Collective Closure?

- Public debate as the solution to controversies about science and technology

Forthcoming in Acta Sociologica – September 2010

Associate Professor Maja Horst

Department of Organisation

Copenhagen Business School

Kilevej 14A, 4.

2000 Frederiksberg

Denmark

Phone: +45 38152826

Email: mho.ioa@cbs.dk

Biographical note:

Maja Horst is associate professor at department of organisation, Copenhagen Business School. Her research interests lies within Science and Technology Studies: science communication, Public Understanding of Science, Research Management and Governance of Science and Technology. She has recently published in *Social Studies of Science; Science, Technology and Human Values;* and *Science and Public Policy.*

Abstract: Developments in biotechnology have sparked a number of social controversies during the last decades and it has been common to understand public debate as a necessary prerequisite for the ability to deal with these controversies. This is particularly true in the case of Denmark, where public debate has been taking place for more than 25 years, and the paper uses the Danish example to argue that controversies about biotechnology intersect with fundamental political discussions about order and control in today's knowledge society. Inspired by cultural theory and the work of Mary Douglas, it is proposed that arguments about biotechnology are justified by reference to particular articulations of social order. Her four notions of social order are identified in the analysis of a sample of arguments from four major Danish newspapers. On the basis of this typology, the paper examines the broad discursive consensus in favour of public debate and participatory exercises regarding the social responses to biotechnology. It does, however, simultaneously point to inherent tensions in the expectations towards public debate and its role in the creation of solutions to controversies over science and technology.

Keywords: Sociology of knowledge, Controversies, Cultural Theory, Public Understanding of Science, Social order, Engagement.

> I would like to try presenting culture as a dialogue. This is like joining a powerful movement in the social sciences to turn action into speech and text, and I should say firmly where it is different: I am not taking the Habermasian view of the ideal society as dialogue, because I am not emphasizing possible harmony, but the contrary. The aspect of the cultural dialogue that needs to be understood is accountability. Think of culture as essentially a dialogue that allocates praise and blame. Then focus particularly on the blame. Intercultural dialogue is inherently agonistic; the outcome will at any one point be a victory for one and defeat for another of the contestants; the contest is about the form of the life to be led in common.
>
> *(Mary Douglas, 1997: 129)*

With the birth of the first IVF baby in 1978, biotechnology became a permanent issue on the public and political agenda in many European countries. Tapping into earlier discourses on eugenics, abortion and medical ethics, the debate about biotechnology and reproduction has given rise to a great variety of utopian as well as dystopian visions of the future (Dijck, 1998; Mulkay, 1997; Nelkin & Lindee, 1995; Turney, 1998). In a seminal analysis, Michael Mulkay has argued that in the course of the debate about embryo research in Britain, people's hopes and fears about embryo research and their conflicting ideas about the place of science in present day society were publicly formed and displayed (Mulkay 1997: 2). The present paper is an effort to develop this argument and demonstrate how biotechnological controversies intersect with fundamental political discussions in today's knowledge society. Controversies about biotechnology represent disagreements about the regulation of science and technology in a complex and differentiated society, but they are also conflicts over basic conceptions of social order and the shaping of a future *good society*.

Faced with proliferating controversies it has become commonplace (at least in many European countries; see, e.g., Hagendijk et al., 2005) to argue that public debate and engagement are necessary prerequisites for the legitimate regulation of biotechnology (Durant, 1999; Joss, 1999; Weale, 2001; Wilsdon & Willis, 2004). On a practical level, governments and other policy

institutions have been experimenting with activities concerning public participation in science (Borch & Rasmussen, 2000; Finney, 1999; Franz, 2006; Joss, 2002). Despite the differences between the objectives of these practical experiments and their theoretical proponents, there seem to be a common expectation that public debate can somehow ameliorate controversy. This common subscription to the value of public debate in the face of controversies is interesting because it comes from many different actors including both proponents and opponents of biotechnology. In this paper, however, the focus is not on whether actors agree or disagree, but how they manage to agree and disagree at the same time. If controversies about biotechnology can be understood as fundamental disagreements about the place of science and technology in the social order, then what is the implied connection between public debate and the regulation of science and technology? How is public debate expected to solve controversies?

The enthusiasm for public participation in policy decisions regarding biotechnology has been particularly pronounced in Denmark, which has a 150 year tradition of engaging the general public in legitimate policy making (Einsiedel et al, 2001; Korsgaard, 2004). When reproductive biotechnology became a controversial public issue at the beginning of the 1980s, it was a common view among Danish policy makers and opinion leaders that it needed thorough public debate. The calls for public debate led to the establishment of two separate institutions (the Council of Ethics in 1987 and the Board of Technology in 1986), both of which had an explicit obligation to 'stimulate public debate' as part of their legal foundation. Subsequent Danish legislation, numerous official reports and public hearings in the last two decades have all stressed the need to engage in public debate about the controversial ethical, social and cultural dimensions of reproductive biotechnology.

This institutionalisation of public debate in Denmark has attracted international interest. Best known is the model of Danish consensus conferences conducted by the Board of Technology

(Andersen & Jæger, 1999)**.** However, the integration of participatory exercises into the legislative process and the underlying cultural values that this integration is seen to represent have also received notable attention (see, e.g., House of Lords select committee on science and technology, 2000). But the Danish example also demonstrates the ambiguities and paradoxes in the current interest in participatory forms of engagement. As Rowe and Frewer have argued, there is a lack of clarity in the definition and use of theoretical concepts in research into public participation (Rowe & Frewer, 2005). The Danish example, however, demonstrates that this deficiency is not just a scholarly problem; it is also an issue in actual participatory experiences. Despite the Danish tradition of public debate on policy issues, it is impossible to find unanimous agreement on the specific definition of public debate or the general criteria for its social performance. Instead of treating this as a problem of nomenclature, the present paper will suggest that we need to understand public debate as a politicized concept just as Mulkay has urged us to think about science as an object of controversy (Mulkay, 1993). Rather than being a medium for solving controversies and finding legitimate solutions, public debate has become a topic for discussion in its own right (Irwin, 2006). On this basis, the concepts of *science* and *public debate* need to be explored as part and parcel of the debates themselves. In this paper, I will move this discussion forward by identifying stable patterns in the discursive constructions of these two phenomena. The argument will be that the patterns demonstrate how the controversies reflect basic political discussions about power and the social order, but also that they predict that public debate is never going to be a means to solve controversies. Rather the controversies themselves have to be regarded as that which binds society together. The analysis proceeds from the following questions:

- Which societal functions do the concepts of science and public debate designate in arguments about the regulation of biotech, and what are their relationship?

- What are the proposed political functions of public debate, which makes it a suggested tool to resolve controversies about the governance of science?

Conceptual framework and analytical strategy

Controversies can be seen to be visible as sets of conflicting *arguments*. As rhetoricians have long been aware, these arguments construct particular relations between problems and solutions in the effort to make their audiences adhere to a particular representation of a situation (Perelman & Olbrechts-Tyteca, 1969: 4). In his important work on the uses of argument, Stephen Toulmin examines precisely how argumentation is used to justify claims about problems and their solutions (Toulmin, 2003: 11-21). According to Toulmin, an argument consists of at least three important elements: the *claim*, whose merits the argument is seeking to establish, the *data* to which the argument appeals as foundation for the claim, and the *warrant*, which is an (implicit) general proposition that authorises the claim as appropriate or legitimate on the basis of the particular data (Toulmin, 2003: 90-91).

Although Toulmin's model was developed to analyse the micro-structures of argumentation, the notion of *warrant* as that element which authorises 'the step from certain type of data to certain type of conclusion' (Toulmin, 2003: 120) can be usefully applied here. It directs our attention to the fact that in order to construct a particular relation between a problem and a solution, the argument must implicitly refer to a general notion of how problems are to be solved. Constructing a particular relation between a problem and its solution, a*rguments therefore simultaneously subscribe to a general notion of how order is constituted and problems solved.* Mulkay hints at this when he argues that the participants' adoption of a rhetoric of either hope or fear is 'linked to their varying

conceptions of the human community' (Mulkay, 1993: 724). The rhetoric of hope, for instance, implies a social order in which science is generally understood to be a means of solving problems, reducing human suffering and benefiting society at large. In the present paper, I will show how implicit *notions of social order* in arguments about biotechnology are deployed as warrants in particular debates. In order for a solution to make sense as a solution to a problem, the argument must refer to a general notion of how social order is composed, recognised and legitimately maintained. Such notions provide the crucial step from data to conclusion in the arguments we will be looking at.

In order to explore the role of these *notions of social order* it is useful to draw on the cultural theory developed by Mary Douglas (Douglas, 1978, 1996a, 1996b, 1997; Douglas & Wildavsky, 1983). Douglas understands culture as a conflictual dialogue between four different conceptions of social order. At the core of these conceptions are different systems of social accountability according to which blame and rewards are allocated. Douglas' work, then, provides us with a heuristic for an analysis of the appeal to social order as warrant in argumentation about the regulation of biotechnology. Where Douglas talks about 'cosmologies' (Douglas, 1978) or 'thought styles' (Douglas, 1996b), I will talk about '*articulated collectives'* in order to emphasize the rhetorical, rather than anthropological, focus of the analysis. My concern here is not so much what or how people think, but how notions of collectivity are employed as warrants in arguments about controversial science. The term 'articulated' stresses the fact that the four forms are not a structure with an independent existence, but rather a relational figure invoked in arguments by being presented in public discourse. The term 'collectives' is chosen to indicate a shared notion of how the world works – an articulated collective is not just a notion about the order of society, but also about the workings of nature, progress and science.

In order to understand articulated collectives as warrants it is necessary to read cultural theory in a particular way, stressing the indeterminacy in cultural forms. This reading is inspired by Douglas when she emphasizes that

> cosmological values, being used to provide justifications for the actions expected from a person by the constraints of his social environment, are likely to be involved in the choice of actions. Consequently a stabilising factor is identified. However, the individual, not seen here as being passively acted upon by the forces of his social context, is himself a part of that social environment, and he will be actively maintaining and constituting it. Any individual can interact at any level and choose to accept or reject the social pressures and prevailing cosmology in which he finds himself. (Douglas, 1978: 53)

Cosmologies therefore do not determine actions but are constantly re-articulated in actions, and in this paper the focus is on re-articulation through argumentation about problems and solutions regarding the regulation of biotechnology.

The analytical strategy of the paper proceeds from the assumption that arguments in the controversies about biotechnology subscribe to one of four modes of articulating the collective as the implicit warrant for constructing a particular relation between a solution and a problem. The objective of the analysis is not to prove the typology right, but rather to employ it as a heuristic to distinguish between distinct ways of constructing arguments. As heuristic, the four cultural forms are particularly relevant because they can be seen to expand on the rhetorics of hope and fear identified by Mulkay (1993). In 1997, Douglas described the typology as consisting of two ways of exercising power (hierarchy and market) and two ways of opposing power (critical activist and

isolate). Whereas the first two can be seen to correspond to the rhetoric of hope, the latter two correspond to the rhetoric of fear. Based upon a reading of Douglas' various descriptions of these four forms, it is possible to distil a typology of four distinctly different modes of articulating the collective:

- **Authoritative Hierarchy:** The collective is organised in hierarchical relations where every individual person or system has a defined role with responsibilities, privileges and obligations. Actors are defined according to their role or position in the hierarchical order of the whole.
- **Competitive Individualism:** The collective is a market of bartering relations where every individual actor is free to negotiate exchange relations with all other actors. Actors are defined according to their individual resources, interests, and preferences.
- **Sectarian Equality:** The collective is a battlefield where systems of power corrupt the community of people, because each system follows its own systemic rationality. Crucial in defining actors is whether they belong to the systems or to the enclaves of resistance.
- **Fatalistic Isolation:** The collective is an anarchic chaos with no overarching rules and no mechanism that secures order or justice. There is no regularity in the definition of actors, although actors perceived as authorities or executives of power are generally considered ill-willed and rejected.

In the present paper this typology is employed as a structured perspective for classifying arguments into four groups according to the way they understand social order and expect problems, such as controversies, to be solved. In contrast to controversy studies (Nelkin, 1979; Engelhardt & Caplan, 1987) the issue here is not to examine how controversies are actually ended (by scientific or

political means), but rather to examine how arguments construct social order and suggest controversies to be solved.

The empirical analysis therefore consists of classifying arguments according to their subscription to one of the four modes of articulating the collective defined in the list above and subsequently investigate how public debate is understood as a tool for reaching closure in these four groups of arguments. Making the typology operational for classification is achieved by treating each form as a perspective according to the definitions presented above. When, for instance, the perspective of hierarchy is identified, the analysis has found arguments that imply a warrant, which subscribes to a hierarchical notion of social order. These are arguments in which the definition of problems and solutions are deduced from an overarching rule, or arguments in which phenomena are presented as compartments in a larger hierarchy that implies a particular set of privileges and obligations on each compartment.

Empirical analysis

The analysis has been conducted on opinions expressed in the mass media, because it provides access to a broad and diverse set of arguments. Mass media cannot of course be perceived as a neutral mediator of statements regarding biotechnology; indeed, media sociology has demonstrated that the editing process favours controversial, conflictual and diverse statements of opinion (Berkowitz, 1997; Friedman et al, 1999). In the present context, therefore, far from biasing the analysis improperly, the gate-keeping function (McQuail, 1994: 213-4) of the media is analytically productive. While it does not give us access to what we usually call ‘public opinion’ about

biotechnology, it is the site *par excellence* of constructed controversies, i.e., it is where the object of analysis is to be found.

The sample of mass media articles that has been selected for this analysis consists of 104 opinion pieces (including editorials, essays and letters) about the regulation of biotechnological research from four national newspapers in Denmark. The four sampled newspapers have been chosen because they represent a broad spectrum of national opinion. Two of them are large 'quality' papers, the social-liberal *Politiken* and the conservative-liberal *Jyllandsposten*, whereas the third is an intellectual and critical niche paper (*Information*) and the fourth a tabloid (*Ekstra Bladet*)[1]. The sample consists of all the long opinion pieces printed in these papers between 1 August 1997 and 31 December 2001. Each of these articles has been analysed to summarise its main argument(s) and subsequently classified according to the predominant mode of articulating the collective. Some articles fall into more than one category as they employ different types of arguments.[2] The provisional categorisation of articles according to their predominant type of argument, however, was not the main purpose of the analysis. It has served as a heuristic device to identify four groups of arguments, which have subsequently been analysed qualitatively, in order to explore how different arguments understand the societal function of science and public debate.

In the following, the analysis of the four groups of arguments will be summarised briefly in four separate sections. Each section will describe first how controversies about biotechnology and science are understood as problems, and subsequently how public debate is implied to solve these problems. The four sections include a few quotations from the newspaper articles in order to illustrate how the analysis has been conducted.[3] To ease the reading of the text, the groups of arguments are referred to as, for instance, 'hierarchical arguments' rather than 'arguments subscribing to a hierarchical mode of articulating the collective', although the latter is technically a more correct wording according to the analytical setup (it is not the argument that is hierarchical but

the notion of social order implied in the warrant of the argument). After the description of the four groups of arguments the paper will return to a discussion of the similarities and differences in the articulation of public debate as a means of solving controversies.

Authoritative hierarchies

Some of the arguments that have been deployed in the controversies about biotechnology, define actors and phenomena according to a defined role or position within the order of the whole. I have classified these as subscribing to a hierarchical mode of articulating the collective. Responsibilities, privileges and obligations here follow a division of roles and the hierarchical arguments all emphasise the need to establish or respect the social order. Controversies, in this mode, are seen as results of conflating things that ought properly to be kept apart. One significant example of this is the expression of a tension between market forces and freedom of research. The arguments rarely reject market forces as a principle for economic organisation in companies, but they often claim that the use of market exchanges should be restricted to economic areas of society, and should not interfere with the realm of knowledge production. These arguments are often put forward by actors described as researchers, but they are also associated with other types of actors, for instance a newspaper editor as in the following: 'A society ought not to treat information about the genome of its citizens as a commodity that can be sold to the highest bidder' (Politiken's Editorial, 1998). The argumentation in this unsigned editorial from Politiken is advocating a general principle, which stipulates that knowledge should not be treated as a commodity and regulated by market forces

In these arguments, controversies about biotechnology are understood mainly as problems that arise because society does not understand how science works and does not respect the need of science to be governed by its own intrinsic laws and values. As an example, it is argued that

scientific ‘exploration of the possibilities [in cloning research] ought not to be stopped [by outsiders to science]. But the use [of research results] should be debated’ (Jensen, 1999). Arguments like these can be seen to imply a kind of *logic of scientific inquiry*, which has to be respected if science is to create proper (usually defined as ‘true’) knowledge. Freedom of research is defended because it serves the purpose of safeguarding ‘serious research’: ‘Within genetic research there is a current tightening of conditions that, if allowed to continue, will have paralysing effects on the successive exchange of preliminary results, which is commonly regarded a precondition for all serious research’ (Politiken’s Editorial, 1998).

Despite the fact that these arguments are often put forward by researchers, they cannot simply be interpreted as defending a specific interest of the researchers themselves. Rather, they are defending the societal institution of science and the need for other parts of society to respect that science can only deliver results if its integrity is respected. It is, however, not always the logic of scientific inquiry that is the foundation for the identification of ‘right answers’. Some hierarchical arguments point to ethical reasoning as the basic principle for deciding what is right and wrong: ‘There is a reason to stick to ethics, because otherwise one will end up losing one’s sense both of direction and of colour’ (Tiedeman, 2000). Just like the arguments about the logic of scientific inquiry this argument point to the need to respect an institution, but in this case it is ‘ethics’, which has to be recognized as a fundamental principle of social order.

Hierarchical arguments share the idea that controversies arise when there is poor understanding of the general principle for the identification of ‘right answers’ – be this scientific method or ethical reasoning. Reaching closure and restoring order will therefore be achieved by recognising this principle and acting accordingly. Describing the restoration of the social order, it is common for the hierarchical arguments to present ‘society’ as a ‘we’. It is ‘we’ who have to face the new challenges posed by biotechnology and act accordingly:

> Society has to take a stand on which kind of knowledge is good and which is not from case to case. The individual citizen cannot decide on this alone, since genetic knowledge affects just a single individual only in extreme cases, and normally also the family of the individual. For this reason alone we must evolve ethical norms about the access to knowledge on a societal level. (...) It is an important task for experts within the health care sector to pose – and possibly answer – the questions, which will make all of us wiser. (…)The health care authorities have a gigantic responsibility to guide and inform the people about the significance of this new knowledge. (Politiken's Editorial, 1999)

In this argument, social order is not built solely on the aggregation of individual preferences, but on general principles. Decisions on genetic knowledge affect the whole, not just the parts, and therefore societal institutions like ethical norms should regulate its use. In this case the demand to 'face the challenge' leads to a suggested solution in the form of a combination of expert knowledge and public information. In this way, the hierarchical arguments appear similar to the 'deficit-model' of science communication (Irwin & Wynne, 1996; Elam, 2005), with 'knowledge' or experts at the top and ignorance at the bottom. On the other hand, citizens also have to behave in certain ways, and being a responsible citizen requires the willingness to let oneself be informed through the process of public debate. Not taking part in the enlightening dissemination of knowledge, either as sender or receiver, is irresponsible, since it might lead to 'wrong' perceptions: 'If we are not very careful, the genetic discourse will install itself where myth and fairy tales reside' (Politiken's Editorial, 2000).

As in the quotation above, public debate is seen as a central mechanism for this process of informing about the guiding principle that is expected to lead to closure in the controversies about

biotechnology. It is through communication in a public sphere that the members of society can be generally educated and cultured as particular elements in the social order and hereby become aware of the connection between their particular role and the unity of social order. Rather than using external power to enforce the hierarchical order, it seems that it is supposed to be persuasive by nature. If 'we' (inside the hierarchical order) just inform and communicate 'the truth' clearly enough then 'they' will understand and accept the 'right' answers as deduced from this principle. Public debate is thus a means of diffusing knowledge about the hierarchical order with the purpose of shaping the individuals as virtuous members of society, so that controversies can be solved in an amicable fashion.

Competitive individualism

The crucial feature of arguments that subscribe to competitive individualism is that they articulate the collective as an exchange mechanism, where actors pursue their own interests and coordination is reached through mediation between different preferences. In general, competitive arguments articulate science as a resource in society: 'These technologies will be the 'iron horse' of the future' (Jensen, 1999). It is common to see scientists described as autonomous people with interests and preferences of their own and scientific progress is articulated as the result of this individual pursuit. The arguments seem to follow a logic similar to the invisible hand of the market: if all scientists pursue their individual goals unhindered, the result in terms of new solutions will be most beneficial to all. By protecting the autonomy of individual scientists, society is therefore leaving room for a kind of *invisible hand of scientific progress*:

> We can use our rational senses to find good solutions, both individually and in common. It is better to be tolerant and let people be at liberty to try different methods, than to try to force everybody to do the same; partly because we are individuals with different goals and partly because it could easily have disastrous results to force a bad solution on everybody. (Sandberg, 2000)

In competitive arguments, controversies over science and technology are seen to arise because 'many people are scared of the future' (Sandberg, 2000) or because people let themselves be guided by emotions which means that 'politicians over-react and [prohibit that research] which will cure diseases and reduce suffering' (Jyllandsposten's Editorial, 2001). In general, the solution to these problems of irrational fear of the future or emotional reactions is to consider benefits and disadvantages: 'Any new technology implies risk. So when we ask ourselves whether it is morally defensible to introduce a new technology we ought to weigh estimated positive consequences against estimated negative consequences' (Lippert-Rasmussen, 2000). Quotations like these are often associated with actors described as either policy makers or researchers, although they are rarely portrayed as public scientists. In this context, it should be mentioned that the arguments rarely distinguishes between research undertaken in private or public settings. The main concern is how to design organisation and regulation of science, so that it best delivers useful solutions to society – no matter whether it is private or publicly funded.

Apart from their basic utilitarian appeal, competitive arguments differ from the hierarchical arguments, in that there is no extrinsic norm to which actors can refer in order to deduce determinate answers. Rather, actors are stuck with all the other actors with special preferences and interests, when trying to reach co-ordination in society and legitimate closure on questions of regulating biotechnological research. On this basis, public debate takes on a different function than

in the hierarchy. Rather than being a means to diffuse basic principles, it is a vehicle for negotiation or mediation between different interests and preferences:

> The report from the Council of Ethics pose a number of ethical questions in relation to genetic testing and it is the intention to create public debate about these. The newspaper would do well to offer its pages for this purpose. The objective is to create a sensible framework for the use of genetic knowledge in the future. I find it important that we devote time to this debate. (Mikkelsen, 2000)

On this basis, arguments should be voiced and mediated with each other in order to reach legitimate co-ordination. As the newspaper Politiken argues in another editorial: 'A vibrant debate should be the basis of clear international regulation in the field, so that we do not end up with industrial technology, without having consulted the public' (Politiken's Editorial, 2001). The implication of this quote is that it is justifiable to go ahead with industrial implementation *if* the public are in favour of it. Consensus, however, is not a necessity from the perspective of competitive individualism. Reaching closure is equivalent to the co-ordination of different interests and preferences and this can in principle be done through voting or other quantitative methods of aggregating individual preferences. The central feature of public debate is therefore the possibility of mediating between interests and preferences. Co-ordination consists of taking as many things as possible into account, and then trying to reach a compromise from these diverse considerations. This is demonstrated clearly by the chairman of the Council of Ethics in a 'new year's message' to the young generation:

> My wish will be, that you will not let yourself be directed by misguided despondency that the trend cannot be curbed, but that you will participate in setting the agenda for the path that progress should take – therefore, have courage. (…) That you will question the everlasting demand for rapid decisions since your choice touches upon fundamental values, including what has been termed the wealth of nature and the nature and dignity of human beings – therefore, demonstrate humility and caution. (Nielsen, 2000)

In this quote the mediation between considerations is presented in terms of 'choices'. Social order cannot be deduced from a universal, absolute or hierarchical norm, but has to be determined by participants in the process. And this is the fundamental difference between this and the previous perspective. Whereas hierarchical arguments conceive of public debate as means to identify the basic principle that should be the foundation for closure, arguments subscribing to competitive individualism inscribe public debate as a vehicle for continuous negotiation and mediation in which closure is always contextual. The competitive arguments invoke an ideal of public debate as a means to reach some kind of negotiated settlement on the regulation of biotechnological research.

Sectarian equality

When we shift to the perspectives of sectarian equality and fatalistic isolation, the notion of amicable solutions and exercise of power for the common good dissappears. These two ways of articulating the collective represent perspectives of counter-power and protest, where the collective is not articulated as a positively ordered entity. Rather, the prevailing social order is articulated as the problem, either because it is problematic in itself or because it is non-existing.

The basic discriminator for classifying arguments as sectarian is the perception of social order as a battlefield between good and evil and a clear distinction between positive ideals and corrupted or polluted practice. Controversies in these arguments are a sign that there is something fundamentally wrong with science. It is, however, not the search for knowledge in itself that is wicked, but the 'unholy alliance between the logic of profit and the uncontrollable urge to create new knowledge' (Engelhardt, 2000). 'Imagine the whole world ruled by a handful of resourceful brains sitting […w]ith only one criterion for the decisions they are going to make: what will they gain in terms of money' (Lembcke, 1998). Corruption by the forces of capitalism and power, however, is not so easy to spot: 'Techniques have been developed that on one hand sound very helpful, for example in fulfilling adults' dreams of the enrichment in life that children are, but on the other hand these techniques are an expression of the degradation of the human being' (Dalgaard & Dalgaard, 1998). Arguments like these are often associated with professionals outside the scientific world, for instance teachers or people with a religious affiliation, or with social scientists. It should also be noted that these arguments are particularly prolific in opinion pieces and editorials taken from the critical niche-paper Information and the conservative-liberal Jyllandsposten.

The arguments emphasize that to understand the true state of science, it is necessary to realise that there is a discrepancy between surface and reality. Even though scientific development looks like progress, we have to realise that it really is degradation. The notion of disguise plays a conspicuous part, and often the arguments imply a difference between surface and 'reality'. It is therefore common to articulate the apparently *invisible hand of progress* as concealing the opposite motion: *the slippery slope of corruption*. Controversies arise because people have sensed this threat of corruption and the crucial question is now what course of action is to be followed given this threat:

> The question is whether we will be able to control the continued trend if we cross this qualitative limit – even if it is only a tiny step. The slippery slope is right ahead with all its medical temptations to take just another little step, again and again. Until a strange humanity eventually stands out, struck by oblivion and unable to weigh dignity against personal utility. (Jyllandsposten's Editorial, 2000)

It is therefore necessary to 'draw a line' (e.g. Fahrendorff, 1997) and make this corruption visible, before 'we' become lost or corrupted just like the scientists. In the sectarian arguments, however, the reference to 'we' as the locus for resistance does not denote a general 'we' of society, as in the hierarchical and competitive arguments. Here, 'we' denotes ordinary people – the *lay people* who do not belong to the systems of power – at least not the medical profession or other elites:

> We should not let ethics and legislation be lead by the nose of doctors and researchers, who are positioned in a borderland, and have many times transgressed the limit, set by legislators. We should set the limits, because there ought not to be any doubt, that yours and my bike-mender, carpenter or dustman are just as good judges of ethics, as the doctors, lawyers, and priests that are usually asked about ethics and morals, and which always make up the ethical councils and committees that seem to have appointed themselves keepers of good morals. Not even the most cocksure professor can take responsibility for the possible consequences of the almost daily new gene technological initiatives. So there are weighty reasons for putting the brakes on those researchers who (...) fill their wallets every time they find a new gene therapeutic treatment. (Sohn, 1999)

The references to ‘we’ is noticeable, because the author or the opinion piece thereby positions himself on the side of the ‘ordinary’ people in the fight against corrupt institutions. The reference to ‘we’ carry an air of egalitarianism, but it is also the locus of the resistance. It is the ‘bike-menders’ and ‘garbage collectors’ of the world – rather than the elite – who should decide on regulation and closure of controversies. This, however, takes an open fight because the ‘ordinary’ people are described as being up against a powerful enemy:

> A narrow cadre of powerful experts, the technocratic elite, is apparently determining the development of society – which means maintaining the prevailing madness – and defence of the free play of power forces is conducted publicly as a fight against all external critique. In this lies the objective reason for pessimism – and for criticism. (Støvring, 1998)

The explicit connection between pessimism and criticism in this quotation is interesting because it illustrates ‘the threat’ as constitutive for social order. The world is divided into two opposing sides – the systems of power, led by the narrow caste of the technocratic elite, and ‘the rest’, which is then simply constituted as the negation of the power structures. It is the identification of power structures as corrupt that gives public critique its *raison d’être*. Public supervision and democratic control is construed as the means to fight the prevailing madness, but there is usually no elaboration of what it is that has to be protected. Instead the general public has to fight systems of power simply because they are systems of power. By definition, they threaten to corrupt or colonize everything. The important objective in these arguments, however, is not the definition of this positive side, but rather to use egalitarian public debate as means to sound the alarm in order to fight the corruption of the elites and their systems of power. Through debate, the ordinary public will come to see this

corruption and subsequently be able to identify the necessary limits on research in order to preserve areas of freedom.

Fatalistic isolation

The fourth perspective in the employed typology is that of fatalistic isolation, where the collective is articulated as an anarchic chaos with no overarching rules securing order and justice. It is perhaps not strange that only very few newspaper articles from the empirical sample were classified in this category. If society is perceived as an anarchic chaos with no opportunities for securing order, it makes little sense to write an opinion piece about how biotechnological research should be regulated (which is the empirical identification of the sample of newspaper articles). Still, conducting the classification it was possible to identify a handful of arguments where fatalism seemed to be the prevailing answer to an irrevocable development. Most of these come from the tabloid Ekstra Bladet, and it is significant that fatalism seems to be the predominant mode of argumentation in their (rare) coverage of biotechnology in longer opinion pieces in this paper. The present analysis does not offer data to explain this, but the observation is striking in terms of understanding how Ekstra Bladet configures its readership and their relationship to science and new technology.

Anti-authoritarianism plays a prominent role in fatalistic arguments. The authorities of science, capital, state and so forth, are seen as using power structures to act in their own interest. Thus, science for instance is not an institution, or an actor, creating knowledge for the benefit of all, but a *monster of authority* intertwined with all the other 'monsters' of society – living a life of its own and only acting in its own interest:

> Science has expropriated the workshop of God. And the Christian church. What has become of it? (...) Faith or science. It is always about money and power over souls. In theory, politicians are the ones who, when faced with all of this, should maintain public sense and set the limits. But we cannot count on them. They have bureaucratised ethics to some administrative councils, with private letterhead, office administration and private interests. (Ekstra Bladet's Editorial, 1998)

The reason for classifying arguments like this as fatalistic is the impression of anarchic chaos with no overarching way of reaching positive closure. The only thing we can be sure of is that we can't count on anybody. Furthermore, although the arguments usually articulate scientific developments as horrific, they are not sectarian, because the threat from corruption is not presented as important. The collective is not in danger of being corrupted – it *is* corrupt.

Both science and public debate are treated as phenomena that are all somehow incorporated in the project of elites or systems that are out of reach. Far from being a means to solve controversies, public debate is seen as a glossy, manipulative effort to legitimate the monsters of authority. The difference between this perspective and that of sectarian equality is the lack of fragility, threats or importance in revolting against this project in order to create a better society. In the fatalistic perspective there is no systematic way in which it is possible to reach legitimate closure and influence the actions of other actors in order to bring about a particular kind of social order. In contrast to sectarian argument, which imply a vision of the community of people and a road away from perdition, the cynical fatalist detaches via satire, but has no vision of actions to be taken to avoid the current situation. The following quote is taken from a column in Ekstra Bladet written as a kind of reportage from a conference organised by the Council of Ethics:

> She says it herself: We should neither be the clergy of fear nor happy, babbling optimists. Who is she? And why is she talking like this? Nielsen, Linda. Professor, dr.jur., University of Copenhagen. And chairman of the state's Council of Ethics. The remark about the clergy of fear or the babbling optimists applies to the Council of Ethics as such, and yesterday's highly academic day of debate about Man-made Man, which went off according to plan in a well-behaved gathering of learned initiates of the present academic clergy. A state financed seminar for intellectual opinion makers, who daily camp on each other's doorsteps at hospitals and colleges. Yesterday it took place at the Radisson SAS-hotel, where they could confirm each other in the proper code, and with the particular verbal ground rules that are the means by which the elite distinguishes itself from the mob. (...) And how far should we go? Towards cloning people, for instance. No. Nobody wants to do that anyway. Besides, law prohibits it. But it could have been refreshing, if just a single person had had that opinion. What is wrong with producing a couple of hundred clones of Wolfgang Amadeus Mozart? (Christoffersen, 1999)

As argued earlier, it is not strange that the fatalistic perspective is rare in a sample of debate contributions focused on the regulation of biotechnological research. When arguing in favour of regulation it is common to have some sort of vision of how to create a better society. Whether this vision is the reinforcement of a hierarchical order, the free exchange between individuals or resistance towards corruption, they all seem to imply that it is possible to imagine a 'better' world and that regulation of research should somehow have the effect of advancing this vision. In contrast, the perspective of fatalistic isolation is not focused on a positive description of (future) social order,

but rather on ironic comments or rejection of present power structure: it is of no use to regulate science and technology, because it will follow its own warped course of action anyway.

Public debate as solution?

The previous analysis points to profound differences in the expectations of public debate as a means to solve controversies. These are summarised in table 1. The objective of the paper is not to suggest ways of improving participatory methods, but to draw attention to these differences and argue that they need to be understood as more than just questions of nomenclature (Rowe & Frewer, 2005) or participatory procedures (Barns et al, 2000; Webler & Tuler, 2002).

[table 1]

In general, the analysis suggests that the four modes of argumentation refer to mutually exclusive definitions of publics and the 'we's of society. Hierarchical arguments talk about enlightened citizens, who take on responsibilities according to their prescribed role, competitive arguments perceive of publics as various groups of stakeholders with interests and preferences and sectarian arguments articulate the public as the community of ordinary people, who should fight the dehumanising systems of power. In this way, the publics implied in these arguments have some interesting similarities with different perspectives employed in the academic study of Public Understanding of Science (PUS) (Elam & Bertilsson, 2003). The focus on enlightenment and diffusion of information about the ruling principle in hierarchical arguments has a lot in common with the 'deficit-model' of traditional PUS (for a critique of this model, see Irwin & Wynne, 1996).

Likewise, the interest in public debate and participatory methods within PUS can be said to have some similarities with competitive as well as sectarian arguments. As an example of the former, Michael argues that we could begin to understand scientific knowledge as a consumable, which is being evaluated and valued according to different standards of usability (Michael, 1998). The affinity with sectarian arguments is less clear, but perceptions of the public sphere as a vehicle for democratic control with science (Edwards, 1999) or a criticism that participatory methods are 'tagged on to dominant models of science, technology and the public, rather than superseding them' (Levidow & Marris, 2001) or even that the commitment to engagement is 'something of a mirage' (Wynne, 2005: 68) point in this direction.

The point here is not that academic studies of PUS have been unduly biased by political values. Rather, the point is that expectations about how citizens as publics can and should participate in governance of science share the same basic conditions as arguments about regulation of biotechnology. Engagement and dialogue can be seen to enjoy broad discursive support, but the specific construction of participatory exercises might reveal fundamental differences. Any specific experiment with participation constructs citizens in particular ways, if not necessarily by design, then at least by the social process itself, as it unfolds during the exercise (Irwin, 2001). And often the actors' expectations and interpretations of how this construction takes place will be diverse and conflicting. As an example, both experts and so-called 'lay-people' in Danish consensus conferences often struggle to negotiate their own and the other actors' roles in the engagement process (Blok, 2007; Jensen, 2005).

In light of the present analysis these difficulties are not just a question of making implicit definitions of effectiveness explicit. Rather, the present analysis suggests that it would often be impossible to find a common measure by which the effect or efficiency of participatory methods can be understood and evaluated. Any judgement will be more or less explicitly based upon a

cultural bias and would therefore be seen as problematic from the other perspectives. On the other hand, the built-in cultural biases serve as the backdrop for any success criteria and expectation of outcome.

From a hierarchical viewpoint participatory methods are expected to inform lay people about the guiding hierarchical principle, most often scientific knowledge. But whereas crude information levels can be measured it is difficult to establish causal relationships between the development of a controversy and the measures of information (Davison & Barns, 1997; Kallerud & Ramberg, 2002). More importantly, there is a possible circularity involved: controversies are supposed to be solved by education about the hierarchical order (often scientific knowledge as the truth), so if consensus is not reached we just need more education and information.

From a competitive viewpoint participatory methods are expected to lead to negotiation of preferences, but only real time development will reveal whether a working compromise has been struck. If a working compromise is not found, various explanations can be employed. It might be, that the inclusion criteria in relation to stakeholders were wrong, so that important parties have been left out of crucial decisions or that issues were framed in the wrong way or important aspects left out. And finally, the compromise is always contextual and time-bound, because preference structures keep changing. Most importantly, however, there is no outside authority which can serve as the basis for judging whether a compromise is right or wrong. If relevant members of a contextual community agree on a compromise, there is no external point for criticising this agreement. Any evaluation must therefore find its normative basis in an evaluation of whether the relevant actors themselves are satisfied with the process and the compromise.

From a sectarian viewpoint participatory methods are supposed to awaken the lay public and make them see the threat of corruption in order to assume democratic control over science and biotechnology. The inherent tension between the surface and the hidden reality, however, is

dominant in this mode of argumentation, and therefore it is always possible to question whether a specific engagement exercise has managed to expose corruption, or whether corruption has just taken on new forms. This form of criticism is evident in evaluations of participatory exercises, which claim that although the rhetoric is seemingly democratic, the exercises are 'really' just a new form of manipulation by the systems of power. This suggests that of all the different objectives presented by hierarchical, competitive and sectarian arguments, the sectarian demand for an egalitarian debate is the most difficult to fulfil. On the other hand, this is not surprising since the inherent point of sectarian criticism is not to reach closure, but to keep existing as criticism.

The discussion suggests that any experiment with public debate in the face of controversy can be interpreted rather differently and that it is unlikely that there will be unanimous agreement on its purpose and evaluation. Seen from the perspective of competitive individualism, for example, the other perspectives are doomed to fail in the effort to create scientific literacy or egalitarian participation. If viewed from the other perspectives the competitive mode will err in its lack of prescription of better and worse collective action. If authoritative hierarchy and sectarian equality can agree on anything it is the need for action in order to ensure that the collective will not decay. Seen from their perspective, competitive individualism presents a dangerous consumerism that ultimately furthers functional explanations, which uphold the present system without offering anything in the way of normative judgements.

Conclusion

The analysis has demonstrated that arguments in controversies about biotechnology imply very different perceptions of public debate as a means to solve controversies about science. These

perceptions are based on very different notions of social order. Despite their differences, however, the analysis also demonstrates how hierarchical, individualistic and sectarian arguments all agree that public debate is important in situations of controversy. As described in the introduction, the Danish debate about biotechnology is characterised by broad subscription to this ideal. In light of the analysis it appears that it is precisely the interpretative flexibility and the broad alliance between different types of argumentation that gives the idea of participatory exercises discursive support and makes the orchestration of public debate seem reasonable. The different modes of argumentation need not agree on the outcomes in order to agree on the necessity of public debate.

The demands for debate can therefore be understood as a diversion that takes the heat off the controversies because it holds an implicit promise of closure in the future. This becomes especially clear in calls for 'the creation of more public debate', which are often justified by appeals to the difficulty of reaching an agreement. To an outsider this demand for more debate can seem somewhat paradoxical as the very decision to speak presumably indicates an engagement in a debate that is already underway.

The only mode of argumentation that does not share the broad support for experiments with participatory methods is fatalistic isolation. In itself this is ironic since it seems that this is precisely the kind of argument that the other three modes are most concerned to eliminate by engagement in dialogue. Precisely the rejection of the possibility of positive control of the collective – and the rejection of science and public debate as means of reaching closure in controversies – are features with which the other modes do not associate positively. From their perspectives, fatalism is seen as an arbitrary reaction fostered by a lack of knowledge or empowerment that could be remedied by participation in a public debate about biotechnology and the social order of Danish society.

It would be tempting to conclude that participatory methods and public debate in general might not have a lot of impact since arguments only ever have their intended effects on actors that

already share the basic cultural bias. But that would be taking things too far. First of all, it would imply that actors inhabit these modes of argumentation on a stable basis, which there is little evidence to suggest. In fact, the analysis demonstrates that different editorials in a paper can subscribe to very different articulated collectives, and also that several debate contributions subscribe to more than one in their various arguments. While articulated collectives can be understood as discursive positions for making arguments, there is no necessary stability in the subscription to these modes. There is no determinism in adopting them, and human beings probably take on these positions in various patterns of change and stability.

Second, the fact that calls for public debate can have a diversionary effect does not imply that the ideal of public debate is an inadequate or inappropriate substitute for a more genuine and effective vehicle for reaching closure. The differences in objectives connected to the notion of closure through debate mean that actual public discussion will probably never satisfy one of these modes of articulating the collective completely. But this is simply a fundamental condition of societies. Following the perspective of cultural theory, we do not live in a harmonious community of consensus; rather, the dialogue is political. Each day we engage in confrontations about what will hold with what, whether in local details or general discussions on the social and natural constitution. These, in turn, are incorporated into each other as articulated collectives. Although public debate is unlikely to work as a means to reach a final solution, so that controversies will cease, there is no evidence to suggest that it is a function that modern society can or should dispense with. How the insights of this paper can inform specific engagement exercises, however, will have to be a topic for another paper and should be developed through discussions with engagement practitioners.

Acknowledgements: The author is indebted to Lene Koch, Alan Irwin, Thomas Basbøll and Abby Peterson for valuable comments to earlier drafts of this paper.

Notes

[1] Controlled readership figures in 2001 according to the Danish Newspaper Publisher's Association: Jyllandsposten 720,000, Politiken 524,000, Information 94,000 and Ekstra Bladet 477,000 in a population of 5 mill., see http://www.danskedagblade.dk/dCMS/application.do

[2] The overall distribution based on this classification is depicted in the table. While it is obvious that the distribution seem to reflect clear editorial differences between the four papers, this aspect is **not** the key focus in the present paper, since the classification was not done with this analytical perspective in mind. The numbers in parenthesis show the number of editorials included in the overall figure.

Newspapers	Total	Authoritative Hierarchy	Competitive Individualism	Sectarian Equality	Fatalistic Isolation
Politiken	34 (15)	22 (13)	10 (5)	8 (1)	0
Jyllandsposten	31 (4)	12 (1)	13 (2)	8 (1)	0
Information	33 (12)	16 (6)	1 (0)	20 (9)	1
Ekstra Bladet	6 (3)	0	0	2 (1)	4 (2)

[3] In translating the Danish text, I have tried to keep the translation as close to the original as possible – even where this meant reproducing an unclear sentence.

References

Andersen, I-E. and Jæger, B. (1999) 'Danish Participatory Models. Scenario Workshops and Consensus Conferences: Towards more Democratic Decision-making', *Science and Public Policy* 26(5): 331-340.

Barns, I., Schibeci, A. Davison and Shaw, R. (2000) 'What Do You Think about Genetic Medicine? Facilitating Sociable Public Discourse on Developments in the New Genetics', *Science, Technology, & Human Values* 25(3): 283-308.

Berkowitz, D. (ed) (1997) *Social Meanings of News* (Sage Publications).

Blok, A (2007) 'Experts on Public Trial: On Democratizing Expertise Through a Danish Consensus Conference', *Public Understanding of Science* 16(2): 163-182.

Borch, K. and Rasmussen, B. (2000) 'An Analytical Approach to the Implementation of Genetically Modified Crops', *Tibtech* 18(December): 484-486)

Christoffersen, Peder (1999) 'Frygtens Præsteskab [The Clergy of Fear]'. *Ekstra Bladet*, 26 March 1999, p. 24.

Dalgaard, Tina Junker & Dalgaard, Esper (1998) 'Den Biomedicinske Glidebane [The Biomedical Slippery Slope]'. *Jyllandsposten*, 31 May 1998 (3. section) p. 11.

Davison, A and I. Barns (1997) 'Problematic Publics: A Critical Review of Surveys of Public Attitudes to Biotechnology', *Science, Technology, & Human Values* 22(3): 317-339.

Dijck, Jv, (1998) *Imagenation. Popular Images of Genetics* (London: MacMillan Press Ltd)

Douglas, M (1978) *Cultural Bias* (London: Royal Anthropological Institute).

Douglas, M (1996a) *Risk and blame - Essays in Cultural Theory* (London: Routledge).

Douglas, M (1996b) *Thought Styles* (London: SAGE).

Douglas, M (1997) *The Depoliticization of Risk* (Boulder: Westview Press).

Douglas, M and A. Wildavsky (1983) *Risk and Culture* (Berkeley: University of California Press).

Durant, J (1999) ‘Participatory Technology Assessment and the Democratic Model of the Public Understanding of Science’, *Science and Public Policy* 26(5): 313-319.

Edwards, A (1999) ‘Scientific Expertise and Policy-Making: the Intermediary Role of the Public Sphere’, *Science and Public Policy* 26(3): 163-170.

Einsiedel, EF, E. Jelsøe and T. Breck (2001) ‘Publics at the Technology Table: the Consensus Conference in Denmark, Canada, and Australia’, *Public Understanding of Science* 10(1): 83-98)

Ekstra Bladets Editorial (1998) ‘De Hvidkitlede og de Sortkjolede [The White-coated and the Black-gowned]. *Ekstra Bladet,* 25 January 1998 (1. section) p. 2.

Elam, M. (2005) ‘When Scientists Meet Film-makers: Inventing a Swedish Approach to Public Engagement with Biotechnology’, *Acta Sociologica*, 48(3): 237-252.

Elam, M. and Bertilsson, M. (2003) ‘Consuming, Engaging and Confronting Science: The Emerging Dimensions of Scientific Citizenship’, *European Journal of Social Theory*, 6(2): 233-251.’

Engelhardt, Robin (2000) ‘Livet er en Patentlov [Life is a Patent Law]’ *Information,* 31 March 2000, p. 1.

Engelhardt, T and A. Caplan (1987) *Scientific Controversies* (Cambridge: Cambridge University Press).

Fahrendorff, Lars (1997) ‘Det Grønne Håb efter Festen [The Green Hope after the Party]’. *Information*, 30 august 1997, p. 8.

Finney, C (1999) ‘Electronic Consultation. Extending Public Consultation via the Internet: the Experience of the UK Advisory Committee on Genetic Testing Electronic Consultation’, *Science and Public Policy* 26(5): 361-373)

Flyvbjerg, B, (2001) *Making Social Science Matter - Why social inquiry fails and how it can succed again* (Cambridge: Cambridge University Press).

Franz, S (2006) 'Local Steps in an International Career: a Danish-style Consensus Conference in Austria', *Public Understanding of Science* 15(1): 73-88.

Friedman, SM, S. Dunwoody and C.S. Rogers (eds.) (1999) *Communicating Uncertainty. Media Coverage of New and Controversial Science* (New Jersey: Lawrence Erlbaum Associates, Publishers).

Hagendijk, R, P Healey, M Horst and A. Irwin (2005) *Science, Technology and Governance in Europe: Challenges of Public Engagement* (STAGE Final report, www.stage-research.net).

Hagendijk, R and A. Irwin (2006) 'Public Deliberation and Governance: Engaging with Science and Technology in Contemporary Europe', *Minerva* 44: 167-184.

House of Lords Select Committee on Science and Technology (2000) *Science and Society* (London: The Stationary Office).

Irwin, A (2001) 'Constructing the Scientific Citizen: Science and Democracy in the Biosciences', *Public Understanding of Science* 2001(10): 1-18)

Irwin, A (2006) 'The Politics of Talk: Coming to Terms with 'New' Scientific Governance', *Social studies of science* 36(2): 299-322.

Irwin, A & B. Wynne (1996) *Misunderstanding Science?* (Cambridge: Press Syndicate of the University of Cambridge).

Jensen, C.B. (2005) 'Citizen Projects and Consensus Building at the Danish Board of Technology: On Experiments in Democracy', *Acta Sociologica* 48(3): 221-235.

Jensen, Jesper Bo (1999): 'Den Nye Tid og den Nye Tidsånd [The Novel Times and the Novel Time-spirit]'. *Jyllandsposten*, 3 January 1999 (3. section) p. 4.

Jensen, P.H. (1999) ‘En Rystende Udvikling for Parkinsons Syge [A Shaking Development for Parkinson’s Disease]’. *Jyllandsposten*, 5 September 1999 (4. Section) p. 8.

Joss, S. (1999) ‘Public Participation in Science and Technology Policy- and Decision-making - Ephemeral Phenomenon or Lasting Change?’, *Science and Public Policy* 26(5): 290-293.

Joss, S (2002) ‘Toward the Public sphere - Reflections on the Development of Participatory Technology Assessment’, *Bulletin of Science, Technology & Society* 22(3): 220-231.

Jyllandsposten’s Editorial (2000) ‘Skabningens Herre [Lord of the Creature]’. *Jyllandsposten*, 9 April 2000 (1. section), p.11.

Jyllandsposten’s Editorial (2001) ‘Gal Forskning [Mad Research]’. *Jyllandsposten*, 10 August 2001 (1. section) p. 10.

Kallerud, E and I. Ramberg (2002) ‘The Order of Discourse in Surveys of Public Understanding of Science’, *Public Understanding of Science* 11(3): 213-224)

Korsgaard, O (2004) *Kampen om Folket* (Fighting about the People) (København: Gyldendal).

Lembcke, Rolf (1998): ‘Gener er ikke Lego-klodser [Genes are not Lego Blocks]’. *Information*, 24 February 1998, p. 9.

Levidow, L and C. Marris (2001) ‘Science and Governance in Europe: Lessons from the Case of Agricultural Biotechnology’, *Science and Public Policy* 28(5): 345-360.

Lippert-Rasmussen, Kasper (2000) ‘Fremtidens Krop: Ville det være Dårligt, hvis Vi blev Bedre? [Future Body: Would it be Bad, if We were Improved?]’. *Jyllandsposten*, 10 October 2000 (1. section) p 11.

McQuail, D, (1994) *Mass Communication Theory* (London: Sage Publications).

Michael, M (1998) ‘Between Citizen and Consumer: Multiplying the Meanings of the ‘Public Understandings of Science’’, *Public Understanding of Science* 1998(7): 313-327.

Mikkelsen, Sonja (2000) 'Kontrollen med Gentest [Control of Genetic Testing]'. *Jyllandsposten*, 8 October 2000 (3. section) p. 9.

Mulkay, M (1993) 'Rhetorics of Hope and Fear in the Great Embryo Debate', *Social studies of science* 23(4): 721-742.

Mulkay, M (1997) *The Embryo Research Debate* (Cambridge: Cambridge University Press).

Nelkin, D (ed.) (1979) *Controversy: Politics of Technical Decisions* (Beverly Hills: Sage publications).

Nelkin, D and M.S. Lindee (1995) *The DNA Mystique. The Gene as a Cultural Icon* (New York: W.H. Freeman and Company).

Nielsen, Linda (2000) 'Den Genetiske Cocktail [The Genetic Cocktail]'. *Jyllandsposten*, 1 January 2000 (4. section) p. 4

Perelman, C and L. Olbrechts-Tyteca (1969) *The New Rhetoric. A Treatise on Argumentation* (London: University of Notre Dame Press).

Politiken's editorial (1998) 'Gen-vejen' [The Genetic Road]' *Politiken*, 26 July 1998, 2. Section, p. 2.

Politiken's Editorial (1999) 'Genetisk Set [Genetically Seen]'. *Politiken*, 2 October 1999 (2. section) p. 2.

Politiken's Editorial (2000) 'Livets Bog [Book of Life]'. *Politiken*, 27 June 2000 (2. section), p. 4.

Politiken's editorial (2001) 'Grænsen [The Limit]'. *Politiken*, 1 March 2001 (2. section) p. 6.

Rowe, G and L.J. Frewer (2005) 'A typology of Public Engagement Mechanisms', *Science, Technology & Human Values* 30(2): 251-290.

Rowe, G, T. Horlick-Jones, J. Walls, and N. Pidgeon (2005) 'Difficulties in Evaluating Public Engagement Initiatives: Reflections on an Evaluation of the UK GM Nation? Public Debate about Transgenic Crops', *Public Understanding of Science* 14(4): 331-352.

Sandberg, Anders (2000) ‘Menneskehed 2.0 [Human Kind 2.0]’. *Jyllandsposten*, 5 December 2000 (1 section) p. 11.

Sohn, Vagn (1999): ‘Læger tager Etikken som Gidsel [Doctors take Ethics Hostage]’. *Jyllandsposten*, 20 July 1999 (1. section) p.7.

Støvring, Kasper (1998) ‘Et Mange-hovedet Uhyre [A Many-headed Monster]’. *Information*, 14 September 1998, p.9.

Tiedeman, Erling (2000) ‘Opgivenhedsetikken Spreder sig [The Ethics of Resigning is Spreading]’. *Politiken*, 30 December 2000 (2. section) p. 8.

Toulmin, S (2003) *The Uses of Argument* (Cambridge: Cambridge University Press).

Turney, J (1998) *Frankenstein's Footsteps* (New Haven: Yale University Press).

Weale, A (2001) ‘Deliberative Democracy. Science Advice, Democratic Responsiveness and Public Policy’, *Science and Public Policy* 28(6): 413-421.

Webler, T and S. Tuler (2002) ‘Unlocking the Puzzle of Public Participation’, *Bulletin of Science, Technology & Society* 22(3): 179-189.

Wilsdon, J and R. Willis (2004) *See-through Science* (London: Demos).

Wynne, B (2005) ‘Risk as Globalizing ‘Democratic’ Discourse? Framing Subjects and Citizens’ In M. Leach, I. Scoones & B. Wynne (Eds), *Science and Citizens* (London: Zed Books Ltd).