Introduction: GMOs—global objects of contention

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Abstract: Genetically modified organisms in agriculture have become objects of contention, crystallizing some of today's major political and social controversies. As human-made objects that are alive and have agency, they invite the anthropologist to follow their trajectories and to analyze the power relationships and political economies of meaning in which they are inscribed. Taking as a point of departure Hans Jonas's principle of responsibility for the unknown effects of technological developments, this article questions why a culture of urgency is attached to GMOs in spite of the unpredictable consequences that may arise when they are set free into the environment. As naturally reproducing objects that have intellectual property rights attached to them they raise issues of political governance and of economic power and control. They provoke not only repertoires of contention but also silences that speak about the link between technology and policy in contemporary societies.

Keywords: genetically engineered organisms, governance, intellectual property, non-human agency, social movements, speed

Franz Kafka called *Odradek*¹ an object of no use that does not correspond to any human need or desire and is neither 'natural' nor 'artificial'. For many people, genetically modified plants are such objects that they neither want nor desire but that nevertheless invade their fields, install themselves in public arenas, and penetrate into the intimacy of their bodies. In the imagination of many politicians, GMOs have become something inevitable, the embodiments of progress, which cannot be restricted without provoking economic and political damnation. The essayist Günther Anders (who refuses the designation of

philosopher) suggested that we should torture these objects of our technical imagination until they confess that in reality they are not 'objects' but reified maxims and ossified modes of action (Schraube 2005: 81).

Following Anders's suggestion then, let us torture GMOs and find out what they are. Genetically modified organisms in agriculture interest us here not as the outcome of a sophisticated technological process or as the subject of expert procedures that should determine their innocuous or dangerous nature. We want to look at them as objects of contention that are crystalliz-

ing some of the major political and social controversies of our time. These include the emergence of exclusive intellectual property rights over plants and animals as new institutions of power that are now given global validity in international trade agreements; the controversies about the nature of life itself, as a complex organic process or as a simple mechanic whose 'building blocks of life' can be engineered and controlled; the struggle about whose definitions and meanings prevail and whose are marginalized and silenced; and the effectiveness of democratic institutions for regulating conflicts of interest between citizens and corporations.

What is of interest to us here are not only the strategies and arguments with which the struggle is waged. In this special issue we also leave a large space for indifference and non-participation, looking at those actors who do not want to take sides in the controversy, or are socially marginalized and unaware of the issue. As anthropologists we posit our research within some of the broader frames of meaning making and power posed by philosophers (Anders 1956, 2002; Berlan 2001; Jonas 1982) and sociologists of science (Callon 1986; Wynne 2001) and articulate them with observations of everyday practices and exceptional events where debates over biotechnology are being played out.

Non-human agency

Jean-Pierre Berlan (2001), philosopher of science and prominent anti-GMO activist used to begin his public conferences by asking the audience: "Who in this room is not a GMO?" He then proceeded to explain that all living organisms have been genetically modified in the slow process of evolution, based on competition and cooperation between the species. The agency of all living objects is directed toward the purpose of reproducing themselves. In the process of evolution the most successful species who were capable of surviving the longest, were not those that out-competed all the others but those that were able to diversify, adapt, and cooperate with other species around them. This cooperation is

not in contradiction with the driving principle of self-interest. It is in order to survive that the species cooperate (Verbeek 1998: 55).

The process that is euphemistically called 'genetic modification' breaks with this slow process, jumps the species barriers, and introduces artificially created 'chimerical genes' into living organisms. Organisms are not slowly 'modified' as in the process of evolution, but they are 'engineered' to adapt to human requirements and demands. This process, that started with the development of agriculture, has accelerated tremendously with the invention of GMOs. The current use of the term GMO covers a wide range of objects: unicellular organisms engineered to synthesize substances mostly for medical use, such as vaccines or hormones; genetically engineered plants or animals destined for research, such as the 'Oncomouse', a mouse genetically engineered to develop cancer; genetically engineered plants that produce their own insecticide or are resistant to herbicides; pharmaplants that produce vaccines or vitamins; and industrial GMOs, such as trees genetically engineered to improve their potential for paper production.

While unicellular organisms, animals, and plants engineered for scientific purposes are kept in strictly confined conditions, genetically engineered plants destined for human or animal consumption, pharmaplants, and industrial GMOs are set free into the environment. Although engineered to serve human purposes, from the moment GMOs are released into the environment, they escape human control and develop their own agency. As the philosopher Hans Jonas phrased it: "It may be that we 'take our own evolution in hand' but it will escape this hand at the very moment that evolution takes up the impulse and while we were free to take the first step, by the time of the second step and all the following ones we will be slaves" (Jonas 1982: 72; translation by the author). From the moment GMOs are released, it is up to humans to contain their movements, to appreciate the consequences of their agency, and to predict their impact for the future.

GMOs have agency because they are alive but they cannot assume responsibility for their

actions, as this is an inherently human quality. It is thus between humans that responsibility for these man-made living beings has to be negotiated. The question however is to what extent humans are actually capable of assuming responsibility for the technology that has been unleashed. To what extent can human imagination keep up with its technological inventions? Günther Anders, one of the founders of the anti-nuclear movement and together with Hans Jonas one of the most important German-speaking thinkers and critics of technology, insists on the incapacity of humans to run at the speed of the transformation that we ourselves ordain for our products, our incapacity to catch up with our inventions. He sees a 'Promethean discrepancy' between the world of technology and our ability to visualize it (Schraube 2005: 77). Prometheus, as Aischylos presents him, not only gave the humans the fire he had stolen for them but also gave them the capacity to hope and develop illusions for the future (Verbeek 1998: 84). Psychologically, Anders maintains, we are incapable of imagining the whole complexity of what we were able to produce and to induce (Anders 2002: 34). He sees a certain immobility in the human psyche that has remained relatively static in its emotionality and imagination when compared to the sphere of production, which in contrast has acquired an extraordinary flexibility in the industrial and technological revolutions. Instead of concluding on the immobility of the human psyche in general, I would emphasize that societies function according to different, coexisting, and competing time regimes. As it is impossible to grasp the world in its unending complexity, humans have a tendency to simplify according to competing interests and priorities. The urge for technological change is not unanimous, but rather the result of relationships of power.

The capacity to predict consequences lags behind the technological knowledge that empowers our actions. *Homo faber* triumphs over *homo sapiens* (Jonas 1982: 31; Paul and Steinbrecher 2003: 228). Technological know-how is relatively simplistic compared to the complexity of biological systems. It is comparatively straightforward to insert a gene from a different species

into the genome of a plant, but it is almost impossible to appreciate how the billions of pollen it produces will affect the different environments where it proliferates.

Speed and intellectual property

One motive for this technological drive is the human impulse to go forward and achieve greater control over the material world and other humans. Once created, objects require new inventive impulses for their maintenance and further developments reward the creator with more success (Jonas 1982: 31). The measure of success is money and the medium is intellectual property. Shares in biotechnology ventures and in the so-called 'life-science' industry have become items of intense speculation at the stock market after the first patent over a living organism, a bacterium breaking down crude oil, was confirmed by the Supreme Court of the United States in 1980.² Private industry started to invest heavily in agricultural biotechnology research as now returns on patents could be expected from every genetically modified seed planted. A huge profit potential seemed to wait for those who were first to convince farmers, governments, and international organizations that genetically modified crops were going to boost agricultural production, economize chemicals and save the world from hunger. It is through the analysis of trajectories such as these that we can interpret the human transactions and calculations that enliven things. Thus, although it is obviously human actors who encode things with significance, from a methodological point of view we can follow the things-in-motion that illuminate their human and social context (Appadurai 1986: 5).

The first genetically modified organisms that were commercialized on a large scale carried a gene that made them resistant to a herbicide, mainly glyphosate-containing Roundup. Roundup Ready soy beans were hugely successful in the United States and Argentina and Roundup Ready canola now dominates canola production in Canada to over 80 percent. The other most common GMOs were genetically engineered to

produce their own agro-toxin, derived from the Bt bacterium, *bacillus thuringiensis*. In the case of Bt corn, the donor organism is a naturally occurring soil bacterium, *bacillus thuringiensis*, and the gene of interest produces a protein that kills Lepidoptera larvae, in particular, the European corn borer. Most cotton worldwide is of the GM variety producing Bt toxins. The owner of the glyphosate resistant gene and of the gene producing the BT bacterium, the agro-chemical corporation Monsanto, obliges farmers who want to plant their GM seeds to sign a technology use agreement. This agreement compels them not to reseed the seeds purchased and to allow a Monsanto agent access to their fields and premises up to three years after purchase to inspect whether they respected that rule.

Only five agro-chemical corporations, Bayer CropScience, Monsanto, Syngenta, Avanta, and DuPont hold most of the patents on GM seeds. The owners of patents on GM seeds achieved what plant-breeders had never been able to impose entirely. They obliged the farmers who wanted to use their technology to treat seeds as any other consumer good. The nature of a consumer good is to be ephemeral, to exist in order to be used up. Each piece of property that would remain or reproduce in the hands of the buyers ‘robs’ (Anders 2002: 46) the producer of his or her chance to produce and sell more. A farmer who reseeds his/her harvest is considered a free-rider by the seed corporations that exercise enormous pressure on governments worldwide to toughen seed legislation and to transfer control over seed from the farmers to the corporations (National Farmers Union 2005: 2). Plants genetically engineered to lose their ability to reproduce, the so-called Terminator technology developed and patented by Monsanto, offers a technological tool to seed companies for achieving such complete control over seed.

Promoting the cultivation, commercialization, and appropriation of GMOs corresponds to a linear concept of time inherent in the idea of technological progress and to the acceleration of time intrinsic in the perception of the neo-liberal economy as a race for opportunities and advantages. GMOs are promoted with a dis-

course of urgency, with a ‘breathless rhetoric of speed’ (Sunder Rajan 2003: 88). Speed manifests itself in two distinct ways; both as massively compressed research and production time and as a self-perpetuating logic that contributes to or feeds off speediness. ‘Speed’ in genomics is not just important because change is fast, but because ‘speed’ is a material-rhetorical fulcrum used to lever first the government and then the public and other companies, into responding to ‘hype’ and thus entangle themselves in biotech (Sunder Rajan 2003: 93). The discourses promoting GMOs in international arenas refer to the demographic explosion of the world population and present agricultural biotechnology as the tool urgently needed for combating hunger. Some protagonists go as far as accusing the skeptics and critics of GMOs of ‘crimes against humanity’ for delaying the regulatory approval of potentially life-saving innovations (Potrykus quoted in FAO 2004: 3). The argument that GMOs are needed to feed the world is repeated in spite of the fact that current world agriculture is sufficiently productive to feed everyone and that it is unequal distribution that is causing 800 million people to go hungry. At the national level the urgency evoked is the competition with other countries and parts of the world supposedly more advanced in biotechnology research that might conquer markets and control patents. Intellectual property rights are the accelerators in this race for developing commercialisable GMOs. Originators of patents can be individual researchers, research teams, or the corporation or institution that provides funding and research facilities.

Marilyn Strathern makes the distinction between ‘cultural property’ and ‘intellectual property’. Cultural property is ‘handed on’ over different generations: “it is authentic because it can be shown to have been handed on” (Strathern 1996: 24). Traditional seed varieties handed on and improved over generations would be such a cultural property. Intellectual property is claimable precisely because it has not been shared and has not been handed on. Public researchers are encouraged to engage in joint research with and for private firms that they keep strictly con-

fidential, and to achieve results that could be patented. To fully exploit the period of patent protection, a product that can be commercialized has to come out of the invention as fast as possible. Extensive testing of these new products would shorten the period over which money can be earned from owning the patent and possessing a monopoly over the product. As a result there is little long-term research done on the potential environmental and health impacts of GMOs in spite of the large amounts of public and private money invested.³

Although genetically modified plants are, for the time being, cultivated predominately in the United States, followed by Argentina, Brazil, Canada, and China, they are already today truly global objects, as they are commercialized through transnational corporations that push to expand their markets. Bt cotton is aggressively marketed in India, GM soybeans have been illegally imported into Brazil, and GM corn is found in Mexican fields where its cultivation is forbidden. Open field trials with GM crops take place in a more or less supervised fashion all over the world. Cultivation, transport, and commercialization are regulated through international agencies, such as the Biosafety Protocol, the Convention on Biological Diversity, the Food and Agriculture Organization of the United Nations, and the World Trade Organization. The TRIPS agreement, on trade-related aspects of intellectual property rights, signed in 1994 as an annex of the Marrakech agreement founding the WTO opened the road for the worldwide patenting of life-forms and the generalization of intellectual property rights over plants and animals. It made GMOs global objects of covetousness. It also made GMOs global objects of contention.

Repertoires of contention

The introduction of genetically modified seed, food, and feed on the market from the middle of the 1990s onward coincided with a growing distrust in the promises of market liberalism and technological progress. In Europe it also happened together with food-scares, such as BSE

(Bovine Spongiform Encephalopathy). Activists established the link between the concentration of economic power in the hands of a few agro-chemical corporations, rents collected from patented seed, and the hushed introduction of GMOs on the market. Patents on genetically engineered plants seemed like another outgrowth of neo-liberal capitalism where production is superseded as the font and origin of wealth by less tangible ways of generating value (Comaroff and Comaroff 2001: 5). In the middle of the 1990s, the value of shares in biotechnology ventures had lost all grounding in materiality. Speculating about the rents collected on each GM-seed planted inspired the imagination of speculators, until resistance to the technology grew and the shares collapsed at the end of the 1990s. It sparked contention that consumers could see the enormous profits that corporations would be able to make but that they could not make out any obvious advantage for themselves. They resented GMOs as a risk that was imposed. They demanded to have proper debate about whether the human purposes were sufficiently important to justify taking on such unpredictable possible effects, and about whether the forms of innovation, promotion, and regulation were sufficiently trustworthy to defend the public interest (Wynne 2001: 456).

Over the last ten years genetically modified organisms have brought about an avalanche of protests, lawsuits, petitions, and demonstrations in different parts of world. The arbitration committee of the WTO was called on to decide about the legitimacy of the European moratorium on the import and cultivation of GMOs. Different law courts in France condemned or acquitted protesters who had uprooted GM test-plots. Indian farmers demonstrated against GM cotton, Mexican environmentalists and farmers against the contamination of indigenous corn varieties (landraces) by GM corn. Canadian activists protested on Parliament Hill against the support of the Canadian government for Terminator technology. Agro-biotech corporations confronted trade unions and associations of citizens. Local and regional parliaments defied central governments and supra-national institutions.

The struggle that has taken place since the introduction of GMOs between opponents and proponents of genetic modification in agricultural production, refers to the unforeseen potential implications that a release of genetically modified plants into the environment would pose; as they could cross-pollinate and compete with indigenous plants thus erasing some of the agricultural bio-diversity that had been selected over millennia. It is also about a redistribution of profits and the control over agricultural production. The arguments against this technology point to the new links of economic and ecological dependency, which the replacement of traditional agricultural production by biotechnology would create as intellectual property rights are imposed together with the technology. They ethically reject that humans should be allowed to toy with genetic heritage, and possibly wager ecological disaster, to make a short-time profit. Opponents to the technology question the functioning of democratic institutions and regulatory bodies and their independence from economic interests. They resent the presence of GMOs on supermarket shelves, in their fields, and in their food as an imposition and a violation of their physical integrity. Genetically modified organisms thus become objects of civic dispute involving local, regional, national, and supranational parliaments, international organizations, NGOs and associations, trade unions and multinational corporations, farmers and scientists. Arguments are fought out over the Internet, in the media, in supermarkets, and in the fields.

For this special issue we chose as sites for our research a Mexican valley (Fitting), a Canadian research laboratory (Holmes), solidarity committees with accused activists in France (Pagis), a small town in the British mining district (Degen), and the Canadian Supreme Court (Müller). We spoke with lawyers, peasants, plant geneticists, trade union activists, and people who did not claim any affiliation. The contentions we observed were highly structured and ritualized in the Supreme Court, they were intensely emotional among activists in Mexico and France, silent in the former mining town, and absent in the laboratory. When we are talking about con-

tention we do not necessary deal with open conflicts but also with smoke-screens and truths that are not revealed.

It is in fact impossible to speak of one public of GMO protestors. Because GMOs are global objects of contention the publics involved cannot be defined *a priori*. Mobilizations come from fairly general, broad-based associations to protect the environment, associations of consumers, developmental organizations, anti-globalization groups and from action groups of specific publics, such as organic farmers, farmer trade-unions, and parents of school children. These groups had to simultaneously play on strong common symbols to enlarge their audience and on a singularization of the problems on which the constitution of publics depends (Joly and Marris 2001: 21). The images used in global anti-GMO campaigns feature corn cobs with faces and arms, a giant tomato with a grin on its face, and the Frankenfood Monster with a fish head. They all point to the concern that GMOs have agency and that this agency can have unpredictable consequences. The potential consequences of primary concern for the different groups, however, are distinct, new food allergies, the rise of the price of seed, environmental pollution, etc. Some groups, like the farmers of the *Confédération Paysanne* in Julie Pagis's example (this volume) feel directly concerned by GMOs in their professional practice, while other protestors that share in their actions, like the members of ATTAC, feel affected as 'citizens', who want to use the protest to educate others on this 'problem of society'. It is characteristic of the anti-GMO mobilization to create diverse alliances between these different publics and their groups. An intensive worldwide networking has been sustained and developed mostly through the generalization of Internet access over the last ten years. A click on the JIGMOD link⁴ gives a picture of the mobilizations for the global day of action against GMOs that is taking place as I write these lines (8 April 2006). Pagis shows that these alliances can be precarious and conflictual depending on the organizational forms chosen and on the concepts of democracy and personal political involvement.

There are various repertoires of argumentation against GMOs. Depending on the actors and the sites we find very different ways of accusing GMOs: from the ethical argument that holds that GMOs are not natural and that they will have their revenge, to the political argument that they are imposed against the will of the citizen. Other arguments insist on their economic nature and on how intellectual property rights change power structures. In her article Pagis explores these different repertoires of argumentation and the motives that unite and divide anti-GM activists in France. Their controversies are not only about the consequences of the growing and consuming of GMOs they are also about the transparency and opacity of democratic institutions and about the possibilities of citizens and consumers of making their voice heard. In these contentions, the political role in which the protestors see themselves becomes an issue. Are they protesting against GMOs as citizens, consumers, activists, or shareholders of biotechnology corporations?

The different ways of naming the relationships between people, the state, and corporations condense political, governmental, and popular discourses. Those discourses contain and mobilize different social and public imaginaries, different histories, and different desires for the future (Clarke 2006). In Pagis's example the members of the farmers' trade union *Confédération Paysanne* see themselves as activists combating a common enemy in a disciplined collective way. They express their suspicion toward the members of ATTAC who participate in the crop-razing as citizens who want to bring about a political debate on GMOs. None of the protestors actually claims the status of a consumer of seed or food. This is all the more remarkable as the neo-liberal state, also in France, wants to see citizens more and more as consumers of public services, who exercise choice in the pursuit of individual wants. The loss of choice is also a frequently used argument against GMOs invading the biosphere and making the production of GM-free plants impossible (Müller this volume). By refusing the status of consumer and by claiming the status of ac-

tivist or citizen, protestors reclaim political status and reject the depoliticization of the public domain.

At the same time the politicization of the economic domain has had an increasing impact as concerned shareholders of biotechnology corporations file proposals on GMOs—180 in past years—asking companies to label all products that might contain GMOs—a measure that companies have deemed unnecessary and unreasonable—or to stop producing them altogether (Kary 2006). A proposal at DuPont's 2006 annual meeting, which 7.3 percent of shareholders voted for, asked DuPont's board to report by its 2007 meeting on the existence of adequate systems to monitor its modified seed products once they are in the marketplace; to retain an independent environmental expert to review the effectiveness of its risk management processes; and to examine the possibility that genetically modified seed, through inadvertent cross-pollination, can affect all seed product (Kary 2006).

Also the debates about the introduction of GM corn into Mexico inscribe themselves in political economy, situating the narratives about corn cultivation as a cultural practice and heritage in the larger political framework of trade liberalization, subsidy cuts, and out-migration. Fitting (this volume) investigates the ways in which 'corn culture' is used to make political claims. Traditional corn agriculture has become a symbol used by anti-globalization activists for the need to defend 'the nation under attack' from corporate and US-led domination. However also Mexico's neo-liberal government frames small-scale corn production as a distinct culture to denounce the inefficiency of peasant agriculture and the need for neo-liberal reform. Both discourses about 'deep Mexico' reify small-scale corn production as being untouched by the market and obscure how indigeneity and peasantry are historically constituted. Fitting argues that corn culture is not isolated from the market but shaped by it. The economic hardships faced by corn producers in Mexico are as serious a threat to corn biodiversity as the import of GM corn.

The other side of the duty to know

While opinion polls show a large majority of the European population being critical or skeptical toward GMOs⁵ and a high percentage of US Americans claiming effective labelling⁶ there are also those who seem unconcerned or silent. Media representations often emphasize the combative, polarized character of debate and give the impression that GM matters to everyone everywhere, whether supportive or skeptical of the new technology. Despite this, significant silences exist, a topic that Cathrine Degnen, Liz Fitting, and Christina Holmes discuss in this special issue. There may be different types of silences: privileged, as the silence of engineers working in a laboratory (Holmes); skeptical, because their opinion had not been heard on other issues either (Degnen); and socially excluded (Fitting). The issue is who is legitimated to speak in the GMO debate and how a debate should be led that is recognized as legitimate. Based on fieldwork in Britain, Degnen examines GMOs from the perspective of people who are not diving into the debate. The people Degnen spoke with, did not feel at ease to discuss GMOs and refused to take part in a debate that was led in a way that did not correspond to their daily experiences nor to the language they habitually used. Holmes looks at silences among scientists who are engaged with the technology, but manage to efface the wider socio-political context of powerful interests within which their work takes place. The scientists Christina Holmes spoke to, did not address the wider social and economical implications of GMOs engulfed as they were in the daily routine of the laboratory. Publicly voicing food safety concerns or addressing the problem of patents, is not part of what researchers in biotechnology are expected to do by their peers. If they wish to make a career they have to keep their public statements strictly to the domain of what is called 'sound science', a science that is value-free, supposedly neutral, and strictly limited to scientific 'fact' (Heller 2002; Pusztai 2002).

This neutrality of science is increasingly questioned by concerned citizens and activists oppos-

ing the introduction of genetically engineered plants and animals into the environment. They regard biotechnology as 'captured' by commercial and other politically 'interested' forces (Wynne 2001: 475). Citizens emphasize their own expertise based on common sense and everyday experience. The 'back-to-the-landers' (Pagis this volume), oppose an alternative practice to the dominant discourse, living on organic farms, eating organic food, using renewable energy, etc. Instead of falling silent when confronted with the scientific discourse of risk, they question the official discourse of objective risk assessment altogether. The discourse of riskification implies that the consequences of the introduction of genetically engineered organisms into the environment is measurable in terms of advantages and risks. Nature and society become fields of potential liabilities and benefits to be understood through cost benefit analysis, as Heller critically pointed out (2001: 25) The criticism of the discourse of risk is precisely that such cost benefit analysis is impossible because the consequences of setting free genetically engineered plants into the environment cannot be predicted. Critics of biotechnology thus call for the recognition of this ignorance. They assert what Jonas calls "the other side of the duty to know" (1982: 28). They see it as their ethical duty to admit to ignorance and to question and supervise the technological powers that those in power want to unleash.

Participatory biotechnology commissions set up by governments tend to separate the consultation of 'experts' from the consultation of 'citizens' on the grounds that the judgments of the latter are value-based. The 'real objective risk versus subjective perceived risk' framing is deeply institutionalized in modern risk management culture. However the risks that are supposedly subjectively perceived do not carry the same weight when political decisions are to be made. The dominant approaches assume that ethical concerns can either be scientifically defined—by defining (and weighing) consequences—or otherwise are solely matters of private, individual choice which can be resolved by market mechanisms alone (Wynne 2001: 446). In reality environmental values pervade all aspects of

risk assessment, the cognitive frameworks that guide biosafety research, the uncertainties to be tested, and the normative judgments that define ‘environmental harm’ (Levidow and Carr 1997: 40). Yet, official language downplays such judgments by portraying risk regulation as a matter of objective science. Through dual regulatory procedures the state separates ‘risk’ from ‘ethics’, relegating ‘ethics’ secondary to ‘sound science’.

Governing GMOs

In the special issue of *Focaal* 46 “Science/technology as politics by other means”, Simone Abram questioned to what extent what is considered scientific or technological knowledge has become a surrogate for political argument (Abram 2005: 4). She concluded that if science and technology discourses are, in fact, diverting political arguments into moral ones, science is resistible and malleable and becomes a governmental technology through the imperfect process of implementation (Abram 2005: 17). She explains science is socialized when it comes out of the laboratory (where attempts have been made to purify it out from the social) and that as it comes back into the complexities of the out-of-the-laboratory (that is, in the process of implementation) the purity of the science is compromised.⁷ Part of this compromising implementation process is influenced by political processes in which nation building—and indeed state building—are key. In using science-practice as a governmental technology, and as I showed in the Canadian Supreme Court case in using the ‘sound science’ argument to replace and overshadow legal arguments, the science-purity is compromised. In the compromise it becomes weakened (because its strength lies in the purification process) and vulnerable to manipulation, failure, resistance, etc.⁸

The debates around GMOs show that there is never just one scientific position. Ecologists portray the environment as a fragile ‘ecological balance’, vulnerable to ‘imbalance’ by GMOs; laboratory scientists portray the environment as more resilient, capable of stabilizing itself (Lev-

idow and Carr 1997: 36). To state patentability of living organisms requires the reduction of organic processes to a mechanistic one, replacing the idea of a plant by the concept of ‘composition of matter’ as it was done in the Supreme Court case that I studied (in this volume). The chemical elements composing a DNA sequence become the ‘building blocks of life’ that humans can recompose and change, similar to Lego blocks.

While the mystery of life seems to disappear and is reduced to technological procedures, intense fears take hold of some consumers, that nature might strike back and overpower man who contends to control it. In the laboratory, however, there is always a struggle with the ‘mystery of life’, as Christina Holmes analyses in her research in biotechnology laboratories (this volume). It is its messiness, its complicated and unexpected repercussions that keeps getting in the way when scientists are trying to impose control and reduce the plants to a series of technological procedures. As Chaia Heller phrased it, “GMOs have the ability to produce a climate of uncertainty, to baffle and divide scientists who can neither fully predict nor control their behavior, that creates a discursive space in which human actors debate, contest and appropriate information regarding their potentially spontaneous and ‘risky’ behaviors” (Heller 2002: 7). Anthropologists have not been exempt from these debates. They started to study the social life of genetically modified seeds attempting to contribute to a fuller knowledge of practices that affect gene flows (Richards 2002: 622). They analyzed the link between the use of biotechnology and farmer deskilling (Magnan 2004) and they became interested in understanding how ‘technological futures’ are constructed (Richards 2002: 622). Glen Stone challenges anthropological approaches to biotechnology as biased by an a priori aversion to technology (Stone 2002: 626) and expresses his concern about how the abandonment of neutrality affects the practice of science. In a response to Stone, Miguel Altieri points out that technological choices are simultaneously political choices that also have to be analyzed as such (Altieri

2002: 619). This is the approach we chose to take in this special issue, focusing on the discursive space that GMOs create.

As the ideological foundation of expert knowledge becomes apparent, opponents of genetic engineering reframe GMOs as a problem of food quality linked to productivist agriculture, cultural homogenization, and globalization (Fitting this volume; Heller 2002: 5). Heller sees in the French anti-GMO movement a shift of discursive authority from the objective and scientific risk expert standing supposedly outside culture and history to the intensely engaged *paysan* expert standing for culture and history (Heller 2002: 29). In Mexico, maize agriculture is portrayed as part of tradition, linking issues of maize biodiversity, peasant agriculture, knowledge, and cuisine. The traditional corn producers are constituted by anti-GM activists as the true experts (Fitting this volume).

The public's combined intellectual ethical judgment of scientific knowledge is also a judgment of the quality of the institutions, which are the proponents of that knowledge. Their integrity is questioned as they appear utterly unwilling to render that knowledge-culture accountable to a public discussion of its limitations (Wynne 2001: 447). While Ulrich Beck saw in the 1980s the disenchantment with politics as a consequence of depoliticizing, undemocratic technological changes in the name of progress and rationalization (Beck 1986: 303), anti-GMO activists today see the introduction of GM-technology as a highly political imposition. Furthermore, they see a collusion between economic and political interests and regard it as dangerous to have incompetent and venal politicians take decisions. The 'danger' of GMOs becomes thus inextricably linked to the interests of those who promote them. GMOs may or may not be hazardous in themselves, but they definitely become unpredictable if they are released without proper testing for health and environmental consequences, if they have to respond primarily to profit motives and if they become objects supporting the myth of progress. GMOs are thus what Bruno Latour would call 'hairy objects' which attach themselves in a risky way.

The producers, and for that matter regulators and judges, of such objects are no longer invisible "but appear in the open, embarrassed, controversial, complicated and implicated with all their instruments" (Latour 1999: 40). Anti-GMO movements thus have the potential of questioning and challenging institutions and their mechanisms, an issue that we have discussed in an earlier number of *Focaal* (Müller and Neveu 2002).

Once the question is posed who is responsible for these human-made objects that have agency and that are owned as intellectual property, the messiness of legal arguments and the ambivalence of judgments become apparent. The judges and lawyers implicated in the Canadian court cases opposing farmers to the multinational corporation Monsanto have to define the types of ownerships that can be claimed over genetically engineered plants that grow and multiply in the open and that trespass into farmers' fields (Müller this volume). They also have to determine who is responsible and liable for their natural reproduction. In the Canadian Supreme Court case the multinational corporation Monsanto accused a grain farmer of infringing their patent because he had replanted GM canola seeds that had blown into his land. The corporation successfully claimed intellectual property rights over the harvest of these seeds as the offspring of the initial modified grain. In the second court case, organic farmers filed a class action suit accusing multinational corporations owning the intellectual property rights over genetically engineered crops of polluting their crops. The second case was also decided in favor of the multinational corporations.

In my contribution to this special issue I look at the views on property, responsibility, and agency that are present throughout the trials. If we define property as a 'bundle of power', as Sir Henry Maine did (Hann 1998: 8; Verdery 1998: 161) the powers attributed to the biotechnology corporations and arising out of their claims to intellectual property rights are far-reaching and replace in part those of government. In the trial they were contested by the lawyers representing the farmers in the name of moral

principles that gave precedence to the inviolability of the farmer's property and that insisted on the universal responsibility that the corporations should assume for their inventions if they continued to claim intellectual property rights. The judge in the second trial maintained, however, that it would "unreasonably interfere" with the commercial freedom of the biotechnology corporations if they would be held liable "in an indeterminable amount for an indeterminate time to an indeterminate class". Confronted with the unsolvable contradiction that the attribution of responsibility supposes the proof of a potential risk while uncertainty makes it by definition impossible to prove such a risk (Delmas-Marty 2004: 372f.), the judge concluded on the absence of responsibility. The free reign of the market forces thus took precedence over the moral imperative that Jonas advocates for our technological age: "we can put in jeopardy our own lives but we shall not take a chance on the existence of humanity" (Jonas 1982: 36; translation by the author).

Jonas regards human nature as something humungous in the flow of creation from where it emerged and where it can get engulfed once again. He thinks that only a high degree of politically imposed social discipline can accomplish that the immediate advantages, achievable in the present can be subordinated to the long-term requirements of the future. While regulatory mechanisms by governments and international agencies seem to be hopelessly behind the actual challenges that the release of genetically engineered organisms into the environment pose, protestors worldwide seem to have grasped the extent of the challenge. The widespread, multifaceted, and imaginative contestation of the inherent necessity of GMOs questions the neo-liberal project in its irresponsibility for the future. It refuses the logic of weighing short-term benefits and risks and claims instead that the danger of unlimited damage and loss cannot be balanced against short-term profits. When his opponents accused Jonas, along with environmental activists, of excessive pessimism, he retorted: "The true pessimism is on the side of those who regard what is existing as sufficiently bad and worth-

less to take any gamble for improvement" (Jonas 1982: 75; translation by the author).

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Notes

1. In one of his stories, Franz Kafka tells of a creature stalking his house that, when asked, says its name is *Odradek*. The thing has no intelligible shape and does not correspond to any human need or desire. It seems neither 'natural' nor 'artificial', does no visible harm, but is almost painfully disquieting. The noun *odradek* does not exist in Czech. It is a neologism that Kafka invented probably derived from *odradit* 'to discourage'. *Odradek* would thus mean 'the thing to be discouraged'.

2. Diamond versus Chakrabarty, 447 US 303 (1980).
3. The Canadian Federal government for example spent about CAD 200 million on biotechnology research in 1991–1992 (figures from Industry Canada quoted in Kuyek 2002: 31). Glen Davis Stone writes in 2002 that the US government spends about a quarter billion US dollars a year on biotechnology research (Stone 2002: 627).
4. JIGMOD stands for the JointInternational-GMOppositionDay—the Web site is: <http://altercampagne.free.fr/>.
5. Across Europe, consumers have rejected GMO foods and public concern over these products remains high. The Eurobarometer opinion poll published by the European Commission in December 2001 showed that 94.6 percent of EU citizens want the right to choose, 85.9 percent want to know more before eating GMOs, and 70.9 percent simply do not want GM food (see <http://europa.eu.int/comm/research/press/2001/pr0612en-report.pdf>).
6. In a 2001 poll by ABC News.com, 93 percent of Americans surveyed said the federal government should require labels for genetically engineered foods. The survey also found that a majority of Americans (52 percent) believe genetically engineered foods are unsafe. The Food Policy Institute of Rutgers University conducted a poll in October 2003, which reported that concerns about genetically engineered foods have increased since 2001. 94 percent of Americans think GE ingredients should be labeled as such. Less than half (45 percent) believe it is safe to consume GM foods. Almost two-thirds (62 percent) feel “serious accidents involving GM foods are bound to happen” and 54 percent feel “GM food threatens the natural order of things.” Only a quarter (24 percent) agreed with the statement, “genetically modified food presents no danger for future generations,” while half (50 percent) disagreed and another quarter (25 percent) was unsure. Many US companies are removing genetically engineered ingredients from their products, including Frito-Lay, the world’s largest snack food maker; Novartis, the maker of Gerber baby food; Trader Joe’s, Whole Foods, and Wild Oats markets, three of the largest natural-food store chains in the US; Seagram, one of the world’s largest distillers; McDonalds, which stopped using genetically engineered potatoes in its French fries; and McCain Foods, which produces about a third of the world’s French fries.
7. “Think of the idea of engineering being the application of physics, for example, where small quantities are described as ‘negligible’ and then ignored. In this ignoring lies a whole world of failure between the theory and practice. You could say similar things with medicine, where lab conditions are never reproduced in whole persons. There is a partial parallel here to Calton’s article (1986) on the scallops which do not behave in the sea in the way they did in the lab” (Simone Abram, personal communication, April 2006).
8. “Science does not become a governmental technology because it is compromised, but in the adoption of scientific discourse/practice/etc as a governmental technology, it is necessarily compromised. (It’s a subtle difference to express in grammar, but I hope you see where I am laying the causal emphasis). In effect, the process of implementation is always imperfect, full of compromises, pragmatic, etc. Although I overstate the purification of the science lab, it is the contrast, which is significant. If ‘pure’ science is compromised through implementation (in engineering, medicine, etc), then the adoption of scientific discourse as a political mechanism adds a further layer of transformation” (Simone Abram, personal communication, April 2006).

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