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Genetic Technologies Meet the Public

The Discourses of Concern

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To clarify concerns that the public has with genetic technologies, the article presents the results of focus group interviews conducted in Denmark in 2000. The concerns of the public are divided into three ideal-typical categories: social (dealing with environmental and health risks), economic (dealing with both the threats and opportunities of the new technologies), and cultural (taking up ethical and moral concerns). Following a general discussion of why it is important to take these discourses of concern seriously, each discursive category is discussed with examples taken from the focus group interviews.

Keywords: *genetic technology; public concern, risk; ethics*

One of the main difficulties in dealing with the new genetic technologies is that they are solutions in search of problems. They have not been developed to eradicate poverty or to cure diseases, even though such claims are often made on their behalf. Rather, they have been developed to test, or apply, certain technical processes having to do with the transfer of genetic material from one organism to another. The potential "uses" of those processes have been defined later, only after it has been shown that the particular test or application has been able to work in a laboratory.

While the developers of many other technological innovations have often had a well-defined social problem or need in mind when they set about doing their innovating, the promoters of genetic technologies have primarily taken their point of departure in a particular technique. And while the developers of

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many other technological innovations at an early stage of a new product's development often have a sense of a particular "market" where their product can be sold, the producers of most genetic technological products are often not in that situation. In a sense, they have to invent, or at least locate, problems that their products are able to solve and create markets in which to sell them. The technologies are supply or producer driven rather than demand or market driven. This means that public concerns need to be taken seriously if these products are ever to become widely accepted—and acceptable. The more these concerns are taken into account in the process of product development, the more appropriate will be the "problems" that are eventually found for the available solutions. If not, it is quite likely that many of the products that are based on the new technological possibilities will ultimately prove to be unsuccessful in the so-called market.

Aant Elzinga has characterized the work, or social activity, that is involved in the societal adoption of technology as a multifaceted process of cultural appropriation (Elzinga 1998). At the most visible level, appropriation takes place as a kind of structural adjustment process by which a technology is used in different contexts and adjusted to the various demands and conditions imposed by society and its institutions. This is the realm of formal and informal regulation and consists both of political and legal institutions, as well as forms of mediation, communication, and diffusion. Alongside this process, where the technology is appropriated in a practical sense, a discursive appropriation also takes place by which the technology "is actively made part of a repertoire of earlier and more familiar images that represent opportunities or threats" (Elzinga 1998, 24).

The practical and discursive aspects of appropriation are in no way isolated from each other. In relation to the genetic technologies, differences in government regulation can be ascribed to variations in the prevailing discourses of concern. It has been suggested that the dominance of commercial discourses—that is, stories of business opportunities—in the United States in the 1980s helped pave the way for a positive policy and regulatory framework for biotechnology (Pline 1991). By contrast, European discourses during the same time period were more ambivalent, and in many countries the dominant discourses focused on health and environmental implications rather than commercial prospects (see Durant, Bauer, and Gaskell 1998). These more-skeptical attitudes obviously had an influence on the regulatory and policy discussions and thereby contributed to what is generally seen as a slower pace in the technological development and application of genetic technologies in Europe in comparison to the United States.

Hence, the possession of discursive power—that is, control over what is debated and discussed in public—affects not only which discourses prevail;

it also has an effect, at least indirectly, on how practical appropriation processes take place. The power of U.S. commercial interests to control the discourses, and to thus emphasize economic benefits while marginalizing critical voices of concern, can be seen to have had a real influence over the political processes related to genetic technology. In short, discourses matter (for recent overviews, see Tokar 2001; Gaskell and Bauer 2001; Pilnick 2002; and Bauer and Gaskell 2002).

The Discourses of Concern

One of the difficulties in analyzing discourses, especially in relation to genetic technologies, is their intrinsic complexity and multifaceted character. People tend to talk about several things at once: we are constantly mixing discourses. To explore the public concerns, it is therefore necessary to distinguish among the discourses and investigate them in a way that can bring out the contradictions and ambivalence. To give meaning to these technologies, people tell different sorts of "stories" that correspond to what can be thought of as the main story lines of technological change (Jamison and Hård 2003). On one hand, there are economic stories of product development and innovation, where the key actors are business firms and consumers performing in the commercial marketplace. There are, secondly, social stories that refer to different actors and the interests that they seek to materialize as they "construct" technological artifacts and systems. And finally, there are cultural stories that refer to what is considered appropriate uses of technology in different life-worlds and cultural contexts. These broad discursive categories take specific shape in relation to particular technologies. Thus, in relation to genetic technologies, the economic discourses refer to commercial costs and benefits as well as corporate power and responsibility, the social discourses refer to the environmental and health consequences and to the risks and uncertainties associated with the environmental and health consequences, and the cultural discourses discuss the moral and ethical concerns that are raised by these new technologies (see Table 1).

The social discourses are by now perhaps the most familiar. The new technologies are seen as highly uncertain, in terms of their implications or consequences for human health and for the various natural environments on which social life is dependent. It can be suggested that these concerns are particularly strong in countries like Denmark, where environmental organizations played an important role in the debates of the 1980s, helping to set the agenda for the political and policy discussions about biotechnology (Baark and Jamison 1990). There are of course many reasons for differences among

Table 1
Discourses of Concern in Relation to Genetic Technology

Main Concern	Central Issues	Keywords
Social	Environment and health	Risk, uncertainty
Economic	Profitability and production	Cost/benefits, responsibility, power
Cultural	Religious and/or moral aspects	Ethics, rights, integrity

countries in relation to discourses of concern. Gaskell, Thompson, and Allum (2002) have pointed to factors such as media intensity and ownership, knowledge about gene technology, political structural differences, and public trust in regulatory processes for the understanding of the difference between the United States and Europe. To these can be added the role and influence that nongovernmental organizations have in different political cultures. In many European countries, as well as in the European Union, Green parties are represented in parliament, and nongovernmental organizations are given relatively direct access to decision-making forums and institutions. In the 1980s, when Danish organizations were taking part in policy and legal deliberations in relation to biotechnology, in the United States, similar organizations were much less influential. This was due both to differences in media structure and differences in the roles that nongovernmental organizations played in various processes of biotechnological assessment (Jamison and Baark 1990).

The economic concerns are generally expressed in terms of costs and benefits, and obviously, their articulation depends on who has power over the public sphere and, in particular, what might be termed contexts of mediation. Again, there is a major difference between the United States and a country like Denmark, where a somewhat wider range of economic interests and concerns are represented in the public sphere both because of different media structures and different economic histories and structures. While potential benefits are certainly talked about and presented in the media, the costs or economic liabilities of the new technologies are also discussed much more actively in a country like Denmark than in the United States. The economic threats are given voice as well as the economic opportunities.

As such, the economic discourses in a country like Denmark give much more emphasis to the ways in which the new technologies threaten the survival of other economic activities, especially agriculture, which is important to the Danish economy and is based primarily on other technological inputs rather than on genetic modification. There is also concern about how responsible corporations are, in terms of the claims they make, as well as in relation

to their actual practices. The kind of concerns that are expressed by critics, such as the Indian environmental activist Vandana Shiva, are well represented in the Danish public debate and are not marginalized as they are in the American context. Shiva and many other critics see the new technologies as a form of theft; according to her, their producers are literally stealing the harvests and thus challenging the livelihoods of other producers (Shiva 2000). Since the technologies have primarily been developed in the United States and are being exported to Europe, this kind of language has a resonance in a country like Denmark that it does not have in the United States.

The cultural discourses of concern are also somewhat different in Europe and the United States. There is, in both continents, a similar religious or moral tone to the stories that are told—the same sorts of criticism of "playing God." The use of the new technologies is seen to transgress certain codes of conduct or ethical principles concerning what is acceptable behavior. What differs is the kind of ethical principles that are invoked, especially in terms of imputing "rights" or values to nonhuman nature. In the influential opinion of Francis Fukuyama, genetic technologies represent a "posthuman future" (Fukuyama 2002) that challenges notions of human rights and freedoms; in a country like Denmark, the concern is not only with human rights but with natural and animal rights as well.

Differentiating among the discourses of concern makes it possible to explore in a somewhat more nuanced fashion what is usually seen as a very polarized situation. Too often, the "public" is described as one amorphous entity with a generally negative—and uninformed—perception of genetic technology, while "experts" or the "industry" are generally seen as positive and well informed. This simplistic understanding can be seen at all levels of debate both in the media, within industry itself, and in parliamentary and other political deliberations. As such, the public's skepticism is seen as a problem that has to be solved—usually with more "information"—rather than as a range of concerns that need to be addressed. The fact that public concerns are varied and complex means that those concerns cannot be rejected out of hand but need to be taken seriously if a successful adoption of these technologies is ever to take place.

A Focus Group Investigation

To explore the complexity of the concerns and expectations related to genetic technology, a qualitative study of lay attitudes toward gene technology was carried out. Focus groups (see Morgan 1997 and Fern 2001) were chosen as the qualitative method to gather information about the lay perspec-

tives on gene technology. Although we recognize that the semistructured form typical of focus groups to some extent sets boundaries for the discussion, it also allows the participants to develop arguments, share expectations, and express concerns that might not have occurred in individual in-depth interviews.

A series of focus group interviews was carried out following a funnel-shaped interview guide. The structure of the interview guide invited the participants to reflect on gene technology in general and one by one express spontaneous reactions, followed by a group discussion of the initial reactions. This was followed by discussions within three themes (food gene technology, nonfood gene technology, and actors involved in the politics of biotechnology). Each theme was, like the introducing part, organized in a funnel-shaped structure moving from spontaneous reflections over a relatively free group discussion to a relatively structured process, where the moderator played an increasing role and different stimuli were used. These stimuli included showing cards describing different uses of genetic technology and offering genetically manipulated corn chips for the participants to consider eating. The discussions during the second theme (nonfood gene technology) and the third theme (actors) were stimulated by showing cards describing, respectively, different nonfood uses and names of different actors and groups of actors.

The study was composed of seven focus groups of four to seven participants, all together involving thirty-six interviewees. Each interview lasted approximately two hours, and apart from the interviewees, a moderator and a technical assistant participated. All interviews were tape recorded and subsequently transcribed. To maximize the quality of the transcription, the transcriber also attended the interviews. The interviews took place in Denmark between February and April 2000, a period of time when the societal awareness of gene technology was at a relatively high level, compared to the first half of the 1990s, but also a period when no major GM issues attracted particular attention at the societal level.

Since the ambition of the interviews was to get a qualitative insight into the arguments for and against gene technology and not a quantitative overview, the participants were sampled to ensure maximal variation in opinions and arguments, not representation. Hence, sampling of interviewees paid attention to characteristics known to discriminate attitudes to risks, such as gender, world view, and age (see, e.g., Slovic 1999), and characteristics intuitively expected to be of importance, such as degree of urbanization, educational background, and occupation. Furthermore, recruitment paid attention to group dynamics as they were composed paying respect to representation of different attitudes in each interview and excluding overly partisan posi-

tions that could have dominated the discussions and taken them too far in one direction. Individuals known to be working within the biotechnological or related sectors were also excluded beforehand. The practical recruitment of the participants took place using a "snowball sampling" technique, where one to two recruiters were asked to contact a number of persons in their circle of acquaintances. The advantage of this method is that careful instructions to the recruiters allow the researcher to handpick the participants and optimize the group composition.

The analysis of the transcribed interviews followed a three-step procedure; the steps of this analysis were primarily based on Coffey and Atkinson (1996) and Kvale (1996). First, the interviews were coded into themes inspired by existing research into attitudes toward gene technology such as Gaskell and Bauer (2001), Grove-White, Macnaghten, and Wynne (2000), and Marris et al. (2001), and by a bottom-up approach identifying additional issues taken up by the participants. Second, the coded texts were retrieved, and the arguments within each theme were identified and characterized using a simple analysis inspired by Stephen Toulmin (2003). Third, a process of structuring meanings through narratives took place, where the themes were collapsed and divided up in three narratives that on one hand covered most themes and on the other appeared as relatively self-contained entities. Apart from our own empirical material, the discourses of concern were also constructed paying attention to the aforementioned qualitative and quantitative research contributing to the robustness of the discourses and indicating that they are not to be seen as exclusive Danish discourses about genetic technology.

In the following, we will exemplify the three discourses of concern as they were articulated in the interviews.

The Social Discourses

It is not surprising that when risks appeared as an issue in the focus group interviews in 2000, it was in terms of environmental and health risks. These discussions displayed common features and generally broke down into either the notion that genetic technology is not fundamentally different compared to other technologies or the idea that genetic technology constitutes a qualitatively different level, or type of risk, compared to "older" technologies.

When the view is that the risks of genetic technology are similar to those any other (new) technology could spark off, the frame of reference is the familiar risks of industrial production and agriculture, like the release of chemical substances and their threats to environment and health. An oft-

mentioned concern relates to agricultural uses of genetic technology, where crops are made resistant to pesticides such as Roundup. Here, genetic technology is seen as a technical device surpassing the traditional sensitivity of crops to pesticides and thus no longer restricting the used quantities of pesticides nor frequencies or periods of application, resulting in an increase in the use of pesticides that will show up as environmental destruction as well as in a threat to human health. Such positions reflect the discussions about pesticides, health, and environment that appeared in Denmark during the 1990s following the discovery of agricultural pesticides in several groundwater deposits. These discoveries challenged the traditional understanding of Danish drinking water as safe, clean, and unpolluted, owing to the protective geological layers removing any pollution from the downward-seeping water. The following comments on the development of Roundup-resistant sugar beets demonstrate the concern:

> Lone: I don't like [the Roundup-resistant] sugar beet, Roundup is a very powerful herbicide!
> Lis: Yes, and it seeps right down into the groundwater.
> Lotte: Yes, into the water!
> Lis: I don't think Roundup should be legal at all!

As in most other discussions of pesticide-resistant crops in the interviews, the discussants never refer to the actual health and environmental problems. Still, there is no doubt that they are highly critical of the use of Roundup. But since the critical pesticide/groundwater debate has been so important and generally diffused to most members of the public, the contents of the critique are a sort of tacit and mutual knowledge.

Such traditional concerns over the environmental and health impacts of the release of substances are, however, overshadowed by the qualitatively new risks attributed to genetic technology. At the core of this concern is the observation that genetic technology is different, as it (at least in principle) provides humankind with the ability to reconstruct and mix the genetic makeup of any living organism. This also moves the risks of genetic technology to a qualitatively different level, where risks may be unknown, irreversible, and uncontrollable and may appear at a much faster pace than we are used to. Benny expresses the concern in relation to the environment as follows:

> [Genetic technologies] influence our environment more and differently from what we understand as "traditional pollution" coming from pesticides, wastes, heavy metals, and the like. I fear it will have a severe impact on the natural bal-

> ances in local as well as global ecosystems. Within a limited timeframe, [genetic technology] could have disastrous impact on natural balances.

A core concern is that these changes, unlike traditional side effects, are irreversible: once an altered genetic construct is "out there," it is in most cases also out of control. Transgenic organisms are thus comparable to the unstoppable rabbits intentionally released in Australia.

The environmental discussions are often framed within a systematic ecological perception, where nature is seen as a fragile set of (eco)systems that need protection. Since genetic technology makes it possible to construct new organisms and these new organisms may/will spread themselves or their genes in the existing ecosystems, this is seen as a threat. This quite influential "system-ecological" position can be seen as a legacy from the environmental movements appearing during the 1970s (see Jamison, Eyerman, and Cramer 1990). These movements imported the ideas of systems ecology from the United States and framed environmental problems, to a large extent, within this understanding. The system-ecological view pervades the following reflections, where the powers of genetic technology are contrasted to our limited understanding of organisms and the ecosystems: According to Henrik,

> We are puzzled by the seeds: we can't tell the difference between two seeds, and yet the one may end up as a tree and the other as a carrot! There is a lot inside [the organisms], some of it determining the yellow color of the carrot and some of it the height of the tree! Coming this far increases our responsibility. What I mean is, as we refine the instruments and are able to copy the mutations just as we wish them to be, it renders great possibilities, but we also have to stop at a point reflecting over what we are doing. . . . We are not forging a piece of iron—this is different! We have seen catastrophes like when toads were released in Australia to eat some snails—and now hundreds of years later [the toads] are still a problem. . . . It's not that I'm terrified, but the more we get into [genetic technology], the greater responsibility we are taking on us.

Another aspect of system-ecological arguments holds that nature as a system includes some inherent protective mechanisms securing the relative stability and safety of the system. Genetic technologies, it is argued, bypass these safety mechanisms and thus endanger the stability of the system. This can either be a result of the very nature of genetic technology as trespassing hitherto stable barriers like those between species, or it can be a result of the increased pace of development (e.g., new food plants or microorganisms used in bioindustries). The time-based argument is expressed by Thomas in the following:

> [What concerns me is] traditional breeding compared to genetic manipulation. When you use genetic manipulation, you move from the starting point to the final product in one move, fiddling with the genes you want to change. When you breed, you have to do it at the speed of nature and allow nature to produce what it needs. Nature will make sure that you are stopped in time—genetic manipulation wouldn't be stopped by nature because it isn't natural.

People seem to be concerned about health in much the same way they are concerned about the environment. Issues like the presence of pesticide residuals in Roundup-ready crops and unintended loss of nutritional status of genetically manipulated food products were mentioned, just as were expressions of concern related to the qualitatively new foods. Despite this, only few express a fear of eating GM foods themselves. Instead, concerns are rather with impacts on the perspective of decades or generations. This concern is reflected in the following exchange on food risks referring to what was then the first case of mad cow disease in Denmark:

> Alice: Take the soybean. It is genetically manipulated to resist Roundup. The consequence will be that the amount of Roundup used suddenly will be multiplied a hundred times! . . . Everybody will start buying [Roundup] because the plants love it. Commercially, that is brilliant!
>
> Anders: But it is still completely crazy to develop [a plant] that can withstand a poison.
>
> Anna: Yes it a vicious circle, . . . using a poison that will kill off everything else, all the weeds.
>
> Arne: Now I understand your health concern: if the tomato is genetically manipulated [to resist Roundup], then they can spray three times during the growth season. And even though they claim it's all gone, we know that there is something left.
>
> Alice: No, that's not why I'm worried about the health. My concern has to do with the manipulating of the tomato: at a certain point, I believe the tomato will say, "Now I'm going to produce some unhealthy substances." Just like those cows we hear about at the moment: suddenly, they produce a substance that has terrible impacts for the cow and, as far as we know, also for humans. . . . They are probably checking these tomatoes in every detail for all known toxic substances, but I'm not sure some sort of biochemical chain reaction won't take place. Maybe not now, but in eight generations.

When it comes to the benefits, the distinction between food and medical applications of genetic technology is clearly exposed: GM foods are, unlike many medical applications, generally not supported, because the benefits are not obvious and are, furthermore, not seen to exceed the risks or problems. In other words, since genetic technology is so controversial, it requires what

could be termed societal benefits rather than (just) individual or economic benefits. This is similar to the findings of the Public Perceptions of Agricultural Biotechnology in Europe's research project, where a result of interviews in five European countries was that "the question of need could not be reduced to a simple issue of perceived personal benefits" (Marris et al. 2001, 52). Within the social discourse, this means that significant environmental or health benefits must be identifiable—although such benefits, a common claim goes, only make genetic technology acceptable if there are no alternatives.

Within the medical arena, this altruism is disturbed by a more self-centered view, appearing when the context is changed from abstract appraisals to the involvement of the life and health of oneself, close friends, or relatives—that is, when the consumer in the affluent Western world is replaced by a patient. In these cases, many admit willingly that the situation is changed and risks (or any other moral scruples for that matter) are set aside, as the end justifies the means:

> Tom: All the time I return to the question: "What if it was someone close?" Then all my moral concerns would be pushed far aside, wouldn't they?

Hence, the medical applications pose a clear dilemma: on one hand, there are risks and unknowns (and as we shall see later on, moral concerns), but on the other hand, these technologies could be useful in individual cases of serious illness just as they may be beneficial at a societal level. Combining gene technology and medical applications is, however, not a carte blanche for these applications, a fact that was clearly demonstrated by the debates in the interviews following the presentation of the use of gene technology to develop transgenic rats predisposed for obesity. Such rats, the interviewees were told, could potentially help develop drugs to treat obesity.

The combination of transgenic research animals and the issues of animal welfare they raise combine a controversial technology with a likewise disputed use of animals. This discursive "cocktail" evokes different—and conflicting—understandings of when something is beneficial and makes it possible to go a little beyond the simple statement that medical applications are more acceptable than food applications among other things simply because the former are perceived as more useful. When confronted with the transgenetic obese rat, the participants split in two: on one hand, there are those who found the application acceptable; on the other, there are those who rejected it. The arguments in favor followed the general arguments in favor of medical biotechnology as well as those brought forward in relation to applications addressing problems in the poorer countries. It was claimed that

obese people are suffering and that like any other people in distress, we have an obligation to help them. It is not that those arguing down this line fully accept the use of research animals; on the contrary, such positive arguments may be followed by an expression of unease connected to research animals. On the other hand, others argued against the development of such rats. The typical line of arguments was that since obesity is most often self-inflicted, (transgenic) animals should not be used to develop medicine—it is simply a luxury problem and a wrong strategy. Their argument is similar to those used against GM foods, namely, it is not useful in a societal sense and there are alternatives.

To explore the depths of these arguments, the interviewees were offered the suggestion that the rats were to be used in diabetes 2 research, knowing that there is a relation between obesity and the development of diabetes 2. This closer link between a recognized disease challenged those who previously had rejected the rats. Some changed their opinion when confronted with this "new" information. According to these participants, diabetes 2 is comparable to any other disease and thus is a suitable argument for using genetic technology and manipulated animals. Others, however, maintained their rejection, stressing the link between diabetes 2 and obesity and arguing that since obesity is self-inflicted, so is diabetes 2. The following is a typical example of such arguments:

> Erik: I don't think it makes any difference—obesity is still the cause. People should pull themselves together! I can't understand why people allow themselves to grow bigger and bigger and bigger and bigger—it's a luxury problem, that's what it is!

Central in this refusing argument is the notion that there are alternatives that should be pursued before genetic technology is applied. The fact that there are alternatives also plays a central role in the skepticism toward applications addressing problems of malnutrition or famine in poor, "third-world" countries. Such uses are met by immediate appreciation by most if not all interviewees. The argument behind this acceptance seems to be that we, in the industrialized world, by impeding the development of genetic technology indirectly make people starve and ultimately die in poor and less developed parts of the world; therefore, we should promote investments in genetic technology in the industrialized as well as abroad. Such applications caused spontaneously positive reactions from most participants, even some of those who rejected GM foods as a whole. The view is that such uses hold a promise of relieving pain and suffering of people in distress, as expressed by Tom in the following:

> Using genetic manipulation to fight hunger and poverty—it's probably a very cheap solution, I'm sure it is. . . . [Making cows that produce more milk, rice with more vitamins, and drought-resistant cereals] are cheap solutions. It's expensive to make irrigation systems and to feed the third world, but today, the West has got a good and cheap solution, and we should go for it.

These applications pose a dilemma for many. After some consideration, many do, however, turn to rejection based on a number of arguments, one of them being the notion that there are alternatives. The problem (starvation and malnutrition) is recognized, but the disagreement concerns which strategies are the right ones to handle such problems. Rather than developing controversial technologies, other strategies should be examined and advanced. Taking this argument a bit further, a proper strategy would be to secure efficient distribution systems and infrastructures, as well as advancing traditional breeding techniques. The arguments put forward often seem to reflect an opinion that rather than pursue a development of technical fixes and run the risk of creating new risks, the source of the problem should be eliminated. There are, however also more cynical expressions, like this put forward by Ejvind when commenting on the development of golden rice:

> Most of the applications [of gene technology] are utterly useless. Take the vitamin A–enriched rice—couldn't the aeroplane bringing us the rice take some vitamin A pills back home to those who need it? I can't see that it is useful at all, I really can't.

The Economic Discourses

Throughout history, powerful interest groups have presented new technologies as a means of increasing prosperity and contributing to economic growth. Genetic technology is no exception to this optimistic "story line" (see Jamison and Hård 2003). This was particularly the case in the United States in the 1980s, where the prevailing understanding of genetic technology was as a source of new wealth and prosperity. By contrast, similar technological optimism never caught on to the same extent in Europe, where genetic technology was, and still is, questioned by many and large segments of the public remain skeptical.

The image of a European public skeptical to the sales pitch of American corporations was clearly exemplified in the interviews where a prevalent discourse, particularly in debates over GM foods, is quite the opposite: the genetic technological project is advanced by cynical corporate interests, with the sole aim to make profits. Although it is recognized that there are responsi-

ble companies, there is a widespread perception that business is not responsible enough. Morten expressed this view clearly in the following:

> To me [genetic technology] raises a moral question. People my age tend to place moral debates and questions about "the right" and "the good" within the political system. So do we, when we ask ourselves if there is any morality in these companies? Or is morality to private companies all about pushing the problems aside to a place where we can't see what's going on? If we can continue making the money go the right way, we can close our eyes? . . . I don't know, but perhaps the old distinction between politics and economy doesn't work anymore; perhaps it's not that separated, or perhaps it's separated in another way.

Such statements should not be interpreted as a general rejection of making money. The argument is rather that the combination of genetic technology and profit making is viewed with some distaste. Or put another way, making money is not a satisfactory argument for applying genetic technology—you need to subject the application to a broader appraisal, or assessment, to be able to demonstrate more "noble" objectives. Hence, the kinds of benefits required for genetic technology to be considered acceptable are neither private (economic) advantage nor increased societal affluence but what we termed "societal benefits." The following is an example of this somewhat ambivalent attitude toward making money on genetic technology:

> Tage: I look at it this way: [genetic technology is an option] to increase profits at all levels right until it ends up in our homes. I don't really like that!
>
> Tove: In principle, I don't care if somebody makes a lot of money, but I do think it is unfair if it is at any price, if the ethical costs and the costs for nature are neglected and it's all about profits. . . . Sometimes, you wonder if those who have invented all this, if they don't have to eat at all, if they in a way are "outside this world"! I cannot follow this line of thought, I think we need to go about it the opposite way around! If we don't set limits to all this profiteering, we cannot stop genetic technology. As a society, we need to set some limits! . . . At the same time, I also know that if we all felt like that, the wheel hadn't been invented yet. . . . I feel embarrassed [saying all this], but at a certain point, we need to stop and say, "This is it! We are not going to put up with anymore of this!"

Such arguments are of course challenged by applications where the benefits do seem to satisfy societal needs. Medical applications are often given as examples of this. Here, profiteering is not questioned to the same extent as in the food area.

The essence of the argument appears at the interface between food and medicine where foods become medicine, either because they are designed to be drugs in the form of probiotics or functional foods or because the genetically manipulated food is aimed at starving or malnourished people in the poorer and less developed parts of the world. The story told here is one about the failure of the market economy to satisfy "societal needs"—the bottom line seems to be that at the end of the day, we all know that the dynamics of the market economy is not to the benefit of the poor and weak.

This kind of argumentation is most clearly expressed in relation to the third-world applications, where another, and one of the arguments with most support, is based on a critical distance to the logic of technological development in the industrialized world. According to this view, the well-known dynamics of competition and market economy allocate almost absolute power over the development process and the distribution of the products to the business interests. Consequently, they control what applications of genetic technology are taken to the marketplace, under what conditions they are sold, and at what price they are sold, all guided by an urge to conquer the market and make profits, as Mads illustrates in the following:

> The problem is that those developing genetic technology don't do it for the sake of the brown eyes of the people in the developing countries. . . . The purpose is to sell something and make people dependent on the companies that have developed the products! . . . [These technologies] are not developed to help anybody but to make money—that's the purpose!

Although the link is not directly expressed, such views may very well be sustained by the (common) observations of how a transnational corporation like Monsanto, despite the outspoken consumer rejection, so strongly marketed genetically manipulated soya on the European market in 1996 (Lassen et al. 2002). Labeling can, on one hand, be seen as a means to exercise consumer power, but the reluctance to secure labeling of GM foods must also be seen as the companies exercising power over consumers by depriving them of their freedom of choice—or simply as a strategy to force feed the public with GM foods, a concern expressed by Tage in the following:

> I don't think it's fair to do this to people! Take a couple of parents who have been on the go since six in the morning, bringing their kids to their institutions or schools in the morning, having a busy workday, picking up the kids again! And now they also have to consider if products are made by genetic technology or not! I don't know how many labels exist; they label this and that—I think it's dreadful! It's as if they say, "You have to have it!" . . . It's just like the EU [European Union] votes—we voted against the Euro, but politicians won't accept

> that, they will drag us [to the polling place] again. . . . We will have [genetic technology] whether we want it or not. We can protest against it from now on and till doomsday, it will come! Science is so many things, and this science is all about making profits—you can't just stop it!

The element of lacking trust indicated by Tage is another important aspect of the discourses about genetic technology and power closely associated with the economic discussions. Trust, or rather lacking trust, in politicians, industry, researchers, or experts in general is often taken to the fore as a basis for skepticism. In the quotation above, Tage is, indirectly, backing this lack of trust with reference to past experiences, where Danish politicians, after a defeat in a referendum about the EU in 1992, called for a new referendum only a year later—with the result according to their recommendations. Along with this mistrust in politicians' respect for democratic decisions, Tage also expresses a deep distrust in science as such, based on its reliance on profit making. The low level of trust in industry and science when it comes to genetic technology is well known (see Grove-White, Macnaghten, and Wynne 2000).

For example, it was shown in the 1996 Eurobarometer survey that 71 percent of the Danes (and 54 percent of the citizens in EU and Norway and Switzerland) tended to agree that irrespective of the regulation, biotechnologists will do whatever they like (Durant, Bauer, and Gaskell 1998). Such skepticism indicates that the producers are either seen to be cynical or as not seeing their products in a broader societal context. Whatever the reason may be, such skepticism surely fuels the idea that the development, in a sense, is unstoppable once it has been commenced, as expressed by Tage above and in this argument from Tove:

> Basically, you don't want [gene technology]. But then again there is this drought-resistant plant for the deserts—that sounds brilliant, doesn't it? But if you accept just one single application, you'll have to eat all of it! You can't pick one and leave the other—that's impossible, because I don't trust the scientists.

At the core of such argumentation is the idea that since technological development is basically uncontrollable, accepting even the most obviously beneficial and low-risk applications will almost automatically lead to implementation of all other applications, even the most ghastly applications like human cloning or transgenic children.

The Cultural Discourses

The concerns dealing with genetic technology as a cultural challenge predate in a way the actual development of the technology in recent decades. Technological development as a threat to cultural values and beliefs, or in religious terms, an affront to the divine and the supernatural, is by no means new or restricted to genetic technology. Already in the early nineteenth century, there was the depiction of the Frankenstein monster, and in the 1930s, Aldous Huxley, in his *Brave New World*, took up such matters. These works, in particular, have inspired the recent metaphors attached to genetic technologies, such as "Franken-food" or "brave new technologies." Dorothy Nelkin and Susan Lindee have discussed the public representations of the gene, and how, for example, films, television, and popular novels provide frameworks for understanding and talking about genetics and genetic technologies (Nelkin and Lindee 1995). Films such as *Jurassic Park*, *The Boys from Brazil*, or *The X Files* draw directly on the fears and hopes related to genetic technology in disintegrating the borders between the human and the nonhuman and indeed in giving humans supernatural power to fashion a new kind of nature. Hence, it is no wonder that these concerns play a role in the public debate about genetic technology.

In contrast to the generally negative positions articulated in the interviews, there is, of course, a positive version of the cultural challenges raised by genetic technology. This is the story about how genetic technology is just another step in the process of humankind's inevitable conquest of nature. Some visualize this control over nature as leading to an abundance of (healthy) food; some present genetic technology as a tool to control disease and the reproduction of humans.

In the light of the strong representation in art and literature and the presence of horror visions in the popular culture—with the regular reports of new examples of human cloning—it is not surprising that the cultural discourses play an important role in public concern. The basic concern seems to be that genetic technology is in conflict with some fundamental values or principles of order. To the more religious, these concerns are expressed in terms of a violation of a divine order: genetic technology is seen to interfere with the works of God, and as humans we should abstain from interfering in these matters. Others use a vocabulary inspired by ecology or a kind of natural rights philosophy, where the offended subject is not God, but nature. In this view, genetic technology harms the order of nature or simply naturalness. Although different in their origin, these two lines of thought are similar when it comes to the critique of genetic technology: there is a challenge to deeper meanings or sacred guiding principles.

Within the medical area, a central question is to what extent we can allow ourselves to strive for safety, perfection, and eternal life, here expressed by Lotte, commenting on amniocentesis and the increased ability to identify and remove handicapped fetuses:

> I don't think it's any harm that there are different individuals. I believe that there is an underlying meaning, when things are like that. . . . God has decided that things should be different, and even handicapped children have something to offer us.

Ultimately, such views result in reflections over our right to use gene therapy, as in the following, where both sides of the discussion are represented:

> Hanne: Wouldn't you say that [gene technology] should be legal if you had a child with a very serious illness and the removal of one gene could save the life of the child or save it from a handicap like Down Syndrome? . . . I know the borderline between the sick and the normal is moving, but is that an argument for not fiddling with the genes? I would run the risk!
> Henrik: Why not leave it to nature to decide who is strong enough to be born? They may be born with a handicap but can survive it. I think we begin to act as God, don't we?

Another argument is presented by Hanne, who interestingly dissociates herself from the idea that there is a meaning in things but operates with an idea of "chance" as a sort of guiding principle in a very Darwinian way:

> Hanne: I have considered manipulations of the natural basis, our hereditary material. I think the evolution is governed by chance. As I see it, there is no underlying meaning in our government of the direction of mutations. Now it's us making the mutations, consciously and controlled; beforehand, catastrophes happened or animals were extinct because they developed in disharmony with the natural evolution. Now we are the agents of evolution—or whatever we call the "it" that makes the mutations . . . that leaves us with a huge responsibility. We need to consider what we do when we play the game of "chance."
> Interviewer: Do you think we are conscious of that responsibility?
> Hanne: No, not enough.

There is a certain awareness that gene technology is not the first technology acting against nature or God; other technologies do so, but this should not necessarily be seen as legitimating the use of genetic technology. Instead, technologies can be seen on a continuum from totally harmless technologies to totally outrageous technologies. Genetic technology is somewhere on this scale, and to many, it marks the borderline, or turning point, between the

acceptable and the unacceptable, as it is expressed by Tove in the following comment:

> Basically, I think genetic technology is against nature. I know many other things are too, but having a past doesn't necessarily mean you can't draw a line at a certain point and say, "Now we stop fooling around with things!". . . . Looking at all this, I also think that the scientists are acting as God, interfering in the way things are constructed. I don't really think that's a good idea. As genius as the Earth we are living on is constructed, with plants, humans, and animals and all that, you will never reach that level.

This argument is also interesting because of the double basis in nature and God, illustrating that the two concepts, or principles of order, are extremely difficult to separate from each other.

Conclusions

It is our contention that the concerns expressed by the public in focus group interviews such as those we have reported in this article are not sufficiently taken into account in the process of public policy making or in the broader processes of "cultural appropriation" in regard to genetic technologies. The policy "discourses" in Denmark, as elsewhere, tend to deal almost exclusively with the economic costs and benefits of these technologies and the short-term health and environmental risks. While what we have termed "cultural concerns" are sometimes discussed in the media, they tend to be neglected by policy makers.

It can thus be suggested that among policy makers, as well as among the scientists and business people and other promoters of these technologies, issues are framed in narrower terms than appear to be the case among lay people. What might be termed "political economic concerns"—issues of corporate power and responsibility, commercialization of research, the links between science and business—that were taken up in our interviews are generally absent from policy deliberations. And the longer term ecological risks that were discussed in the focus groups are also seldom taken up by policy makers. Policy discourses tend to simplify and reduce complex issues, not least because of the dominant role that political ideologies tend to have in the policy process (see Fischer 2003). Not only are the ranges of issues reduced, but the meanings of those issues are also simplified into what might be called an expert language and, in the case of genetic technologies, a more specifically commercial- or business-minded expert language. Similarly, as Brian Wynne has argued on numerous occasions, policy makers often have an

inadequate conception of public attitudes in regard to scientific and technological issues, not least in relation to the genetic technologies (see Wynne 1996). The problem is often seen as one of ignorance and lack of information; the public is all too often seen as not understanding the issues. By listening to the concerns of lay people in their own terms and language, it can thus be suggested that policy makers can become more aware of the complexity of public attitudes and that policy decisions, as well as marketing strategies, might, as a result, become more appropriate and the products that are brought to market might thereby become acceptable to a wider range of the public.

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