake the direction in which we want our society to move. There is no escape of thinking of ways of involving citizens. But it is difficult, and that is what the final section will be about.

The big question is now: who decides about the characterization of a problem into one or the other category? Do nanoparticles pose a simple or uncertain risk situation? The answer is that this needs to be settled by a broad monitoring committee. This broad committee will include university scientists, scientists of specific organizations, stakeholders, and representatives of the general public. This committee then will do something like a triage of problems. If a problem is, for example, characterized as simple, it can be given to a purely scientific advisory council. If a problem is complex, in the Netherlands we give it to a 'sector council' that also has scientists from industrial agents. In some cases you really need a public debate of some sort. The next and final section will discuss one such example that we currently are carrying out in the Netherlands.

4. Experiment with democracy: societal dialogue on nanotechnologies in the Netherlands

We started a year ago with this societal dialogue on nanotechnologies, and it will be finished by March 2011. The government decided on this dialogue by following the advice by the Health Council and two other bodies in the Netherlands. The organizing committee, of which I am the vice-chair, is made completely independent of the government. That is because we have some experience with previous public debates in the Netherlands. Especially in the case of genetic modification the public got suspicious that the government was not intend to listen but only wanted to use the debate as a kind of lubricant to push already made decisions through society. With this experience in mind, both the government and we as committee wanted to make sure that the public debate was as clearly as possible separate from the government. The flipside is that the government is not committed to immediately do what we conclude from the debate. That's the price that we pay. But I'm happy to pay that price.

Our agenda is really open in the sense that as a committee we don't have an opinion on what we want out of this. So what we do? We then were immediately confronted with that fundamental problem that you can only have a dialogue once you understand what you're talking about. Very few people know about nanotechnology in the Netherlands, so we first have to do a lot of information giving. That needs to be followed by awareness raising so that people understand not only what nanotechnology is about, but also can recognize problems and promises, risks and benefits—that there is actually something to debate and something to think about and engage with. And then finally a dialogue can follow. The outcome of all those projects of information giving, awareness raising, and dialogue are collected by our

committee and translated into a societal agenda on nanotechnology. We will present this to the government in the last week of January 2011.

The committee had 4.5 million euros, which we used to create a plurality of perspectives and voices. We made a preliminary list of issues that we thought would need to be discussed. This was done on the basis of a stakeholder consultation of action groups and industry scientists who already know about nanotechnology. Then we issued an open call for proposals, and anyone - individuals, action groups, churches, institutions, university departments, industry, labor unions - could submit proposals to do a project of information, awareness building or dialogue. One project had a maximum budget of 130,000 euros. We received about twice as many proposals as we could fund, and we selected as transparent as possible a series of projects that together cover all three stages of the process. So, as a committee we are not the authors of the information; we do not set the problems for awareness; we do not control the agenda of the dialogue.

There have been books written, TV programs broadcasted, exhibitions displayed in libraries, hospitals and museums. A bus travels around the country with nanotechnology experiments that will allow people to tinker with nanotechnology. If we see information that we think is really wrong, then we'll ask another expert to provide her expertise to contrast the evidence that we thought was a bit fishy. So we do try to orchestrate, but we do not control. Same applies to awareness. One example of a project is "nano in the baby room". It will be a virtual project with a baby room and you can point to particular aspects of the furniture or food or toys, and ask how much nanotechnology is in there now, how much might there be in the future, and what could be the benefits and the risk. There will be theater plays and artistic productions to create different kinds of perspectives and stimulate awareness. We have no idea what will come out of it, but we figured that using such different vocabularies and styles of thinking might help the general dialogue. Philosophers write vignettes and scenarios that in two pages take one particular problem and then describe how nanotechnology might play out in both positive and negative ways. These vignettes and scenarios are used by other projects too. A school project started with laboratory experiments and school class lessons, and finishes with a debate with CEOs of industry and politicians of the provincial government. There will be web debates, science cafes. One project of Protestant Christians discusses the potential of human enhancement: is this tinkering with or improving upon God's creation? They are planning to liaise with Islam scientists and try to compare an Islamic perspective and a Christian perspective on the ethical dimensions of nanotechnology. And there is one project that explicitly relates to international relations and the role that nanotechnology may play both on the weapon side and on the reconnaissance and peace enhancement side.

To conclude. The most fundamental point is the issue of expertise and democracy: we need to balance a variety of knowledges in our society, scientific knowledge but also other kinds such as users' knowledge or patients' knowledge. The theory that I have outlined helps to do that balancing act, by showing when scientific expertise is necessary, and when you need stakeholder expertise to be added to that, and when you also need the expertise of citizens. Second, I have ar-

gued that institutions like the Health Council of the Netherlands and the US Academy of Sciences are needed to make our technological cultures democratic. These institutions themselves seem, paradoxically, undemocratic in the sense that all their deliberations are completely confidential. The Health Council, like the National Academy of Sciences in America, provides a place for scientists to debate, to have controversies about how to interpret scientific evidence, and to translate their knowledge into a serviceable truth, into an advice that may work for politics. It is crucial that these discussions remain confidential so that there can be a true, scholarly discussion about what is the political meaning of some scientific evidence. And so that's all the backstage work. After that, it goes front stage and it goes out into the public. We think that this will create again some trust in scientific evidence. Thirdly, on the nanotechnology debate, I just don't know yet. You can try your best Dutch by going to this website (http://www.nanopodium.nl). And finally, the core message is that we need to experiment with our democracy. We need to do that because the character of our technological culture asks for a new constitution. All democracies still work with, basically, 19th century constitutions. We can't blame Montesquieu that he didn't think of our nanotechnologies, biotechnologies and nuclear technologies. So we need to think about developing a new political constitution to democratically govern our technological cultures.

Democratising Technoscience through Undemocratic Spaces

Paolo Volonté

Democratization of science is a main topic in the studies of science and technology today (Maasen and Weingart 2005; Nowotny, Scott and Gibbons 2001). Following the steady process of political democratization and administrative technocratization in the last century and the up-to-date increasing case of the commercialization of science (Mirowski and Sent 2008), the issue of a wider participation of people in the decisions regarding funding and design of technoscientific undertakings has been risen. At the same time, the old assumption of technological development being a positive goal has been challenged by new social and cultural movements. The need of public discussion on some basic issues of technoscience has been put forward. Some radical scholars, referring to new ways of knowledge construction and diffusion through the web, ask for an open access to all scientific assets (Boyle 2007) or for a removal of the enclosure surrounding the scientific and academic knowledge commons (Kranich 2007).

The issue of democratization of science is at the core of Wiebe Bijker's paper and a main topic in his intellectual path. His research on the Dutch Health Council (Gezondheidsraad), that is extensively reported in the book of Bijker, Bal and Hendriks, *The Paradox of Scientific Authority* (2009), proves to be a general inquiry in the role of expertise and advice in times of democratizing science. In fact the issue of democratization of science is intertwined with the question of the actors legitimized to contribute to the technoscientific debate: just scientists and technicians, also stakeholders, or the affected groups of citizens?

In their book *Rethinking Expertise* Harry Collins and Robert Evans afford the same issue raising the question about "how we *set boundaries* around the legitimate contribution of the general public to the technical part of technical debates" (Collins and Evans 2007, p. 113). The question is here an opposite one in comparison with Kranich's: how to set boundaries, instead of how to remove them. Collins and Evans' point is that in science only those who know what they are talking about should have the right to contribute to technical debates, since a general openness to everybody's opinion would subdue the experts' view to the view of a democratic but ignorant mass. This happens as a matter of fact, state the authors, because it is usual that politics influence scientific practice (see Shapin 1979). But it doesn't belong to the legitimate intentions of scientists, who try, on the contrary, to reduce the influence of politics on their job: "Social studies of science may have shown that politics and other mundane influence are *intrinsic* to scientific knowledge, but, like interpretative ambiguity, they should never be *extrinsic*" (Collins and Evans 2007, 126). This is why scientific knowledge practices as a matter of fact don't share the democratic setting that is dominant today in politics.

Also from Bijker's paper arises that technoscience is not and should not be a democratic process in itself. Bijker states that in technoscientific scenes "you can only have a dialogue once you understand what you're talking about". Technoscience tends to be a closed environment where scientists and technicians develop a scientific or technological issue trying to exclude laypeople from the debate as far as they aren't functional to their purpose. This brings technoscience to take up a secluded space in society and to wield a big power on political decisions though eluding a democratic legitimacy. It is a main issue in the production of scientific and technological knowledge the idea that only those who have expertise can decide what is true and what is false, what is due and what is to be avoided. Bijker's paper shows how institutions like the Dutch Health Council try to support this issue with the aim of introducing authoritative scientific expertise in the political debate. They offer a secluded backstage where scientific experts can construct a common view, that afterwards is offered to the political debate in the front stage through an advisory report. The conclusions in Bijker's paper are, with respect to this, very clear: the Dutch Health Council is undemocratic in the sense that it "provides a place for scientists to debate, to have controversies about how to interpret scientific evidence, and to translate their knowledge into a serviceable truth, into an advice that may work for politics". Such institutions are helpful insofar as they can guarantee the construction of a serviceable scientific knowledge, i.e. useful for policy planning, without falling under politics control, i.e. without being subjected to the interests of political parties or lobbies and social groups. That is, they are helpful insofar as they enable to overcome controversial settings as the one discussed by Bobbio, Guzzetti and Pellegrini on the last issue of this journal. But this is only possible insofar as they are not democratized in their practices. A secluded space is anything but democratic. The "third position" that Bijker, Bal and Hendriks (2009) support against pure democracy and pure technocracy consists actually in this: to detract a discussion from usual democratic dialectic for a while and subject it to the technocratic one, which takes place thanks to the exclusion of laypeople; and to reinsert afterwards the discussion in usual democratic dialectic, namely when experts have reached a shared knowledge and confidence that can be showed outside as an authoritative advice. Only through such an undemocratic space technoscience can serve democracy. This is a sort of paradox, but also a clear phenomenon that Bijker points out in his paper, a social issue in technoscience: it is only thanks to an undemocratic process that technoscience can be democratized.

This is why we still have to consider technoscience as an elitist and authoritarian body in Western societies. It includes, as such, some political risks that many sociologists already emphasized by criticizing technocracy. But the right way to limit the risks of such a technoscientific elitism, claims Bijker, is not to democratize it. To democratize scientific procedures would destroy the power of science of producing reliable knowledge and authoritative advice. On the contrary, the right way is to democratize the procedures of mediation between "scientific knowledge" (however it has been produced in the backstage) and political needs; but, at the same time, to save the intrinsic undemocratic character of the production of scientific knowledge in the backstage.

Evidence of this point is easy to find. The Italian university system is today under huge critiques. Several social subjects in the political institutions as well as in the media reinforce the idea that Italy's university is inefficient, and that its most important weak point is the system of recruitment. I think that this happens because of the existence of a democratic clue in the recruitment process. In Italy the evaluation committees are elected by all professors of the same discipline. This is democracy: people are chosen by a majority, and space is opened up for the rise of democratic bodies, of such fundamental tools of democracy as groups organizing the people's vote, i.e. parties. However, parties and lobbies are groups of interests, and usually the goals they pursue don't fit with the goals of scientific research. Scientific careers are influenced by the "democratic" opinion of the majority, and this weakens the framework of scientific knowledge production in a systematic way.

Through recovering the essential role of expertise and advice Bijker imposes a turn in his own theoretical position (Bijker, Bal and Hendriks 2009, pp. 153-154). A turn that should be regarded as very important. In the Nineties he worked on the idea that we must democratize science and technology involving stakeholders and citizens in the decisions that have to do with technology and science. We must increase, he thought, public participation in the governance of science. Today he keeps the same position, but adding a remark: there is a space in technoscience that must be preserved against the influence of citizens and stakeholders. The case of the Dutch Health Council demonstrates that scientific advice is more effective and useful when it is formed according to the rules of scientific discussion, instead of the rules of political discussion or those of civic society discussion.

I think this turn is very important because it brings us closer to a fundamental change in science and technology studies. The mainstream of STS still aims at showing that technoscience is something different from the front stage it shows to the world outside. A lot of studies are carried out to show that there is a backstage in science where scientists act in a very different way as they would admit according to the scientific method. In fact they construct knowledge and artefacts by weaving social networks. But the very question is now: *why* is there a front stage and a backstage in science? Why do scientists exclude the possibility for politics and society to extrinsically influence their work, while in fact they are influenced by them? Usual answers to this question are unsatisfying. They refer to such issues as prestige or social distinction, not considering that the differentiation between backstage and front stage is not a disguise, but a rule that scientists are ready to follow although it brings huge costs for them. The front stage builds an ideal (called "method") that imposes strong constraints on the everyday job of a scientist. Even in the backstage of the Dutch Health Council world there is a tendency, a need to bridge the gap between that ideal and the reality of a discussion in a committee with colleagues, stakeholders and other subjects. Now, is it functional or dysfunctional to have such a front stage, to have such backstage constraints? And following precisely which kind of constraints do scientists and people of the Health Council act in this way? And above all, are there – as I suggest – social mechanisms underlying these relationships, namely mechanisms that binding scien-

tific practice to an ideal obtain to give more social reliability to the knowledge scientists claim?

I suggest that we should try to better understand how scientific knowledge is constructed thanks to social dynamics, and mainly, how it happens that through social interactions a peculiar kind of knowledge, that we call scientific, arises. In other words, we should inquire how it happens that a social sphere devoted to the production of new knowledge claims and actually mostly tries to follow a number of behaviour rules (an ideal) that in fact cannot guarantee the achievement of any real truth, of any true knowledge. And yet it does, and doing it produces an extraordinary growth of useful knowledge over time.

Scientific Authority and Responsible Innovation

Cristina Grasseni

On May 3rd, 2010, the Giannino Bassetti Foundation for responsible innovation had the honour of hosting Professor Wiebe E. Bijker at its Milan headquarters, within the framework of a course in Policy Research launched by IRER (Istituto Regionale di Ricerca della Lombardia). Prof Bijker's work on the relationship between technology, society and science has much in common with the issues addressed by the Bassetti Foundation, especially regarding political and normative issues *vis-à-vis* societal vulnerability in technological cultures.

In particular, in his 2009 *The Paradox of Scientific Authority, The Role of Scientific Advice in Democracies*, co-authored with Roland Bal and Ruud Hendriks, the author tackles the issue of the role of scientific advice in risk governance, and the question of how democracy can work in a technological culture.

The paradox of scientific authority, in general, is its strive to maintain power whilst its basis – scientific knowledge – has been deconstructed as an unquestionable benchmark for claiming authority. Epistemological constructivism as well as the political and economic bias of some forms of scientific advice should undermine scientific authority as a blanket category to which one should demand apparently neutral deliberation on scientific and technological issues regarding society at large. As the authors themselves state, "The cases in which scientific advice is asked more urgently are those in which the authority of science is questioned more thoroughly" (Bijker, Bal and Hendriks 2009, 1).

Nevertheless Wiebe Bjjker's ethnographic insight focuses specifically on the success, in the very face of such paradox, of scientific advisory bodies such as the Gezondheidsraad (the Health Council of the Netherlands). Elaborating on a nuanced notion of "independence" for governing bodies such as the Gezondheidsraad, Bijker addresses the issue of participation, democracy and representation.

My own questions regard the role of scientific advice in democracy as a possible instance of "responsible innovation". Even more so, since in a previous Bassetti Lecture Sheila Jasanoff addressed the political implications of society's image of science. In her view, bioethics can be studied anthropologically, as a cultural narration with normative effects: "collective knowledge ways constitute a culture's civic epistemology: they are distinctive, systematic, often institutionalized, and articulated through practice rather than in formal rules" (Jasanoff 2005, 255).

We can see one such culturally-laden civic epistemology at work in the Netherlands: strictly speaking, the Health Council's mission is "to inform our ministers and the two chambers of Parliament about the state of scientific knowledge on issues of public health, by means of publishing reports"; "to provide cutting – edge

perspectives on hitherto unresolved questions" and to publish advisory reports that contain policy recommendations (Bijker, Bal, Hendriks 2009, 15). But the question is: how are technological elites held accountable? What is the best relation between scientific advice and policy making? Which role can STS play in the politics of modern societies, built on science and technologies? (Bijker, Bal, Hendriks 2009, 2-3). My opinion is that Bijker's research works convincingly at unpacking the articulations of institutional power: it shows by description where power lies and how it acts. In this sense, rather than providing a theory of scientific advising – as this is stated to be the purpose of the book - it certainly succeeds in introducing an 'ethnographic turn' in studying the democratic governance of technological culture. By this I mean the fact that it introduces us "behind the scenes" and, through participant observation, it highlights the distance between theory (The Gezondheidsraad advises the government on the state of scientific knowledge but does not meddle with politics) and practice: the Gezondheidsraad exercises freedom of interpretation towards normative social discussions, it is proactively responsive to its institutional environment and has the capacity to position itself as a social actor *vis-à-vis* the debate on Xenotransplantantion, or on Medical Treatment's efficacy *versus* efficiency. Instead of stressing the un-reconcilable opposition between the standard view of science and the constructivist view of science as human handiwork – a construction process involving social dynamics – Bijker's approach is anthropological in the sense that it observes and describes first the local culture and practices of scientific advising.

The expression "regimes of collective experimentation", used in the authoritative STS report chaired by Brian Wynne and presented to the European Commission as *Taking European Society Seriously* (2007), recapitulates the challenge. In fact, the "Science in Society" programme of the European Commission pledged to increase societal dialogue on questions relative to science, especially with a view to anticipating fears, encouraging scientific careers and making scientists more aware of their social role.. European "knowledge society" was in fact to be built, according to the Lisbon agenda, on scientific and technological competitivity as a way of improving the quality of life. In the evolution of the programme, a "milestone event" was set in March 2005, when the European Commission organised the *Science in Society Forum* "to take stock of the developments and achievements under the new theme. The forum marked a watershed in thinking about Science and Society. It showed, among other things, that it is not enough to simply inform the public about scientific advances, but that there should be a real engagement of civil society and the public".[1]

[1] The Bassetti Foundation participated itself with a case study conducted in collaboration with Observa on Public Participation and the Governance of Innovation see: http://ec.europa.eu/research/science-society/index.cfm?fuseaction=public.topic&id=1263&lang=1.

Probably with this type of engagement in mind, the European Commission invited a group of experts in Science and Technology Studies (STS) to conduct a specific study on science and governance in June 2005. According to Mariachiara Tallacchini, a member of the expert group, "The mandate of the Director General of Research for the European Commission was to analyse the growing sense of unease that pervades the interactions between science and society and to explore ways of developing constructive relationships between techno- scientific expertise and public fears, with a view to create a more efficient governance in Europe".[2]
The expert group was coordinated by Brian Wynne and included several renowned scholars from the scientific and academic communities, who were involved in a multidisciplinary discussion.[3]

Regarding the role of experts and functionaries, the report stressed how the collective structures, assumptions, imaginaries and routines through which institutions exercise governance may be problematic. The production of reports, the commissioning of audits, the implementation of protocols and codes of practices do not enter a fully legislative pertinence but rather implements styles of governance.

Bijker's work shows us the nitty-gritty of how one such style of governance actually works. The Dutch Health Council positions itself as a social actor, or as a "boundary organization" with an agency of its own, deftly used to "co-define" the issue, to "land" its reports and to "repair" misinterpretations. Through research and personal experience in the Gezondheidsraad, Bijker comes to the conclusion that granting a certain degree of "confidentiality" is crucial to allow a subtle "boundary work", resulting in "serviceable truth".

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[2] "Science and Governance: the provocation of responsibility", on line article, February 2008 www.fondazionebassetti.org/ en/ focus/2008/02/ science_and_governance_the_pro.html.

[3] The expert group included French sociologist Michel Callon, Portuguese lawyer Maria Eduarda Gonçalves, Sheila Jasanoff, professor of science and technology studies at Harvard University, Belgian economist Maria Jespen, French economist and sociologist Pierre Benoit-Joly, Czech sociologist Zdenek Konopasek, German economist Stefan May, Claudia Neubauer from the Fondation Sciences Citoyennes in Paris, the Dutch philosopher of science Arie Rip, Karen Siune, director of the Danish Centre for Research and Policy Research, Andy Sterling, director of Science for the Science Policy Research of the University of Sussex and Mariachiara Tallacchini, professor of Science and Technology and Law at the Catholic University of Piacenza. The report was presented in March 2007 in the presence of Goran Hermeren, President of the European group for the ethics of science and new technology and Cristine Majewski head of the External Relations Unit and administrative board of the European Food Safety Authority. The Italian version, translated by Mariachiara Tallacchini, *Scienza e governance. La società europea della conoscenza presa sul serio* (Rubbettino 2008) was presented at the premises of the Giannino Bassetti Foundation in Milan in February 2008 with the participation of Mariachiara Tallacchini and Brian Wynne.

What does it mean to be an expert consultant to a decision-maker? Does reliance on expertise constitute a challenge to representative democracy in itself? Or do we need to safeguard a protected space in which accuracy, responsibility and authoritativeness finally result in some kind of accountability? These are open questions, finding specific answers in concrete contexts. They were met for instance by Daniel Mulhollan, Director of the Congressional Research Service of the Library of Congress at a seminar of the Bassetti Foundation in December 2008 (www.fondazionebassetti.org). Both the CRS and the Dutch Health Council seem to thrive in "relative seclusion". In other words, Bijker grants that "institutions with confidential internal processes are necessary for proper functioning of democracy at the level of technological cultures" (Bijker, Bal, Hendriks, 2009, 166) but that "the democratic character of scientific advice must be found in the way in which scientific advisory reports function within a broader process of governance of technological cultures" (p.1).

The same questions find different solutions in the grounded practices expressed by distinct political and institutional cultures. Therefore, an encompassing answer seems to lie in a catalogue of best practices and of well-rehearsed and nuanced routines rather than in a general theory of scientific advising. But Wiebe Bijker shows us how to extract useful analytical categories from the quagmire of ethnographic narration and the serendipity of institutional normalization.

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