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Deliberations on the Life Sciences: Pitfalls, Challenges and Solutions

Michiel Korthals

Wageningen University, michiel.korthals@wur.nl

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Abstract

In this article I sketch several versions of the deliberative approach and then discuss five problems which confront a deliberative ethicist of contemporary problems of the life sciences, in particular about food, nature and agriculture. I begin by discussing problems of unequal participation in deliberations and secondly analyze cognitive and normative uncertainties that abound in the life sciences like biotechnology. Thirdly, these sciences comprise different scripts (e.g. nutrigenomics: personalized or public health) that steer the type of outcome, like products and services. Dependent on the framing, the products and services look different. Fourthly, multi-level problems are addressed, in particular the relationship between local, regional, national, international opinion formation and decision making. Fifthly, I will turn the table and argue that some scientific and technological project can have a large and severe deliberative impact and others not. Discussing these challenges I will develop some tools, like mapping different arrangements of the interaction between genomics and societal developments, developing imaginary futures by aesthetic explorations and by scenarios, by different moral screenplays and dramatic rehearsals, deliberative leadership, and designing deliberation eliciting technologies.

Keywords

participation, framing, uncertainties, multi-level governance, life sciences

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Introduction
In many European countries consultations on new technologies and other types of innovation are established. In the Netherlands in the seventies a large national debate was undertaken on nuclear energy and later in the nineties about genetic modification. For decades citizen juries have been organised in Denmark. England experimented with consultations in 'GM Nation'. This participatory turn has been accompanied by intensive theoretical debate about the function and structure of deliberations as a complement or alternative to majoritarian democratic procedures (see also Gastil 2005; Dryzek 1990, 2000; Mouffe 1996; Renn 1996). In 1971 Habermas published a short and obscure article (Habermas 1971), in which he for the first time explained that discourses were the main vehicles for reaching the truth of propositions (cognitive discourses) and for the justice of ethical judgements (ethical discourses). It took years before he, social philosophers and social scientists developed this idea into more practical political and ethical organisational forms, and in the eighties the first publications appeared that followed this idea more broadly, and the new democratic perspective, coined deliberative democratic, emerged (Renn 1996; Einsiedel 2000; Schot 2001).

The history of this type of democracy is therefore not very old, only forty years. However, in those years several versions of deliberative democracy are developed, implemented and critically assessed. My philosophical involvement with this type of democracy regarding science and technology started with the article of Habermas and now more than thirty years later I am still busy in trying to make sense of this idea and to give it meaning in coping with social and technological developments. Currently, the deliberative approach is plural, often plagued by severe misunderstandings (Theiss-Morse 2002) and accompanied by impressive conceptual and empirical progress and problems (Hamlett 2003).

In this article I sketch several versions of the deliberative approach and then discuss five problems which confront this approach in dealing with contemporary problems of the life sciences, in particular about food, nature and agriculture. Starting with an outline of different types of deliberations, I outline the concept of 'moral entrepreneur' for the role of a deliberative ethicist that elicits implicit worldviews and potential confrontations and cooperations. Then I discuss problems of unequal participation in deliberations and subsequently analyze cognitive and normative uncertainties that abound in the life sciences like biotechnology. Thirdly, these sciences comprise different scripts (e.g. nutrigenomics: personalized or public health) that steer the type of outcome, like products and services. Dependent on the framing, the products and services look differently. Fourthly, multi-level problems are addressed, in particular the relationship between local, regional, national, international opinion formation and decision making. Fifthly, I will turn the table and argue that some scientific and technological project can have a large and severe deliberative impact and others not. Discussing these challenges I will develop some tools, like mapping different arrangements of the interaction between genomics and societal developments, developing imaginary futures by aesthetic explorations and by scenarios, by different moral

screenplays and dramatic rehearsals, deliberative leadership, and designing deliberation eliciting technologies.

What is deliberation?

There are many versions and types of deliberation in practice (Rowe 2004) and many theoretical perspectives on deliberation. I will start with Habermas' proposal. According to Habermas, deliberations are types of communication somewhere in between the three large social categories of government (administration), market, and civil society. He distinguishes three kinds of discourses: cognitive about truth claims of descriptive statements, normative about rightness claims of ethical judgments, and expressive about authenticity claims of emotional expressions. In *Between Facts and Norms* (1996, translation of *Faktizität und Geltung,* 1992) Habermas designs a deliberative process model of democratic politics. This model features a multiplicity of mutually entwined forms of communication. The three types of discourses are supplemented in this model by strategic negotiations, aimed at fair compromise and supplemented by legal discussions that evaluate the results for legal consistency. The result of these discourse are universal agreed upon principles; however, he concedes that in the normative discourses never merely universal norms are produced; time- and place related values and norms of communities are hidden in universal norms.

Habermas strongly believes in the necessity of separating universal moral norms (in rational, i.e., moral discourses) from values of a community that he defines as 'particular'; this distinction is quite strict and difficult to reconcile with his concession that universal norms are saturated with particular values. Moreover, he does not concede vice versa that particular values can have universal moral meaning, for instance food choices of people (expressing their values) can have universal moral meaning by incorporating (or not) universal values like biodiversity, sustainability, and the respect for the good life of future generations. Food choices people make (be it producers, consumers or, in facilitating them, governmental bodies) make, like consuming veal tongue from calves raised in isolated crates, hamburgers and other fast food, or cod has direct ethical impact on animal welfare, on the environment, and on biodiversity. Many have argued against this distinction between moral norms and particular values (Benhabib 1996). Habermas' restriction of ethics to moral, universal principles implies that ethics is not able to take into account the gray zone between universal norms and universal aspects of the Good Life and to assess the ethical meaning of the particular good life that people.

Secondly and related to this, is Habermas' presupposition that with respect to discourses on universal norms one should always strive for a moral consensus and produce only one right solution, as can be seen from the following statement (Habermas 1998, 403):

> "The democratic process promises to deliver an imperfect but pure procedural rationality only on the premise that the participants consider it possible, in principle, to reach exactly one right answer for questions of justice."

As to this second point of criticism that moral decisions do not allow for a variety of good solutions, in another publications Habermas has tried to make it clear that the binary feature of moral judgments (either right or not right) belongs exactly to their cognitive (rational) meaning. He presupposes that decisive reasons for instance on moral judgments

on moral meanings of food always can and should be given. Habermas makes it very clear that rightness is only connected to normative judgments. With the validity claim of rightness connected with a normative judgment the speaker asks for agreement and in the case his opponent does not agree, evidence has to be given that indeed the normative judgment is right. Consequently, Habermas calls discourses and outcomes that are the result of compromise, fair negotiation, or prudent consideration not really moral and rational.

Other versions of the deliberative model, like that of Benhabib (1996) or Bohman (2007) have criticized the unnecessary limits Habermas puts on the potentialities of discourse (or deliberation) and reasoning and his emphasis on strictly universal discourses. Bohman points out that even in the moral type of discourse, often not decisive but plausible reasons play a dominant role. The continuous emergence and uncertain implications of new scientific and technological developments in the field of food and nutrition makes it nearly impossible for only one answer to be the right one (see below). It seems to me that Habermas' perspective insufficiently takes into account diverging worldviews, their concomitant controversies and dilemmas, their ethical impact, and the potentialities of ethical and moral deliberations about them.

Thirdly, Habermas excludes with this intrinsic connection between rightness and individual judgments ideas of Good Life from the moral domain; these later ones are mostly shaped in form of narratives and can by implication not rationally discussed. Testing a rightness claim means scrutinizing the arguments for or against a certain ethical judgment. However, most individual ethical judgment get their meaning from those narratives, just like other cognitive judgments, and they function within a larger framework or vocabulary that in case of severe doubt also has to be discussed, which however is impossible in a rational discourse á la Habermas.

Concluding, in my view, rational deliberation does not always require consensus concerning moral problems regarding food. The pragmatist John Dewey lets the concept of deliberation also include:

> 'the imagining of a plurality of possible futures and the ways that lead to their realization. This involves thick descriptions of complex scenarios, of various competing possible lines of action and courses of conduct. According to Dewey, creative deliberation is dramatic in three senses: in its concern with character, which mirrors our dominant interest in the manifestation and interaction of personalities; in its concern for plot, for creative redescriptions and new narratives; and in its suspenseful and open-ended nature' (Keulartz 2004, p. 20)

In table 1 below I have organised the four possibilities of a pragmatist ethics in which deliberations may play a role.

Tasks for a Pragmatist Ethics	Product	Process
Rationalist ("context of justification")	(a) *Traditional ethics*: Providing arguments and justifications for or against courses of action	(b) *Discourse ethics*: Structuring and safeguarding fair public deliberation and decision making
Romantic ("context of discovery")	(c) *Dramatic rehearsal*: Criticizing and renewing vocabularies, exploring possible future worlds	(d) *Confrontation and Cooperation*: Explicating, confronting and aligning heterogeneous moral vocabularies and worldviews

Table 1, Adapted from Keulartz et al 2002, p. 203

In line with the pragmatism of Dewey, one should make a distinction between deliberations, aiming at individual judgments and decision making that may or may not be based on consensus (type a and b) and deliberations aiming at the development and aligning of interesting opinions and narratives, where no consensus is necessary (c and d, see table 1). In these last two types vocabularies are renewed and ethical experiments can be done or various vocabularies can be brought in contact not to determine the validity of the individual judgments but to find out in how far constructive cooperation is feasible. With this last type of deliberation an important feature of pragmatism is at stake. In a fully fledged 'pragmatists ethics' the four types of deliberations should be taken into account.

The four types of deliberations make it quite clear that Habermas in his deliberative approach only gives attention to the first two and not to the other two. However, in deliberations type c and d framing of ethical issues mostly happens from different visions of the good life, how meager this often is made explicit. The role of the deliberative pragmatist is in this type of deliberation to act as a 'moral entrepreneur', and to explicate the different vocabularies at stake and to manage them with mutual beneficent cooperation as an end-in-view. In deliberations a and b the pragmatist acts more like a communicator who lets stakeholders exchange their opinions fruitfully.

Finally, the distinction between the four possibilities makes it also clear that deliberations *never meet fully democratic requirements of parliamentary democracy, and therefore* never can be an alternative to this very strong (by the vote of all) legitimized type of decision making. Deliberation in the sense of type a) is part of parliamentary debates and decision making and therefore deliberations are always complementary to normal democratic processes. Deliberations (b-d) are more like the Socratic dialogues about intriguing problems of life on the market (agora) in Athens than like the discussions ands decision making procedures in the Athenian republic.

Why deliberations?

Although deliberations are often used in consulting the public about technological innovations, the justifications to do so can vary very much (Einsiedel 2000; Burgess 2003; Rowe 2004). Consultations and deliberations are organized everywhere in Europe (e.g. Understanding Risks Debate 2004). According to the General Food Law of EU, article 7, 8, and 9 there is a need for consultations in the case of innovations.

I can discern at least five types of justification why the public has a right to ask deliberations about science and technology innovations and what motivates governments to organize them and they can be used in different contexts. Increasingly, they reflect more and different values connected with the relationship between science and society. The first three function prominent in Habermas' famous essay on different relationships between science and society according to the technocratic, decisionistic and pragmatistic model, models that have been extensively used (Habermas 1968, p.120-144).

The first justification is purely strategic: because the scientific and technological applications will be used by the public, they should get information on an innovation. One can argue that the value assumption of this type of justification includes the idea that science can give an answer to all important problems. Often this type is used by scientists by saying that science needs the support of society and that getting support is the reason that they ask for public deliberations. If the public refuses to use the innovation it is over, what ever its reason is. So purely out of instrumental justification, it is necessary for science to know as far as possible in advance what the public wants and what it refuses. This is a justification for a fairly restricted way of communication: the deliberation only gives information that the public influences in favor of the proposed innovation, and abstains from talking about risks and losses. A complicating factor is that the science community is not a political and social unity, so some scientist will give more and different information than others, out of social or strategic reasons.

The second justification can be that because the public are the taxpayers, they pay for the science and technological projects, so they have some reason to participate in decision making. In this case, science has some motivation to give more than positive advice, but also to do their best in giving information on the risks. The value assumption of this justification is that science should deliver the fact and that politics has to decide. Although the politicians in the end will decide, the public has some motive to become involved. A variant of this argumentation could be, that because of the normative implications of science, the public should have some say in this, because with respect to normative reasoning scientists are not the only experts. This can be called the normative or democratic argument.

A third justification to involve the public can be an epistemological one. It is often said that experts incorporate only a limited type of knowledge and that the whole, the combination of this detailed knowledge in a higher way, is up to the public. In this case the public is said to function as a source of knowledge, not only as a source of values, as in the last argument. The value assumptions of this justification include the idea that science is not the only producer of knowledge. One can rightly advocate that that lay persons can be experts on certain aspects, like identifying risks (see above), and doing measurements in the case of ecological characteristics. It is indeed the case that e.g. data on bird migration are mostly collected by laypersons and there are many other good examples to be given of the knowledgability of so called laypersons. The claim of

epistemological symmetry of lay and science persons are maybe sometimes exaggerated, but exaggerated is in any case the claim that lay persons always know the best. So we should be careful not to paint the public as not-knowledgeable, but also recognize that science represents a methodologically advanced form of knowledge production.

These three types of justification often occasion deliberations that belong to the first horizontal row of table 1. The next types of justification for deliberation do require broader perspectives and can be better accompanied by the procedures of the second horizontal row of table 1.

A fourth justification can be that innovations have consequences, which end-users and other persons involved will have to cope with. Even people that are not taxpayers or otherwise involved can be affected by innovations. When I decide for a DNA-screening, the information sec can have dramatic consequences (e.g. privacy concerns) for my relatives besides for my self (Rose 1985). When a new, higher yielding crop is implemented, more water will be used, so non-agriculture people can be affected, to name one effect (Huang 2002). Value assumptions steer the definition of what counts as risks and consequences, which is depended on the in the proposed innovation incorporated ideas of the Good Life, which means that we move toward the second horizontal row of table 1, just as in the fifth type of justification.

The fifth justification is in my view the most compelling, because it takes into account that values do determine the considerations of scientists in general and in particular with respect to their decisions on significant truth and consequently on research priorities. Why is so much research done on sexy topics and not on others (like chronic diseases?) A very moderate and sophisticated philosopher of science, Kitcher, in *Science, Truth and Democracy* (2002) has given the view that science is not about truth but significant truth: significance is reached by the choices that are made to do research in one topic instead of another. As Kitcher makes clear, it is here that science should listen to the values, reasoning and standpoints of the public. Moreover, the exchange of opinions on important innovative issues gives citizen the possibility to listen to each other and to understand their sometimes deep differences. Value assumptions at stake here comprise ideals of science, technology and of society. This deliberative point of view is in my view the most compelling argument to engage the public in deliberations on the research priorities (and only if necessary on the data or theories).

Strategic justification	Benefits				
Democratic justification	Benefits	Risks			
Epistemological justification			Data, theories		
End user justification	Benefits	Risks			What good life?
Deliberative justification	idem	idem	idem	Research priorities and framing	What good life?

Table 2. Various justifications for deliberations and their main items

When are deliberations fruitful?

Citizens of modern democracies have a busy life, and it seems to me quite exaggerated to require of them to participate continuously in all kind of deliberations. Their interests and values differ, and so their motivation to positively participate. Moreover, not in all situations deliberations have to be organized, for instance in situations of acute emergency or the reverse, in situation where routine like democratic procedures are sufficient. The functions of deliberations are, as has been discussed earlier, to make possible exchange between different opinions on important innovations, and to look for new ways of handling both the differences in opinion and the innovations. So, what is their function? Mostly, the function of debates is not decision making, but enhancing the insight on cognitive and normative issues connected with science. Consultations are not a panacea or easy instrument. They are not always necessary, nobody is saying this. The structure and main issues is dependent on the aim. In my view, the aim should be the process or increasing the awareness of the participants (stakeholders, actors) of the ethical and social problems of the new sciences, and not always decisions or regulations with respect to these sciences. This process will have probably a very divergent outcome, but parts of these outcomes can be used in the ensuing regulatory and science policy making process.

In the discussion of the human genome for example it became clear from the ethical debates that the public was seriously worrying about issues of privacy of the new genomics diagnostics in health. What will happen if their employer or bank knew that they have certain vulnerabilities? On the basis of these concerns the genomics scientists fundamentally changed their research and responded in a way that made this concern less worrying.

If indeed the process is the most important, one of the main issues of organizing a debate is: who is represented? One should reflect on the role of NGOs: they should not be the only spokespersons, and but, let's admit it, they are also not exclusively power driven, or self interested groups. NGO's are mostly idealistic groups, but one –sided. Some have an argumental style, some are much more dogmatic and deeply entrenched and not in the mood to listen to arguments. It is however, an exaggerated description of their power and agency to say that they invented social unrest. We can only argue that Greenpeace ao could socially amplify the risks because of lack of trust. However, the main issue remains, who do they represent?

What is a successful deliberation?

There is in the literature considerable difference of opinion on the successful effects of deliberations. For instance, Chambers 2003, p. 318 argues that 'a central tenet of all deliberative theory is that deliberations can change minds and transform opinions'. Debates are said to bring people in contact with each other and their opinions, which implies that they change their opinion. However, changing of opinion is not the most important criterion of the success of a deliberation. People change often their opinions due to all kinds of factors. More important is what their motives are in keeping or changing their opinion. In the cases of participating in a deliberation, people can stick to their original opinion, but on the basis of a different argumentation and / or motivation. Was it a new insight or some new way of seeing things? Didn't they broaden their mind so they could give better arguments for their opinion? And when changing their opinion,

did they do this because of the presence of a large majority and cognitive disagreements seemed fruitless of because indeed the majority were right?

Other important questions that determine the success of deliberations are: What will be done with the output of the deliberations? Who participates, who represent what party or part of the public? What will be the agenda? Will be talked about the issues that interests or concern the public?

Five challenges to deliberations

Unequal participation

As a matter of fact, not everyone wants to deliberate all the time. Many people like a kind of 'stealth democracy': they are satisfied with the normal parliamentary decision making that according to their view goes smoothly or does not bother them (Theiss-Morse 2002; 2005). Other people are not engaging with deliberations because they fear for social ostracism or expect not to be listened to. This is a relevant concern because without the inclusion of these involved but not engaged people, the deliberations run the risk to be a kind of 'enclave of gated democracy', a play toy for the well-educated (Feenberg 2001). Inequalities, and unwillingness of dominant parties to deliberate transparently, deter people from participating in debates. The contexts of institutionalization of deliberations and in particular power relations are therefore points of concern for their success. However, people have an opinion and are mostly willing to share these and to debate these in cases where they are really involved (Delli Carpini 2004). Moreover, as Delli Carpini (2004) also reports, there are many good studies that show that people in daily talk indeed construct and develop a kind of ethical discourse. It is not that people do not want tot discuss at all about ethical issues. Depending on the motivations, the issues, the expectations and social context of power, they are willing to participate in more formal settings, for instance concerning a certain technology.

The construction and development of deliberations in these complex societal and technological settings must therefore *firstly* as transparent and inclusive as possible. The agenda must be clear and should not be changed because some dominant player wants that. *Secondly*, with respect to the process, the deliberations about humans and material circumstances must proceed with as impartial and transparent input of experts as possible. During the process of deliberation, not only talk but also extra verbal mechanisms can be applied in trying to deconstruct fixed positions and tense relations and to bring to understanding seemingly strange orientations. Play, aesthetic performances can open up possibilities and make entrenched positions fluid with the result that the deliberations are not repetitions of already well known moves. *Thirdly,* the output of the deliberation should have an effect on decision making. *Finally*, deliberations are components of a public learning process, and some kind of public awareness about their main outcomes needs to be kept lively for instance in media attention (Delli Carpini, 2004; Korthals 2008a; Korthals 2008b)

Fundamental uncertainties of science and technologies

The second challenges to deliberations on scientific and technological deliberations are their dynamic and often uncertain developments. Would one have organized in the fifties deliberations about the pill that is now called the 'anti-baby-pill', the theme of the debate would than have been the healthy regulation of the female period (Keulartz et al. 2002). It took some time before the final function of this pill was found. When deliberations are

organized around ambitions and expectations of scientists directly involved, one runs the risk that the deliberations miss their point. The development of the science presents a dynamic in which "organized skepticism" (Merton 1968) follows "organized utopianism" (our wording, MK): taken for granted truth and certainties are destroyed or better, are unmasked as (un)truths and uncertainties. The persistent intellectual dispute among competing research teams in which established truths fall prey to critical scrutiny is an indication of the mature evolution of the scientific understanding of the world. Scientists claim the right to make promises *and* mistakes; that is the core of the scientific ethos (Merton 1968; Kuhn 1962). This oscillating history shows that during the period of emerging paradigms or disciplines scientists are in need of an organizing utopian idea that rallies their energy and directs their attention. Organized utopianism (promises) seems necessary too and will give occasion to mistakes and false promises; organized skepticism will unmask them later. The history of science is full of these (later discovered) mistakes, which in some cases can turn out to be big problems or even catastrophes. Examples of serious mistakes made in agriculture and food sciences are the use of lead, of radioactivity, and DDT in agriculture and food, and the claim that all vegetable oils are seen to be healthy (Bryson 2003, Chapter 7, 10).

The development of nutrigenomics' innovations is a case in point because its short history has had expectations (personalized nutrition and the individual gene passport) and shows now an uncertain future because cognitive and normative uncertainties galore and fundamental uncertainties are inevitable (like that of multiple functions of genes: Pearson 2006; Piatigorsky 2007; Sriram 2005). Often, more knowledge will not reduce fundamental uncertainties in research, innovation and applications and a fixed state of technology is often an illusion.

Deliberations can take this challenge into account by paying attention to the process of producing scientific uncertainties, and how to manage them. Deliberative strategies to tackle uncertainties can be selecting plausible from implausible uncertainties and making a hierarchy, making scenarios (Petersen 2003), stories, dramatic rehearsals on future strategies and chains of events and constructing emotional strategies how to live happy with uncertainties (Korthals and Komduur 2010).

Framing the problem and inscribing the script
The selection and development of scientific and technological innovations is steered by networks of researchers, policymakers and material things and their concomitant values. These factors 'inscribe', in the words of Akkrich (1992, 208) in the technologies how this technology will look like. For instance, they delegate responsibility to certain actors and not to others and give occasion to different moral judgments and moral behaviours of actors midstream and at end of the developmental path, and she calls this a script. Others, starting with Goffman (1974) call this process of inscribing a script 'framing'. It makes quite a difference when you frame food and nutrition as a public health issue, a personal health issue (Komduur and Korthals 2008) or as a cultural issue or when you frame medicines in terms of the needs of an inhabitant of the West or of the South. When the script or frame of a technology is successful, societal groups align with the technology, but if not, the technology will not succeed.

Deliberations that take technologies at face value, and do not question the problems they are supposed to solve and their prioritization, will in the end fail, because

they take the wrong definition of the problem as a starting point. For instance, when malnutrition is framed as a medical problem (and food is framed as a health issue), only medical strategies will be seen as solutions and not agricultural ones. A different problem definition can change the range of solutions that are seen to be plausible.

An important item of deliberation should therefore the analysis of the given framings of a problem and in how far alternatives do exist. This attention to problem definitions makes deliberations different for stakeholder analysis, because the last approach does take for granted the problem defined by the parties involved and also the way those parties define themselves (Hamlet 2004).

Attention to framings and to the way the participants define their roles requires often quite unconventional strategies that transcend merely talk, like aesthetic explorations (for instance plays), role changing, scenarios and challenging dystopian or utopian proposals for technological innovations (see below; Komduur and Korthals 2008)

Multilevel problems

A fourth challenges has not so much to do with science and technology but with the increasing complexities of the social networks in which they develop. It is now more or less a truism to indicate that modern states are subject to 'territorial dispersal' in the sense that lots of important decision making procedures are delegated to either supranational levels and or to subnational levels (Scharpf 1999). Moreover, 'horizontal dispersal' means that non-state actors contribute to policies (Hajer 2003). The multi level governance of innovations puts deliberations with their often local orientation into a disadvantage, when they are not structured in a more translocal way. Debates about genetic resources, about Genetic Modification of crops or animals or about research priorities or patenting have such a wide spread, even global, impact, that the local deliberation should be connected with vertical levels (Goodin et al 2006). An important principle here is that of subsidiarity that puts responsibility and decision making power in the localities and on translocal levels only when it is absolute necessary. Moreover, in cases where it is necessary to connect the local with translocal levels, it is advisable to put more emphasis on deliberative leadership. Accountable spokespersons of (local) deliberations can bridge differences between the levels involved. Another device can be to construct bridge organizations (like civil society parties) between the various deliberations (Keulartz et al. 2008)

Different deliberative impacts of technologies

Deliberations are mostly started when technological innovations are already underway; even upstream consultations, taking place as early as possible, are response to certain technological ideas. However, in stead of waiting for societal reactions, a deliberative approach could try to stimulate early ideas on innovation that stir up societal debate. Some technological ideas are more controversial than others and can give rise to new, fruitful moral vocabulary than others. In the beginning of the GM debate about animals new ethical vocabulary emerged, like that of animal integrity; nowadays this debate could use some new input, to put more pressure on the minds and behaviour of people to find new ways of thinking and handling these types of biotechnologies. Currently, the ideas on in vitro meat can function as important incentives for debate and for new views on eating conventional meat, which now can be seen as eating a corps. Technological and

scientific projects, even in their first, immature phase can start new debates and in particular change the stalemates that often bring debates to a fruitless and repetitive end. The first technological reaction to scarcity of mineral fuels and climate change in the form of biofuels inspired a debate about biofuels in which it became clear that land water and other resources are important for food, and even more so for meat production. One can call these technologies 'world disclosing', because they inspire to look differently on the world. Compared to other technologies that do not stimulate debate, like that of mobile phones, these disclosing technologies function very well in enhancing moral debates (Driessen and Korthals forthcoming).

Next to art and social movements (to name a few other moral world disclosing agents), one could try to design technologies that actively and intentionally engender deliberation and provoke deliberation in cases where there the public debate has reached a stalemate. With respect to genomics, deliberative engaged people could ask themselves: what technology/innovation engenders the most interesting innovative deliberation?

Conclusion

Deliberative participation can imply mapping different arrangements of the interaction between genomics and societal developments. In this article I first give an overview of the most important theoretical issues that regard the deliberative approach. Then I discuss five challenges, problems of unequal participation, cognitive and normative uncertainties, the different scripts, multi-level problems and finally the deliberative role of deliberations eliciting technologies. Discussing these challenges I developed tools from a non-traditional ethical perspective, like imaginary futures by aesthetic explorations, future explorations by scenarios of different moral screenplays and dramatic rehearsals, accountable leadership and bridge organisations. With all these tools the deliberative ethicist develops him or herself as a moral entrepreneur not only as a communicator that eases deliberative exchange.

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