

# Genetically Modified Crops, Inclusion, and Democracy

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## Abstract

The public controversy over genetically modified [GM] crops is predominantly framed in terms of health and safety risks to humans and the environment. However, opponents of GM crops are motivated by a wide variety of other social, political, and economic concerns. In this paper, I critically assess the predominance of the health and safety framing in terms of Iris Young’s model of communicative democracy. I argue that the health and safety framing leads to the marginalization of the social, political, and economic concerns of GM opponents, within both public discourse and government, and is therefore democratically illegitimate.

## 1. Introduction

The public controversy over genetically modified [GM] crops is predominantly framed in terms of concerns over HEALTH AND SAFETY (Irwin 1995, ch. 2; Middendorf et al. 1998; Lang, O’Neill, and Hallman 2003; Cook, Pieri, and Robbins 2004; Demortain 2013). Within this framing, the primary point of controversy is whether GM foods are likely to cause bio-physiological injury or disease to human consumers; a secondary issue, but one that still fits within the health and safety framing, is whether the cultivation of GM crops is likely to cause bio-physiological injury or disease to nontarget species (that is, animals and plants that are not targeted as agricultural pests) or ecosystems more broadly. Proponents of the development and use of GM crops argue that “science says” that GM crops are safe. But opponents remain skeptical — perhaps even “irrationally” skeptical, in the face of what “science says.”

This health and safety framing omits many other kinds of arguments or concerns on both sides of the controversy. On the one hand, GM proponents frequently offer “feed the world” arguments in support of agricultural biotechnology. According to

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these arguments, biotechnology is useful — perhaps even necessary — to increase global food production and promote food security. “Feed the world” arguments are considered so important that an agricultural biotechnology industry organization “communicator’s guide” identifies feeding the world as one of its four “key messages” (*Food Biotechnology* 2013; for critical discussion of these arguments, see Lacey 2002; Hicks 2015).

On the other hand, GM opponents frequently raise a variety of legal, political, economic, and cultural concerns about GM crops. In the 1980s and 1990s, when agricultural biotechnology was first being developed, analysts raised concerns that it would exacerbate inequalities between farmers and large agricultural chemical companies (Goldburg et al. 1990, especially 39ff) or between developed and developing countries (Busch et al. 1991), and that recombinant bovine growth hormone [rBGH], the first major use of biotechnology in food production, would accelerate consolidation in the dairy industry (Burkhardt 1992). These analysts also raised concerns about the downstream effects of increased inequality and consolidation on rural communities, such as accelerating rural depopulation. More recently, some analysts have argued that strong intellectual property rights for GM plants have indeed contributed to consolidation among plant biotechnology firms, giving them increased power over farmers (Marco and Rausser 2008; Howard 2009; James, Hendrickson, and Howard 2013). In 2009, a group of entomologists raised concerns that licensing agreements required to purchase GM seeds were restricting independent research on the plants (Sappington et al. 2010; Biddle 2014; Glenna et al. 2015). Other analysts raise concerns about the coexistence of organic and GM agriculture (Hubbard and Hassanein 2012), or whether the development trajectory of agricultural biotechnology means that it cannot be used in more sustainable systems of food production (Ervin, Glenna, and Jussaume 2010). Today, the Center for Food Safety, an anti-GM advocacy organization, argues that the international agricultural biotechnology firm Monsanto protects its intellectual property using “aggressive physical and emotional tactics” against farmers (as summarized by Ma 2012, 702). Brandt points out that Zapatista communities in southern Mexico link indigenous cultural and economic concerns in their opposition to GM crops: “Drawing on their cultural identity as ‘people made of corn,’ members of Zapatista communities described the transgenic contamination as an instrument of oppression invaders used to destroy the people by destroying their corn” (Brandt 2014, 883). And, in an ethnography of canola farmers in Saskatchewan, Bronson identifies concerns about, among other things, “the ways in which community relationships change under corporate seed contracts,” “a lack of public deliberation about regulatory decisions,” and a controversy over the relevance of farmers’ agronomic expertise in a major lawsuit (Bronson 2014, 528ff).

Reviewing the variety of concerns raised by GM opponents, some observers of the controversy argue that it is a proxy or flashpoint for a more fundamental disagreement between what rural sociologists call THE CORPORATE FOOD REGIME and THE FOOD SOVEREIGNTY REGIME. (For the main point, see especially Sagar, Daemmrich,

and Ashiya 2000; Nestle 2010; Johnson 2014; Thompson 2014; for the general concept of food regimes, see Friedmann 1993, 2005; McMichael 2005.) Consequently, I refer to the range of legal, political, economic, and cultural concerns raised by GM opponents as FOOD REGIME CONCERNS.

It is plausible that there are strong causal links between certain food regime and health and safety concerns. Chronic economic insecurity can limit access to health care, while chronic health problems can cause economic insecurity. Thus, if GM crops are exacerbating economic inequality and insecurity in some rural communities, then it's plausible that this is further exacerbating chronic health problems in these communities. But a link between food regime concerns and health and safety concerns does not mean that the former can be reduced to the latter. First, some concerns — such as research restrictions or industry consolidation — do not have an obvious or strong connection to health or safety. Second, on the health and safety framing, a paradigm putative causal chain linking a GM crop to an adverse health outcome is a chemico-physiological mechanism that begins when a molecule comes into contact with an organism and interacts with it on a cellular or sub-cellular level (compare Ankley et al. 2010, Fig. 1). This paradigm — investigated using what Lacey (1999, 2015) calls “materialist” or “decontextualizing” research strategies — cannot accommodate the socio-economic and cultural mechanisms that link food regime and health and safety concerns. Thus, a complete understanding of food regime and health and safety concerns would require thinking about both kinds of concerns together.<sup>1</sup>

In this paper, I direct critical attention to the predominance of the health and safety framing — the way in which the controversy is understood as being about health and safety concerns, as per the opening paragraph — in both public and regulatory contexts. I argue that, while the predominance of the health and safety framing may appear democratic, it is actually democratically illegitimate. On the one hand, the predominance of this framing appears to be supported by arguments for “public reason,” shared assumptions and conceptual frameworks for decisionmaking in a pluralist society. However, I show that the predominance of this framing leads to the marginalization of food regime concerns, and thus GM opponents who hold these concerns. My argument draws heavily on the work of political philosopher Iris Young; to borrow from her, the GM controversy is a case in which “political processes ...claim to be democratic but which some people reasonably claim are dominated by only some of those whose interests are affected by them” (Young 2000, 13).

I proceed as follows. Section 2 gives an overview of Young's account of deliberative or communicative democracy. Section 3 discusses the role of expertise in the health and safety framing, and section 4 examines ways in which the health and safety framing effectively excludes food regime concerns — and thus people who have such concerns — from public discourse about GM crops. Taken together, these

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1. Thanks to Claudia Murphy for pressing me to make this point.

three sections imply that the health and safety framing of the GM controversy is democratically illegitimate. Next, in section 5, I examine US domestic regulatory institutions, showing how the health and safety framing is institutionalized in the regulatory framework governing GM crops. This suggests an institutional explanation for the predominance of the framing in public discourse: the health and safety framing is predominant at the public level because it is institutionalized at the governmental level. Finally, in section 6, I combine this institutional explanation with the analysis of sections 2-4 to argue that the predominance of the health and safety framing at the governmental level is doubly illegitimate.

Given the need to lay out a significant amount of background information and theoretical machinery, for the sake of space this paper focuses almost entirely on the US context. Kleinman, Kinchy, and Autry (2009) examine agricultural biotechnology policy in the US, Kenya, EU, Austria, China, and India, and find both similarities and differences. Specifically, every political context uses some version of “science-based” policymaking; but Kenya, the EU, and Austria also recognize a role for “social values-based” policy. That is, in my terminology, health and safety concerns are recognized in all six contexts, but some contexts — unlike the US — also recognize food regime concerns. Descriptively, my institutional explanation predicts that, in contexts where regulatory authorities recognize and respect food regime concerns, the health and safety framing will not be so predominant in public discourse. (Note that this prediction by itself does not *test* my institutional explanation.) Further, insofar as GM opponents are not marginalized at either the policy or governmental level in these policy contexts, my normative point does not apply: the GM controversy is more democratically legitimate in these contexts (at least in this specific respect). Future empirical research could carry out the kind of international comparison that I simply do not have room for here, and indeed thereby empirically test the institutional explanation that I can merely propose here.

In this paper, I do not discuss either the content and (epistemic) justifiability of any health, safety, or food regime concerns. In this respect, my paper does not aim to provide a review of food regime concerns (for such reviews, see Lacy 2002; Thompson and Hannah 2008; Hicks and Millstein 2016). My concern here is not with whether GM crops are actually safe or pose a threat to human health; similarly, I am not directly concerned here with whether GM crops actually have greater yields than their conventional counterparts (on this, see Hicks 2015), contribute to farm consolidation, or exacerbate economic inequality. I also assume, rather than argue, that some GM opponents hold and attempt to raise food regime concerns — I take it that the literature cited above supports that empirical claim. Rather, my aim here is to show *how* these food regime concerns — and, by extension, the people who hold them — are effectively excluded from both public and governmental deliberation, and to argue that this exclusion is democratically illegitimate.<sup>2</sup>

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2. Thanks to Kelly Bronson and Eric Kennedy for pressing me to clarify the aims of my project.

Given this aim, my project here resembles three prior analyses of biotechnology governance:

- (1) Wright’s analysis of the way the design of the Asilomar Conference on Recombinant DNA in 1975 “marginalized social and ethical questions regarding genetic engineering, making it impossible to achieve their sustained consideration” (Wright 1994, 447; see also Krimsky 1982, 99; cited by Kleinman and Kinchy 2003, 384);
- (2) Kleinman and Kinchy’s argument that “those who oppose ...[a] technology because of the expected undesirable social effects or moral/ethical concerns gain legitimate entry into the debate only when they focus on issues, such as the environment, health and safety, that are widely understood to be matters for scientific evaluation” (Kleinman and Kinchy 2003, 380); and
- (3) Parthasarathy’s recent work on the exclusion of “ethical” concerns from US patent politics (Parthasarathy 2011).

Specifically, like Wright and Kleinman and Kinchy, my analysis here examines both discursive and institutional or organization politics; but this paper complements or goes beyond these preceding analyses in several ways. First, while these previous analyses often (though not always) leave their normative conclusions implicit or lightly theorized, I draw on a robust account of deliberative democracy to make an explicitly normative point. Second, Wright focuses primarily on the ways a subset of health and safety concerns — especially hazards to lab workers — were marginalized in the early days of biotechnology governance. By contrast, I focus on the contemporary marginalization of a different category of concerns. Third, Kleinman and Kinchy’s analysis of rBGH politics in the US focuses on legislative debates (Kleinman and Kinchy 2003, 11ff), with only a single paragraph discussing the FDA (Kleinman and Kinchy 2003, 16). However, as I discuss in more detail in section 5, US biotechnology policy is primarily based on a White House memo, which grounded agencies’ authority to regulate biotechnology in pre-existing legislation. Thus, my focus on the executive branch agencies provides a better perspective on how political institutions have shaped public discursive GM politics in the US (thereby developing a point made by Thompson 2014).

## 2. Young on Communicative Democracy

In *Inclusion and Democracy*, Young distinguishes her model of democracy from two others. First is AGGREGATIVE DEMOCRACY, which “interprets democracy as a process of aggregating the preferences of citizens in choosing public officials and policies” (Young 2000, 19). Vote-counting, without assuming any form of discussion or collective deliberation, is a paradigm of aggregative democracy. By contrast, deliberative democracy “associate[s] democracy with open discussion and the exchange of views

leading to agreed-upon policies” (Young 2000, 22). In other words, for deliberative democrats, democracy is characterized by public political deliberation.

Young considers herself a deliberative democrat, but distinguishes her model from “narrower” models. Major examples of narrow deliberative democrats, as identified by Young, seem to include Joshua Cohen, Jane Mansbridge, Amy Gutmann and Dennis Thompson, and Habermas (at least sometimes) (Young 2000, 22n13); more recent major examples would probably include Cheryl Misak and Raymond Talisse (Misak 2000; Talisse 2009; see also MacGilvray 2013; Misak and Talisse 2014).<sup>3</sup>

The principal difference between narrow deliberative democrats and Young is her emphasis on emotionality, power relations — specifically, the ways in which power relations within a deliberative democratic process reflect and reinforce power relations within the broader social context — and indeed the connection between emotionality and power. Young argues that narrow deliberative democrats understand deliberation strictly in terms of the dispassionate exchange of arguments (Young 2000, 36-51). Young talks about her view in terms of “reasonable persuasion and judgment” (Young 2000, 39); while the semantic difference is subtle, she clearly wants room in her model for emotionally laden personal narratives, protest marches, and perhaps sometimes even angry denunciations.

Young articulates her model of deliberative democracy with a set of “normative ideals” (Young 2000, 23-5). For my purposes here, we can paraphrase these ideals into the following criterion of legitimacy:

A democratic decision is normatively legitimate only if all those who are affected by it have an equal effective opportunity to participate in a public process of discussion, deliberation, and decision-making, including effective opportunities to present one’s views, question or challenge the views of others, and have one’s questions or challenges answered.

Young argues that narrow models of deliberative democracy effectively deny less-privileged groups opportunities for equal participation, and thus fail the test of legitimacy. Insofar as privileged groups regard the rhetoric of less-privileged groups as emotional and irrational, narrow deliberative democracy’s norm of dispassionate exchange seems to justify marginalizing and ignoring them. A group of protestors on

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3. Young’s view is also distinct from that of HYPOTHETICAL DEMOCRATS, who deploy thought experiments about hypothetical, usually highly idealized, deliberators. Examples of hypothetical democrats include Rawls and other (though not all) contractarians, Habermas (sometimes), and philosopher of science Philip Kitcher (2011a, 2011b). The approach advocated by Bryan Norton in his *Sustainability* falls somewhere between hypothetical and narrow deliberative democracy, perhaps under the influence of Habermas: a model of hypothetical, ideal deliberation is used to suggest norms and design elements for actual deliberative processes (Norton 2005, especially 277ff).

the sidewalk is merely an angry mob, venting their emotions in an inarticulate cry; but angry mobs and inarticulate cries do not need to be included in the dispassionate exchange of arguments; and thus the protestors may be ignored. Indeed, including an angry mob would likely disrupt the dispassionate exchange of arguments, and thus on the narrow deliberative democratic view the protestors *should* be ignored. In this way, Young argues, narrow views of deliberative democracy reproduce existing forms of domination, oppression, and marginalization within deliberative fora. Thus narrow deliberative democracy fails to satisfy the criterion for legitimacy. To distinguish her model from narrow versions, Young sometimes calls it COMMUNICATIVE DEMOCRACY.

As the example in the last paragraph suggests, much of Young's analysis in *Inclusion and Democracy* focuses on rhetorical styles, or the form of communication: which styles of communication (modes, media, dialects, emotionality) are included or not in particular communicative contexts. Here I am more interested in the content of communication: which kinds of concerns and evidence are included or not.

Young goes on to distinguish two ways in which groups can be effectively denied equal opportunity to participate in deliberation, and thus two ways in which deliberation can fail to be legitimate. DE JURE, EXPLICIT, or what Young calls EXTERNAL EXCLUSIONS are the most obvious and familiar; these occur when a group is literally excluded from the deliberative forum, as when literacy tests and poll taxes were used to exclude Blacks from voting under Jim Crow (Young 2000, 53-4). DE FACTO, IMPLICIT, or what Young calls INTERNAL EXCLUSIONS are more subtle. These occur when a group is nominally included, yet “lack[s] effective opportunity to influence the thinking of others” (Young 2000, 55-7). Young's critique of narrow deliberative democracy argues that narrow deliberative democracy creates implicit exclusions, even when it is explicitly inclusive: less-privileged groups can be nominally included in the deliberative process — they can be permitted to make statements at a town hall meeting, for example — and yet effectively excluded — when their rhetoric is regarded as emotional and irrational and hence ignored when the final decision is made.

It might be argued that Young's model is inappropriate to national-level governance in the US. That is, it might be thought that deliberative democracy is appropriate for neighborhoods and small towns, but unworkable for polities with hundreds of millions of inhabitants. Governing a polity as large as the US requires political representation; either Young's conception of legitimacy is utopian (and so irrelevant) or the US federal government as such is illegitimate (and so the conclusion of the last paragraph could have been reached much more directly).<sup>4</sup>

However, this objection may confuse deliberative democracy with direct democracy, and overlooks existing institutions for public deliberation within the US federal

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4. I thank Mark Lance for suggesting a version of this objection.

government. Young (2000, ch. 4) — along with Henry Richardson (2002) and Mark Brown (2009) — argues that mass politics requires institutions for both representation and deliberation, and indeed the flow of information between representative and deliberative institutions. Representatives — whether they are elected officials, political appointees, or career employees in regulatory agencies — must be informed about the concerns and interests of their constituents in order to make decisions that address those concerns and promote those interests. This is only possible insofar as citizens have effective opportunities to explain and debate their concerns and interests in public fora — that is, insofar as there are inclusive institutions for public deliberation. In the US federal government, advisory committees, public meetings with open comment periods, and opportunities for public comments on new regulations are all significant deliberative institutions, albeit ones that are often dominated by commercial interests. Young’s criterion of legitimacy does not require that every individual component institution of the federal government be a forum for public deliberation. Rather, it requires inclusive public deliberation, mechanisms that connect public and governmental deliberation, and that government authorities be appropriately responsive to public concerns.

Following on this last point, it might be argued that basic freedoms of speech and assembly suffice to satisfy Young’s criterion of legitimacy. If concerned citizens can stage a peaceful protest, for example, it might seem that have opportunities to express their opinions and raise questions and challenges. However, Young’s point is that deliberative democracy requires *effective* opportunities to participate in deliberation, and that effective opportunities require that others are appropriately responsive to one’s concerns. An opportunity to protest — or even make a public statement before a government body — is inadequate if it is simply ignored by other citizens and government officials.

### 3. Explicit Exclusions: Public Reason and Expertise

Communicative democracy seems to require a framework of PUBLIC REASON: factual, ethical, and epistemic assumptions shared by all members of the public and that can provide the basis for democratic deliberation (Rawls 1993, lecture VI, and part 4; Gaus 2011). Without such a framework, PUBLIC REASON DEMOCRATS argue, citizens will not be able to understand each others’ views, or the questions or challenges that others raise against one’s own view. In other words, without a shared framework of public reason, members of the public will simply talk past each other.

Public reason needn’t be COMPREHENSIVE, in the sense of giving answers to all possible questions of ethics, justice, and public policy; indeed, in light of “the fact of reasonable pluralism” it shouldn’t be comprehensive (Rawls 1993, 223ff, et al. Gaus 2011, 2-3; Young 2000, 25). Instead, public reason only needs to be sufficient for public deliberators to develop an overlapping consensus. For political purposes,



arguments, concerns, and proposals don't need to be true or objective; they merely need to be INTERSUBJECTIVELY ACCEPTABLE, that is, acceptable (perhaps for different background reasons that are themselves *not* intersubjectively acceptable) from all of the various perspectives that citizens hold.

Health and safety concerns might seem to provide an adequate framework for public reason, at least on many kinds of issues. In its modern form, the health and safety framework emerged in the 1970s and 1980s as a way to ensure that public policy decisions about new technology and environmental regulations were intersubjectively acceptable (Shrader-Frechette 1991, 5-7; Irwin 1995, ch. 3). Note that the framework is more than just a set of concepts: canons of toxicology, institutions for environmental risk assessment, and guidelines for public policy decisionmaking were all developed together, forming what sociologist Ulrich Beck calls the “risk society” (Beck [1986] 1992; Irwin 1995, 43ff) or what, focusing on governance, we might call the RISK POLITY. (The contemporary institutionalization of the health and safety framing will be discussed in further detail in §5.)

The health and safety framing of the GM controversy therefore seems to be in line with deliberative democracy. Working within this framing, members of the public don't need to articulate their concerns in the idiosyncratic language of their particular comprehensive conception. And, this framing suggests, we can side-step arguments about “natural,” “playing god,” or anthropocentric vs. ecocentric values (compare Comstock 2002). Anyone can raise health and safety concerns about some new technology, and everyone can accept the technical standards for assessing these concerns. In short, the health and safety framing seems to provide a basis for intersubjectively acceptable policies, and thereby seems to help a political system satisfy the legitimacy criterion.

But the health and safety framing can also be seen as technocratic (as argued by Beck, Shrader-Frechette, Irwin, and many others). It assumes — and institutionalizes — a sharp distinction between “the public” and “the experts.” The public can raise concerns about a piece of technology or a policy, but only the experts — indeed, only the experts with certain kinds of credentials and institutional affiliations — are qualified to determine whether those concerns have any merit. But that is to say that only these experts are qualified to actually deliberate about the technology or policy. By restricting deliberation to credentialed experts in this way, the health and safety framing explicitly excludes the public.

Specifically, under the health and safety framing, GM opponents are routinely represented as ignorant, emotional, and irrational, in ways that purportedly contrast with scientific expertise. For example, consider Blancke et al. (2015), an opinion piece by a team of plant scientists and philosophers. They propose that

Lay people [sic] are often unable or are simply not interested in investing large amounts of time and energy to acquire a profound grasp of complex technologies. Therefore, when lay people are confronted with and have to evaluate information about GMOs and the risks involved, they will predominantly rely on their intuitive mind. (Blancke et al. 2015, 2)

Because “negative representations produced by anti-GMO activists” appeal to affective, intuitive cognitive processes, they “will tend to outcompete the demonstrations of scientists and other experts that require an enhanced cognitive effort” (Blancke et al. 2015, 3).

Blancke et al. provide limited evidence that the cognitive and affective processes that they discuss — essentialism, teleological and intentional thinking (that is, concerns about “naturalness”), and disgust — are actually at work when GM opponents form anti-GM beliefs and attitudes. But note that, even if these cognitive processes are at work, this does not imply that evidence and logic are not *also* at work. And Blancke et al. do not provide arguments that these processes or the resulting beliefs and attitudes are misleading or incorrect in the case of GM crops.

In a sidebar, Blancke et al. do briefly consider the question of whether “there [are] any reasonable *scientific* worries to account for the opposition against GMOs” (my emphasis). But they dismiss this possibility immediately: “Some reports and studies have claimed that GMOs per se badly affect health, environment, and small farmers in developing countries. These studies, however, turned out to be unsubstantiated.” Then, insofar as GM opponents continue to cite these “unsubstantiated” studies, “the opposition to GMOs resembles pseudosciences, such as ‘scientific’ creationism and homeopathy, that mimic science in an attempt to gain respectability” (Blancke et al. 2015, 4). Blancke et al. do not cite any actual examples of GM opponents articulating their concerns, much less analyze these concerns in any detail. They do not give examples of the reports and studies that are cited to support GM opponents’ concerns, nor any evidence that these reports and studies have been unsubstantiated. The only citation given in this discussion is to a philosophical discussion of pseudoscience that does not discuss GM crops at all. All together, Blancke et al. assume that GM opponents are so obviously irrational that even evidence of their irrationality is unnecessary.

Even if GM opponents do not deploy evidence and logic and have misleading or incorrect beliefs and attitudes concerning GM crops, this does not justify excluding them from democratic deliberation. First, it is plausible that inclusive, respectful deliberation could be a more effective way to correct mistaken beliefs and attitudes than antagonistic, paternalistic shaming, for the simple reason that the former approach is less likely to trigger a defensive or hostile response. Second, the inclusion of people with heterodox beliefs and attitudes can help identify weaknesses in orthodox beliefs

and attitudes, even if the heterodox beliefs and attitudes are ultimately mistaken (compare Longino 1990, ch. 4), and the weaknesses in the orthodox position can have important implications for policy design. For example, suppose it is true that “the notion that growing GM crops with herbicide tolerance will promote so-called superweeds falls back to the same misconception that a weed can be characterized by a single gene” (Blancke et al. 2015, 2), that is, suppose that concerns about herbicide tolerant weeds are based on mistaken genetic beliefs. Nonetheless, more attention to these concerns in the design of policies regulating the use of herbicide tolerant GM crops might have prevented or significantly slowed the evolution of herbicide tolerant weeds, which today is a serious problem (*The Impact of Genetically Engineered Crops on Farm Sustainability in the United States* 2010, 4-5, 13-14, 71ff; Bonny 2015). Finally, Young’s criterion of legitimacy requires that members of the public have effective opportunities to raise questions and challenges, and receive responses to them. This does not require that the questions and challenges be based on correct beliefs and reliable cognitive processes. But it does require that the expert respondents address the actual content of the questions and challenges, and that members of the public have the opportunity to point out when the experts have not understood their questions and challenges. This kind of back-and-forth between “the public” and “the experts” is unlikely to happen when the public are explicitly excluded from technical risk assessment discussions.

While Blancke et al. claim that their argument “is not intended to characterize public worries in general as irrational,” they also assert that the views of GM opponents “arise from sources that cannot be trusted *prima facie*,” and propose “immunizing” people against “negative GMO representations” by “Instructi[ng] ...young people about biotechnology and its implications ...[using] educational strategies that specifically target and tweak intuitive modes of thinking” (Blancke et al. 2015, 4). This science communication proposal falls squarely within the “deficit model” of the public understanding of science, which has been heavily criticized for decades (Wynne 1991; Gross 1994; Gouyon 2016). In short, Blancke et al. represent the public as ignorant, emotional, and irrational, requiring correction and education from experts, and therefore deserving exclusion from actual deliberation about the risks, benefits, and policy uses of GM crops.<sup>5</sup>

Strikingly, the explicit exclusion of GM opponents as members of the ignorant, emotional, irrational, non-expert public can happen even in the context of disagreement *among credentialed experts* about health and safety risks (Demortain 2013). In a

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5. Some readers of earlier drafts have argued that the exclusion of non-experts is an implicit exclusion, not an explicit one, and so the last few paragraphs should belong in the next section. However, I have trouble understanding these arguments; and calling for a one-way communication from experts to an ignorant, irrational public seems to me like a very explicit way of excluding members of the public from deliberation. In any case, since my overall argument in this paper is that food regime concerns are excluded, it is less important whether they are excluded explicitly, implicitly, or both.

Feature piece in *Nature Biotechnology*, science writer and biologist Laura DeFrancesco discusses several technical critiques of conventional toxicological assessments for GM crops. DeFrancesco identifies several different concerns from PhD-holding scientists about standard animal model (lab rat) assessment methods, including short duration, small samples, and interspecies extrapolation (DeFrancesco 2013, 800). Yet near the end of the piece she attributes concerns about GM crops to “sensational food stories,” misinformation, political manipulation, and public expectations of “definitive and absolute answers to questions of food safety” (DeFrancesco 2013, 801). Because they question the mainstream methods and standards for assessing the risks of GM crops, credentialed experts are recast as ignorant, irrational members of the “lay” public.

In these ways, actual deliberation about GM crops is restricted to the subset of credentialed experts who accept current toxicological regulatory standards. *In this light, the health and safety framing is explicitly exclusive and democratically illegitimate.*

It might be argued that political deference to extra-public, nondemocratic forms of expertise is necessary if decisions are to be made on the basis of intersubjectively acceptable good reasons. That is, public reason might require a certain degree of technocracy. For example, at the end of an opinion piece targeting “relativism” and “postmodernism” in the European GM controversy, Marcel Kuntz, a biologist with the French National Center for Scientific Research [CNRS], argues that

In the face of alleged uncertainties, many politicians and citizens find it reassuring to examine several ‘truths’ and shifting paradigms in risk assessment. However, doing so with no reference to indisputable scientific knowledge renders risk assessment unscientific, increases uncertainty and paves the way for arbitrary decisions. (Kuntz 2012)

However, as Mark Brown argues in *Science in Democracy*, the status of uncertainties as merely “alleged” and scientific knowledge as “indisputable” become political matters when these claims take on political or policy significance (Brown 2009, chs. 5, 8). Bracket the arguments of Second Wave sociologists and historians of science — Kuntz’ scapegoat — who were generally concerned with political disputes *within* the scientific community. Even when scientific knowledge claims are beyond dispute *among scientists*, and so might claim clear *epistemic* authority, it is a further question how much and what kind of *political* authority they have *for the purposes of setting public policy*. An enormous body of research that GM crops are safe to eat may warrant very little weight if people’s primary concerns are about the social, political, and economic impacts of these crops, or if there are concerns that this research has been influenced too much by the economic interests of the agricultural biotechnology industry (Krimsky 2015, 24-6).

In other words, toxicology enjoys greater political authority over GM crops than economics, political science, sociology, or STS. This is not because toxicology is epistemologically superior to these other fields, but because of logically prior, often implicit, contingent decisions about which kinds of concerns and which methods of empirical research are relevant to the governance of GM crops. These are political decisions: decisions about which kinds of arguments and evidence can be used by whom to make decisions that carry political authority. In this way political authority comes from other political processes, not the mere fact of epistemic authority. Specifically, in a deliberative democratic polity, the political authority of scientists and scientific knowledge should come from legitimate democratic political deliberation — that is, deliberation in which both experts and “lay” people, both proponents and opponents of GM crops, have effective opportunities to present their views, challenge the views of others, and receive responses to their challenges.

This does not mean that the political authority of scientists is “purely political” and has nothing to do with their epistemic reliability. But it does mean that democratic processes should be used to determine the political standing that scientists should enjoy by virtue of their epistemic reliability. The *political* significance of scientific expertise is a question for *democratic* public deliberation (see also Sarewitz 2004; Pearce and Raman 2014).

All together, my critique of the health and safety framing in this section is not with its reliance on expertise as such. Rather, it’s with the way this framing renders expertise politically unaccountable; that scientific expertise is taken to exclude, and even be opposed to, public deliberation.

#### 4. Implicit Exclusions of Food Regime Concerns

As noted above, Young emphasizes the way norms of “style and idiom” — the form of speech acts — create implicit exclusions (Young 2000, 55-6ff). I am more interested here in implicit exclusions based on the content of claims.<sup>6</sup> Specifically, in the GM controversy, typically only health and safety concerns are recognized and acceptable (and only when they are accompanied by deference to certain credentialed experts, as discussed in the last section). Food regime concerns, by contrast, are typically not recognized or not accepted as legitimate concerns. In this section, I discuss three ways in which food regime concerns — and thus people who hold them — are implicitly excluded by GM proponents: by being conflated with health concerns, dismissed as irrelevant, or responded to with logical non sequiturs.<sup>7</sup>

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6. Issues of media are also relevant: journal publications — even ones sponsored by industry and not peer reviewed — are likely to be received differently from blog posts, self-published books by independent researchers, or whitepapers from advocacy organizations.

7. There are moments in which food regime concerns are recognized and accepted as legitimate. For example, a major recent National Academies report on GM crops (National Academies of Sciences,

Consider first conflation. In an opinion piece targeting GM opponents, Norman Borlaug — agronomist and Nobel Peace Prize winner — represents opponents as “Extremists in the environmental movement largely from rich nations and/or the privileged strata of society in poor nations” who are trying “to stop scientific progress in its tracks” (Borlaug 2000, 488). He quotes concerns about GM crops from two African writers: “The US does not need to grow nor donate genetically modified crops. To donate untested food and seed to Africa is not an act of kindness but *an attempt to lure Africa into further dependence on foreign aid*”; “Countries in the grip of a crisis are *unlikely to have leverage* to say, ‘This crop is contaminated; we’re not taking it’” (quoted in Borlaug 2000, 489, my emphasis). Borlaug immediately dismisses these concerns in terms of health risks and credentialed expertise: “Neither of these individuals offers any credible scientific evidence to back their false assertions concerning the safety of genetically modified foods” (Borlaug 2000, 489).

To be sure, the quotations given by Borlaug gesture at health and safety concerns, with their language of “untested” and “contaminated” food and crops. But the quotations also include food regime concerns — indicated by my emphasis — about the power of postcolonial Africa relative to the US. I might even argue that the food regime concerns are more significant here than the health and safety concerns. And Borlaug does not respond to the food regime concerns at all. It seems that either he does not recognize these concerns or he conflates them with the health and safety concerns. In either case, the food regime concerns are excluded.

It might be objected that Borlaug, an agronomist, should not be expected to recognize food regime concerns. After all, concerns about neocolonialism are well outside of his areas of expertise; he was almost certainly more familiar with safety concerns, and quite reasonably focused on those elements of the quotations.<sup>8</sup> I agree that Borlaug is not culpable, that is, that he cannot be held morally responsible for failing to do something that he lacked the ability to do. However, even if Borlaug is not culpable, his response still has the effect of excluding food regime concerns, and it is this exclusion that matters for democratic legitimacy. Further, the fact that Borlaug, as an agronomist, did not need to have the ability to recognize food regime

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Engineering, and Medicine 2016) includes a full chapter on economic benefits and food regime concerns; over twenty distinct food regime concerns (characterized variously as “economic,” “public and social goods,” or “scientific progress” concerns) in the list of summarized public comments; and discussions of food regime concerns (characterized as “socioeconomic issues”) in the regulation of agricultural biotechnology (National Academies of Sciences, Engineering, and Medicine 2016, 315-6, 333-4). In the chapter, the report committee generally finds that the evidence available to address food regime concerns is limited and generally recommends more and more rigorous empirical research; in the regulatory discussion, the committee recommends that “socioeconomic issues that go beyond product safety are technology-governance issues that should be addressed by policy-makers, the private sector, and the public” (National Academies of Sciences, Engineering, and Medicine 2016, 334). Thanks to Eric Kennedy for encouraging me to note that there are some moments of more productive engagement.

8. I thank an anonymous reviewer for suggesting this objection.

concerns as such — that is, the absence of an expectation that he should be able to recognize food regime concerns, and respond to them appropriately — itself reflects the marginalization of food regime concerns.

Next is dismissal as irrelevant. My example here comes from the end of a multi-article exchange in *AgBioForum*, which describes itself as “the journal of agrobiotechnology management and economics.” The exchange involves Martina McGloughlin — a molecular biologist and biotechnologist by training and, at the time of the exchange, the Director of the Biotechnology Program at the University of California-Davis — and Miguel Altieri and Peter Rosset (McGloughlin 1999; Altieri and Rosset, 1999a, 1999b). Altieri and Rosset raise a number of concerns about GM crops, including lower yields and unforeseeable environmental consequences, but especially food regime concerns. McGloughlin generally ignores the food regime concerns, focusing on yields and health and safety issues until her “Concluding Comments.” There she asserts that “Altieri and Rosset’s arguments are neither scientifically supported [n]or really about biotechnology.” Instead, they’re “primarily directed against Western-type capitalism and associated institutions (e.g., intellectual property rights, the WTO).” This “political battle,” she asserts, should be taken to “other, more appropriate fora” (McGloughlin 1999, 10, her parentheses). Again, this in the pages of a journal for “agrobiotechnology management and economics.” On McGloughlin’s view, food regime concerns are simply irrelevant to the GM crop controversy, and can be dismissed as such.

Finally, there is the use of non sequiturs to respond to food regime concerns. Unlike conflation, this kind of implicit exclusion seems to recognize that food regime concerns are distinct from health and safety concerns; and unlike dismissal, it seems to recognize them as legitimate. However, a logically irrelevant response still fails to give appropriate respect to food regime concerns and the people who hold them. In this way, non sequiturs are also an implicit exclusion of food regime concerns.

For example, in a Comment piece in *Nature* on the use of GM crops in Africa, Whitty et al. recognize two sets of food regime concerns:

- (1) “Growing non-GM crops may make better economic sense if using a GM variety would tie farmers to proprietary seeds or agrochemicals, lock them out of certain European markets, or restrict them to providing only animal feeds.”
- (2) “Much of the European opposition to GM crops, although couched solely as worries about safety, also stems from concerns about the effect of large-scale farming on small-scale farmers, and the potential for biotech companies to create monopolies.” (Whitty et al. 2013, 32)

The following paragraph seems to be Whitty et al.’s only response to the first set of concerns:

Yet decision-makers in developing economies should be wary of a polarized debate that is playing out in countries where the potential benefits to society of improved crop varieties are marginal, and where people's stances towards GM foods do not necessarily reflect a considered view about the scientific technique and its alternatives. (Whitty et al. 2013, 32)

That is, in response to concerns about economic impacts of GM crops on smallholder farmers in Africa, Whitty et al. argue that GM crops have less potential benefits in Europe than in Africa and that Europeans with concerns about GM crops may be misinformed.

The following seems to be Whitty et al.'s response to the second point:

people often equate all biotechnology with genetic engineering — putting the wide range of advanced non-GM techniques used to improve crops, such as tissue culture and marker-assisted breeding, into the 'unacceptable' category. These techniques can greatly assist conventional breeding efforts. (Whitty et al. 2013, 32)

That is, in response to concerns about smallholder farmers and agricultural biotech monopolies, Whitty et al. point out that molecular biology can be used to improve crops in ways that are not strictly genetic modification.

It might be argued that Whitty et al. do not intend for these passages to respond to the food regime concerns they identify in (1) and (2). But there are no other passages in the piece that are any more relevant to these kinds of concerns. So this defense amounts to saying that, rather than committing a gross non sequitur, they have simply failed to respond to these concerns in any way at all. Furthermore, the structural relationship between these quotations suggests that these were indeed intended to be responses to food regime concerns: quotation (1) comes from the first paragraph of the section; what I have quoted as its response is the second paragraph; and quotation (2) and what I have identified as its response form the third paragraph.

All together, there are at least three mechanisms by which food regime concerns are implicitly excluded from the GM controversy: conflation with health and safety concerns, dismissal as irrelevant, and the use of non sequiturs. Members of the public with food regime concerns are not necessarily excluded formally or *de jure*; formally, it might seem that everyone is free to participate in the discussion. But only so long as they raise only health and safety concerns, and defer to expert decisions about the significance of these concerns. Other concerns, or failure to defer to experts, are treated as grounds to have one's views marginalized, ignored, or ridiculed. This



is often a *de facto*, implicit exclusion. And by Young's criterion it is democratically illegitimate.

## 5. Institutions for Health and Safety

The last two sections of this paper have focused on the exclusion of food regime concerns from public deliberation on GM crops. This section considers governmental or regulatory deliberation, or the institutions that have political authority to regulate GM crops. I first consider the problem of explaining the predominance of the health and safety framing in public deliberation. If this framing leads to explicit and implicit exclusions of GM opponents, then why is it so prevalent? I consider two potential explanations, and show that each has substantial limitations. However, the limitations of these other explanations suggest an important role for national-level political institutions. I then focus on the federal agencies that regulate GM crops in the US. I show how these institutions work within the health and safety framing, and show how this is due to both a key White House memo and the statutory basis (that is, the legal foundation) for their regulatory authority over these crops.<sup>9</sup> I propose that this institutionalization of the health and safety framing — at the governmental level — helps explain the predominance of the health and safety framing at the public level.

First, how can we explain the predominance of the health and safety framing in the public discourse on GM crops? One obvious potential explanation is strategic. Insofar as the health and safety framing excludes GM opponents, it is useful for GM proponents to work within that framing. To put it crudely, it is much easier to win a public debate against misinformed, irrational, anti-science zealots than against people with reasonable concerns about political and economic power.

However, this does not explain why GM *opponents* frequently work within the health and safety framing, even entangling food regime concerns together with health and safety concerns. For example, *Natural News* is a major alternative medicine and anti-GM website. A recent piece (which I found by simply searching the site for “GMO”) focuses primarily on health concerns. But food regime concerns also appear throughout the piece, including concerns that GM crops have “Poor financial returns for farmers” and “violate farmers [sic] rights (Monsanto takes farmers’ farms away by lawsuits monthly),” that “Non GMO corn seed became much more expensive in North America after Monsanto produced GM corn seed,” and that “When put into practice, the benefits [of GM crops] accrue to Big Agriculture while the costs are paid for by the consumer and society in the form of higher prices, toxic food, and environmental

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9. These two points have been discussed extensively in the STS and philosophy of technology literature on GM crops. I do not claim any novel contributions with either of these points, but instead review them for readers who are less familiar with US agricultural biotechnology governance.

degradation” (Edwards 2015, parentheses in original; my brackets).<sup>10</sup> These food regime concerns are not placed in a separate section or otherwise presented in a way that would help readers distinguish them from health and safety concerns. Indeed, by interspersing food regime concerns throughout a piece that is primarily about health and safety, the story gives the impression that food regime concerns are somehow a subset of health and safety concerns. This would seem to make it easier, not harder, for GM proponents to conflate and dismiss food regime concerns, which presents a problem for any strategic explanation: GM opponents seem to have good reasons to resist the predominance of the health and safety framing, and yet they play into it.

Both Kinchy, Kleinman, and Autry (2008) and Thompson (2014) give INTERNATIONAL INSTITUTIONAL EXPLANATIONS for the predominance of the health and safety framing. That is, both papers point to the role of international political institutions in shaping the terms of public deliberation, and specifically international trade agreements such as the Sanitary and Phytosanitary [SPS] Agreement of the World Trade Organization. Using the controversy over recombinant bovine growth hormone [rBGH] in the 1990s as a case study, both argue that the SPS Agreement requires that agricultural trade bans be based on “an assessment, as appropriate to the circumstances, of the risks to human, animal or plant life or health” (“[Agreement on the Application of Sanitary and Phytosanitary Measures](#)” 2016, §5.1), thereby excluding food regime concerns. Indeed, both papers argue that the SPS Agreement, and international trade institutions more broadly, presuppose the corporate food regime, that is, the food regime that many GM opponents reject.

This kind of institutional explanation can help us resolve the puzzle for strategic explanations: while GM opponents have good reasons to resist the predominance of the health and safety framing, working within it may be the only way to get any recognition that they have any concerns at all. As Thompson puts it, “regulatory tools that focus on food safety and environmental risk are the only means left to even slow the potentially devastating social and economic consequences of farmer bankruptcy and dispossession” (Thompson 2014, 14).

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10. To be clear, this particular story contains numerous factual claims that are controversial, highly questionable, and in my opinion potentially misleading. It does not include any citations or links to references. In particular, based on my understanding of the state of the empirical literature: GM crops are generally associated with increases in farmers’ profits, though the size of the effect is highly uncertain and context-dependent; Monsanto does sue farmers for knowingly violating their patents, but not for cases of accidental contamination; the price of seed corn has roughly tripled since 1996, but it is not clear to me to what extent this is due to an increase in the real price of non-GM seed corn; and even if GM foods are causing public health problems, the lack of postmarket consumption data for GM foods makes it impossible to empirically attribute any such problems to consuming these foods. *Natural News* is frequently targeted by “anti-anti-GM” writers as a source of misinformation about GM crops. I am quoting *Natural News* here not because I agree with any of their claims — in this particular story or anywhere else — but to illustrate how health and safety and food regime concerns are entangled in a major anti-GM venue.

However, international institutional explanations have a puzzle of their own. In other work, Kleinman, Kinchy, and Autry (2009) argue that different sets of concerns carry more or less weight in different countries. In Europe, at the EU level, health and safety concerns are primary but food regime concerns play a secondary and less explicit role in some cases (Kleinman, Kinchy, and Autry 2009, 366-7). Further, “Austria’s Genetic Engineering Act of 1994 represents an effort to implement the social regulation of biotechnology,” that is, regulation that is responsive to food regime concerns (Kleinman, Kinchy, and Autry 2009, 368-9), while US biotechnology policy is based almost entirely on health and safety concerns (Kleinman, Kinchy, and Autry 2009, 364-5; see also the remainder of this section). This national-level variation limits the explanatory power of international institutional explanations: WTO agreements cannot explain why food regime concerns carry a great deal of weight in Austria but basically none in the US. This variation among nations suggests a need for NATIONAL INSTITUTIONAL EXPLANATIONS, namely, explanations that appeal to the role of the health and safety framing in national-level regulation of GM crops.

US biotechnology policy is primarily based on the “Coordinated Framework,” a memo prepared by the White House Office of Science and Technology Policy [OSTP] (Kingsbury and Jennings 1986).<sup>11</sup> The memo was directly concerned with the question of “whether the regulatory framework that pertained to products developed by traditional genetic manipulation techniques [sic; for example, conventional breeding] was adequate for products obtained with the new techniques [that is, biotechnology]” (Kingsbury and Jennings 1986, 3\*), and concluded that — except for some “microbial products” — adequate statutory authority already existed at the Department of Agriculture’s Animal and Plant Health Inspection Services [APHIS], the Environmental Protection Agency’s Plant Incorporated Protectants program [PIP], and the Department of Health and Human Services through the Food and Drug Administration [FDA]. (In what follows, I refer to these agencies collectively as “the agencies.”) That is, the Coordinated Framework asserts that the agencies generally have adequate authority to regulate biotechnology under existing legislation.<sup>12</sup>

The Coordinated Framework adopts the health and safety framing: the existing legislation is referred to as “health and safety laws” (Kingsbury and Jennings 1986, 3\*), and the memo instructs the agencies “to assure the safety of microbial products and yet minimize impediments to intellectual and economic advances in biotechnology” (Kingsbury and Jennings 1986, 40\*). Economics expertise is mentioned, but only to

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11. The only electronic copy of this document available is a PDF reconstruction of the original text that does not include the original pagination. Starred page numbers used in citations here indicate pages in this PDF file.

12. In July 2015, the OSTP announced a “modernization” effort for the Coordinated Framework (Holdren et al. 2015). As of April 2016, the three agencies have hosted a series of public meetings on biotechnology policy. Since work on this paper began some time before the public meetings, a systematic analysis of public comments is not included here. However, I do hope to conduct such an analysis in the future. Informally, a substantial minority of comments raise food regime concerns, and the agencies have generally ignored these concerns.

“estimate the benefits of the product[s]” (Kingsbury and Jennings 1986, 64). In the next several paragraphs, I show how the health and safety framing is institutionalized at each of the three agencies and at the Patent and Trademark Office.

As an agency, USDA’s mandate is to promote US agriculture. Specifically, APHIS is responsible for protecting the health of agricultural plants and animals. Regarding GM crops, APHIS regulations apply while GM crops are under development: developers must apply for permits from APHIS in order to cultivate experimental test plots. In this permitting process, APHIS is concerned with weeds and plant pathogens. The APHIS 2015-2019 Strategic Plan, goal 4, describes the program’s basic approach to the regulation of GM crops: “Ensure the safety, purity, and effectiveness of veterinary biologics and protect plant health by optimizing our oversight of GE organisms” (*Strategic Plan 2015-2019* 2015, 14). At the end of development, developers apply to APHIS for “nonregulated status.” This allows the crop to be grown without a permit; that is, it can be sold to farmers for general commercial cultivation.

The EPA’s PIP program acquires its regulatory authority from the Federal Insecticide Fungicide and Rodenticide Act [FIFRA]. FIFRA requires pre-market registration of all pesticides; specifically, “the applicant must show that the pesticide ‘when used in accordance with widespread and commonly recognized practice, ...will not generally cause unreasonable adverse effects on the environment’” (Environmental Protection Agency 2001, 37773, quoting 7 USC 136a(c)(5)). “Unreasonable adverse effects” are defined to include “any unreasonable risk to man [sic] or the environment, taking into account the economic, social, and environmental costs and benefits of the use of any pesticide”; that is, adverse effects would seem to include not only health and safety concerns but also food regime concerns. However, as far as I have been able to tell, the only social and economic concerns that are considered in the published regulatory guidelines are the benefits associated with approving the registration or exemption of a GM crop. For example, in a discussion of a major exemption to the pesticide guidelines, the EPA points to the “general benefits to society from the practices of horticulture and of agriculture in producing the food supply and other plant based products (e.g., fiber, lumber), and economic benefits to growers, and the environment” as among the reasons for granting the exemption (Environmental Protection Agency 2001, 37802). Thus, it seems that “unreasonable adverse effects” refer to the health and safety risks of a GM crop as weighted against its potential social and economic benefits. Food regime concerns — social and economic hazards — do not appear to be taken into account.

At the agency level, FDA’s mandate is to protect human health. Primary regulatory responsibility for GM food plants rests with the agency’s Center for Food Safety and Applied Nutrition, and specifically the Plant Biotechnology Consultation Program; there is a separate program for GM food animals in the agency’s Center for Veterinary

Medicine.<sup>13</sup> GM foods are evaluated as potential ADULTERANTS, “an added poisonous or deleterious substance that may render the food injurious to health or a naturally occurring substance that is ordinarily injurious” (Food and Drug Administration 1992, 14\*).<sup>14</sup> One of the key concepts used by FDA in evaluating GM foods is SUBSTANTIAL EQUIVALENCE, which is defined in terms of the presence of known toxicants in the host and donor species; the potential for the transfer of allergens; and the nutritional content of the GM food (in terms of both proteins and other macronutrients, as well as both the normal consumption of the food and as a result of genetic recombination) (Food and Drug Administration 1992, 21\*; for further discussion of the process of regulating GM foods at FDA, see Jasanoff 2005, 132ff; Meghani 2014).

A response to public comments on food animal cloning shows how the health and safety framing is institutionalized at FDA. To its credit, the agency recognizes that “moral, religious, or ethical issues” and economic concerns — for example, consolidation in the dairy industry — are not health and safety concerns; it does not conflate the various categories of concerns. It also does not respond with non sequiturs. Instead, the agency declines to respond to these concerns on the grounds that it “has not been charged with addressing moral, religious, or ethical issues associated with animal cloning for agricultural purposes.” Similarly, “It is not ...FDA’s responsibility to assess potential economic impacts of its regulated products ... The decision to use cloning technology in food producing animals will be up to the individual producer.” (“FDA’s Response to Public Comment on the Animal Cloning Risk Assessment, Risk Management Plan, and Guidance for Industry” 2008; see also Meghani and de Melo-Martín 2009). The FDA’s only constructive response to these food regime concerns is to suggest that “discussions on these ethical concerns about animal cloning for agricultural purposes should be held in the larger context of ...assisted reproductive technologies.” But the agency does not indicate which social institutions might be appropriate for carrying out these discussions, nor which governmental institutions might have the statutory authority to use them as the basis for regulation. While the tone of FDA’s response is much less contemptuous than McGloughlin’s dismissal of Altieri and Rosset, the substance of the response is, like McGloughlin’s, a dismissal of food regime concerns as irrelevant to the agency’s evaluation. Whether because

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13. Although tangential to my argument in this paper, it’s worth noting that the Consultation Program is a voluntary process that does not conclude with a determination that a GM food is safe to eat. That is, first, developers of a new GM food are not required, either by law or by regulation, to consult with the FDA. While the program is voluntary, as I understand it every GM food available in US markets has gone through the program. Next, at the end of the consultation process, FDA does not formally conclude that the food under consideration is safe to eat. Instead, the agency reports that the *developer* has concluded that the food is substantially equivalent to a non-GM food and so does not require premarket review or approval by the agency. Based on a review of composition data provided by the developer, the agency’s own conclusion is that “we have no further questions” about the safety of the GM food. See, for example, “Biotechnology Consultation Agency Response Letter BNF 000144” 2015.

14. The only electronic copy of this document available is an unpaginated web site. Starred page numbers used in citations here indicate pages in a PDF generated using the web browser’s print function.

of the agency's internal culture, lack of requisite social science and ethical expertise, or the limited scope of its statutory authority, food regime concerns are somebody else's problem. But insofar as this somebody else does not exist, they become *nobody's* problem.

In addition to these three regulatory agencies, the US Patent and Trademark Office [PTO] has significant influence over the development and commercialization of GM crops, insofar as PTO is responsible for awarding IP rights over newly-developed crops and the technologies used to make them. Shobita Parthasarathy notes that, in the US, patent award decisions are regarded as narrowly technical questions. Patent examiners base their decisions on the novelty, inventiveness, and utility of the proposal — roughly, whether the proposed invention is actually new and whether it actually works as described — along with legislative and judicial constraints on what kinds of things can be patented. Parthasarathy goes on to argue that there are substantial literacy, bureaucratic, and institutional barriers between PTO and publics. These barriers are maintained using some of the mechanisms that we have seen at work in the GM controversy. For example, in her discussion of some major early biotechnology patent cases, Parthasarathy argues that PTO officials “classif[ied] the contributions of outsiders as subjective ‘opinions’ or ‘ethics,’ which had no place in this technical domain” (Parthasarathy 2011, 273). All together, decisions in PTO exclude both health and safety *and* food regime concerns. Both the economic and health effects of a GM food are irrelevant to the PTO; all that matters is whether the method of producing it is sufficiently novel and reliable.

All together, the three agencies with primary responsibility for regulating GM crops in the US — USDA, EPA, and FDA — operate within under Coordinated Framework and statutory authorities that assume the health and safety framing. While the specific policies and procedures used by these agencies for GM crops are no more than about 30 years old, they are all explicitly and by design extensions of previous policies and procedures and the agencies' institutional cultures and regulatory authority, all of which assume the health and safety framing. According to the political philosophy apparently motivating this regulatory system, regulations can and should be used to protect consumers from illness and injury, and otherwise market processes should determine where and how technologies will be used. Pat Roberts, Republican Senator from Kansas and Chair of the Senate Committee on Agriculture in the 2015-2016 US Congress, stated this explicitly in his comments at the close of a recent hearing on agricultural biotechnology: “Mandates at any level [of government] should be based on science and address the concerns of health and safety. Mandating regulations with any metric or yardstick other than science, health, and safety exceeds the role of government” (“[Agriculture Biotechnology](#)” 2015, from approximate time index 3:12). Economic harms to individual farmers are just the cost of efficiency; and supraindividual harms to communities or cultures are not even on the radar. Thompson traces this view back to John Stuart Mill:

society admits no right, either legal or moral, in the disappointed competitors to immunity from this kind of suffering, and feels called on to interfere only when means of success have been employed which it is contrary to the general interest to permit—namely, fraud or treachery and force. (Mill (1859) 2008, 115, quoted in Thompson 2014, 7)

Given this institutional setting, the predominance of the health and safety framing in public discourse about GM crops is not surprising. As the food animal cloning case illustrates, even when food regime are recognized as distinct and intelligible, government regulators will not or cannot take them into account when making regulatory decisions. Thus, both proponents and opponents of GM crops have compelling strategic reasons to articulate their points of view in terms of health and safety, in both public and regulatory contexts. Proponents can claim that the preponderance of evidence indicates that GM crops are safe, and therefore these crops should be registered or de-regulated for commercial use; opponents have little choice but to present their concerns in terms of health and safety — even when this is a misrepresentation — if they hope to achieve any regulatory traction. Insofar as GM opponents continue to articulate food regime concerns as such, they are effectively excluded from regulatory deliberation.

This national institutional explanation complements the strategic and international institutional explanations for the public predominance of GM crops. National and international institutions determine the payoff matrix, as it were, within which GM opponents must decide how to articulate their concerns. International institutions explain the global predominance of the health and safety framing; differences in national institutions explain why this framing is more or less predominant in different countries.

## 6. Conclusion

In this paper, I have examined the predominance of the health and safety framing of the controversy over GM crops. I have argued that the framing leads to both explicit and implicit exclusions of food regime concerns, and by extension publics who have such concerns. In addition, I have suggested that the predominance of the health and safety framing in the broader public controversy can be explained in part as a strategic response to the fact that this framing is institutionalized in the US regulatory scheme for GM crops.

Young's model of communicative democracy implies that the health and safety framing undermines the legitimacy of public discourse and regulatory decisionmaking on GM crops. GM opponents with food regime concerns lack equal effective opportunities to participate in discussion, deliberation, and decision-making. They

lack effective opportunities to present their views, question and challenge the views of GM proponents, and have their questions and challenges answered.

The connection that I have suggested between public discourse and government institutions for regulating agricultural biotechnology means that this framing is doubly illegitimate at the governmental level. First, insofar as the governmental-level predominance of the health and safety framing contributes to the public-level exclusion, the governmental-level framing contributes to an illegitimate exclusion. And second, because this framing excludes food regime concerns at the governmental level, governmental deliberations are illegitimate on their own, independently of any influence on public discourse.

The predominance of the health and safety framing might also explain why the controversy over GM crops is so intractable. Proponents of GM crops frequently complain that opponents have not been satisfied by the body of evidence (or “scientific consensus”) that indicates that GM crops do not pose any health or safety risks (see, for example Lynas 2015; for critical discussion, see Krinsky 2015). Surprisingly, the controversy remains unsettled, despite this body of evidence; frustratingly, GM opponents do not “listen to reason”; the controversy is intractable. However, this surprise and frustration only makes sense given the health and safety framing. Insofar as GM opponents have food regime concerns that are logically distinct from health and safety concerns, then we should not expect health and safety evidence to assuage their concerns. Feeding GM corn to lab rats does not tell us, one way or the other, whether certain large agricultural biotechnology companies have too much power over small farmers. It is thus unsurprising that the controversy is so intractable.

Finally, my analysis suggests that governmental institutions have a key role to play in moving the GM crops controversy forward. Given statutory limitations on their authority and a lack of relevant expertise, it’s implausible that any of the three agencies could simply incorporate food regime concerns into their regulatory decisionmaking. However, while they may not be able to *respond* to food regime concerns, this does not mean that they cannot *recognize* and *respect* them. For instance, the FDA’s response to food regime concerns surrounding animal cloning shows that the agency is capable of recognizing these concerns as such, even when they lack the authority to regulate based on them. The problem, in this case, was the agency’s lack of respect for these concerns, which were simply dismissed as someone else’s problem. A more respectful approach might have tried to coordinate decisionmaking with an agency that does have the appropriate authority, such as PTO or the Federal Trade Commission (responsible for regulating potential monopolies). Alternatively, FDA might have directed an appeal to legislators, explaining that citizens have these concerns and that the controversy would likely persist until some government agency was given the authority to respond to them. In the context of the GM controversy, either strategy — coordinating with agencies with the appropriate authority, or calling on Congress to grant them the appropriate authority — would at least partly remove the strong incentive for GM



opponents to entangle health and safety concerns with food regime concerns, and thus potentially help clarify the nature of the disagreement.

## References

- Altieri, Miguel, and Peter Rosset. 1999a. "Ten Reasons Why Biotechnology will Not Ensure Food Security, Protect The Environment and Reduce Poverty in the Developing World." *AgBioForum* 2 (3 & 4): 155–62.
- . 1999b. "Strengthening the Case for Why Biotechnology will Not Help the Developing World: A Response to McLaughlin." *AgBioForum* 2 (3 & 4): 226–36. Accessed May 1, 2014. <http://agbioforum.org/v2n34/v2n34a14-altieri.htm>.
- Ankley, Gerald T., Richard S. Bennett, Russell J. Erickson, Dale J. Hoff, Michael W. Hornung, Rodney D. Johnson, David R. Mount, et al. 2010. "Adverse outcome pathways: A conceptual framework to support ecotoxicology research and risk assessment." *Environmental Toxicology and Chemistry* 29, no. 3 (March): 730–41. doi:10.1002/etc.34.
- Beck, Ulrich. (1986) 1992. *Risk Society: Towards a New Modernity*. Translated by Mark Ritter. London, Newbury Park, and New Delhi: Sage Publications.
- Biddle, Justin. 2014. "Can patents prohibit research?: On the social epistemology of patenting and licensing in science." *Studies in History and Philosophy of Science* 45:14–23. doi:10.1016/j.shpsa.2013.12.001.
- Blancke, Stefaan, Frank Van Breusegem, Geert De Jaeger, Johan Braeckman, and Marc Van Montagu. 2015. "Fatal Attraction: The Intuitive Appeal of GMO Opposition." *Trends in Plant Science* (April 10). doi:10.1016/j.tplants.2015.03.011.
- Bonny, Sylive. 2015. "Genetically Modified Herbicide-Tolerant Crops, Weeds, and Herbicides: Overview and Impact." *Environmental Management*. doi:10.1007/s00267-015-0589-7.
- Borlaug, Norman. 2000. "Ending World Hunger: The Promise of Biotechnology and the Threat of Antiscience Zealotry." *Plant Physiology* 124 (October): 487–90.
- Brandt, Marisa. 2014. "Zapatista corn: A case study in biocultural innovation." *Social Studies of Science* 44, no. 6 (December): 874–900. doi:10.1177/0306312714540060.
- Bronson, Kelly. 2014. "Reflecting on the Science in Science Communication." *Canadian Journal of Communication* 39:523–37.
- Brown, Mark. 2009. *Science in Democracy: Expertise, Institutions, and Representation*. Cambridge, MA: MIT Press.
- Burkhardt, Jeffrey. 1992. "On the ethics of technical change: The case of bST." *Technology in Society* 14 (2): 221–43. doi:10.1016/0160-791X(92)90005-U.
- Busch, Lawrence, William Lacy, Jeffrey Burkhardt, and Laura Lacy. 1991. *Plants, Power, and Profit: Social, Economic, and Ethical Consequences of the New Biotechnologies*. Blackwell Publishing.
- Comstock, Gary. 2002. "Ethics and Genetically Modified Foods: Debating Biotechnology." Chap. 11 in *Genetically Modified Foods*, edited by Michael Ruse and David Castle, 88–107. Amherst, NY: Prometheus Books.
- Cook, Guy, Elisa Pieri, and Peter Robbins. 2004. "'The Scientists Think and the Public Feels': Expert Perceptions of the Discourse of GM Food." *Discourse Society* 15 (4): 433–49. doi:10.1177/0957926504043708.
- DeFrancesco, Laura. 2013. "How safe does transgenic food need to be?" *Nature Biotechnology* 31, no. 9 (September): 794–802. doi:10.1038/nbt.2686.
- Demortain, David. 2013. "Regulatory Toxicology in Controversy." *Science, Technology, & Human Values* 38, no. 6 (May 27): 727–48. doi:10.1177/0162243913490201.
- Edwards, Joel. 2015. "GMOs are dangerous to our health, according to latest independent research." *Natural News* (July 19). Accessed September 29, 2015. [http://www.naturalnews.com/050454\\_GMO\\_research\\_biotech\\_dangers\\_health\\_issues.html](http://www.naturalnews.com/050454_GMO_research_biotech_dangers_health_issues.html).
- Environmental Protection Agency. 2001. "Regulations Under the Federal Insecticide, Fungicide, and Rodenticide Act for Plant-Incorporated Protectants (Formerly Plant-Pesticides)." *Federal Register* (July 19): 37772–37817.
- Ervin, David, Leland Glenna, and Raymond Jussaume Jr. 2010. "Are Biotechnology and Sustainable Agriculture Compatible?" *Renewable Agriculture and Food Systems* 25, no. 2 (June): 143–57. doi:10.1017/S1742170510000189.
- Food and Drug Administration. 1992. "Foods Derived from New Plant Varieties." *Federal Register* 57, no. 22984 (March 29). Accessed September 5, 2015. <http://www.fda.gov/Food/GuidanceRegulation/GuidanceDocumentsRegulatoryInformation/Biotechnology/ucm096095.htm>.
- Food Biotechnology: A Communicator's Guide to Improving Understanding*. 2013. International Food Information Council Foundation.
- Friedmann, Harriet. 1993. "The Political Economy of Food: A Global Crisis." *New Left Review* 1/197 (January-February): 29–57.
- . 2005. "From Colonialism to Green Capitalism: Social Movements and Emergence of Food Regimes." *Research in Rural Sociology and Development* 11:227–64. doi:10.1016/S1057-1922(05)11009-9.
- Gaus, Gerald. 2011. *The Order of Public Reason*. Cambridge, UK and New York: Cambridge University Press.
- Glenna, Leland, John Tooker, Rick Welsh, and David Ervin. 2015. "Intellectual Property, Scientific Independence, and the Efficacy and Environmental Impacts of Genetically Engineered Crops." *Rural Sociology* 80, no. 2 (June): 147–72. doi:10.1111/ruso.12062.
- Goldburg, Rebecca, Jane Rissler, Hope Shand, and Chuck Hassebrook. 1990. *Biotechnology's Bitter Harvest*. Technical report. Biotechnology Working Group, March.

- Gouyon, Jean-Baptiste. 2016. "1985, Scientists can't do science alone, they need publics." *Public Understanding of Science* (May 25). doi:10.1177/0963662516650361.
- Gross, Alan. 1994. "The roles of rhetoric in the public understanding of science." *Public Understanding of Science* 3, no. 1 (January): 3–23. doi:10.1088/0963-6625/3/1/001.
- Hicks, Daniel. 2015. "Epistemological Depth in a GM Crops Controversy." *Studies in History and Philosophy of Biological and Biomedical Sciences*. doi:10.1016/j.shpsc.2015.02.002.
- Hicks, Daniel, and Roberta Millstein. 2016. "GM Crops: Non-Health Issues." In *Encyclopedia of Food and Agricultural Ethics*, edited by Paul Thompson and David Kaplan. Springer, July 28. doi:10.1007/978-94-007-6167-4\_545-1.
- Holdren, John, Howard Shelanski, Darci Vetter, and Christy Goldfuss. 2015. *Modernizing the Regulatory System for Biotechnology Products*. White House Office of Science and Technology Policy Memo, July 2. Accessed May 3, 2015. [https://www.whitehouse.gov/sites/default/files/microsites/ostp/modernizing\\_the\\_reg\\_system\\_for\\_biotech\\_products\\_memo\\_final.pdf](https://www.whitehouse.gov/sites/default/files/microsites/ostp/modernizing_the_reg_system_for_biotech_products_memo_final.pdf).
- Howard, Don. 2009. "Better Red than Dead: Putting an End to the Social Irrelevance of Postwar Philosophy of Science." *Science and Education* 18, no. 2 (February): 199–220.
- Hubbard, Kristina, and Neva Hassanein. 2012. "Confronting coexistence in the United States: organic agriculture, genetic engineering, and the case of Roundup Ready® alfalfa." *Agriculture and Human Values* 30, no. 3 (September): 325–35. doi:10.1007/s10460-012-9394-6.
- Irwin, Alan. 1995. *Citizen Science: A Study of People, Expertise and Sustainable Development*. New York: Routledge.
- James, Harvey, Mary Hendrickson, and Philip Howard. 2013. "Networks, Power and Dependency in the Agrifood Industry." In *The Ethics and Economics of Agrifood Competition*, edited by Harvey James, 99–126. Springer. doi:10.1007/978-94-007-6274-9\_6.
- Jasanoff, Sheila. 2005. *Designs on nature: Science and democracy in Europe and the United States*. Princeton University Press.
- Johnson, Nathanael. 2014. "What I learned from six months of GMO research: None of it matters." Grist. January 9. Accessed January 14, 2014. <http://grist.org/food/what-i-learned-from-six-months-of-gmo-research-none-of-it-matters/>.
- Kinchy, Abby, Daniel Lee Kleinman, and Robyn Autry. 2008. "Against Free Markets, Against Science? Regulating the Socio-Economic Effects of Biotechnology." *Rural Sociology* 73, no. 2 (June): 147–79. doi:10.1526/003601108784514570.
- Kingsbury, David T., and Jerry D. Jennings. 1986. "Coordinated Framework for Regulation of Biotechnology." *Federal Register* 51, no. 23302 (June 18). Accessed May 3, 2016. [https://www.aphis.usda.gov/brs/fedregister/coordinated\\_framework.pdf](https://www.aphis.usda.gov/brs/fedregister/coordinated_framework.pdf).
- Kitcher, Philip. 2011a. *Science in a Democratic Society*. Amherst, NY: Prometheus Books.
- . 2011b. *The Ethical Project*. Cambridge, MA and London: Harvard University Press.
- Kleinman, Daniel, and Abby Kinchy. 2003. "Why Ban Bovine Growth Hormone?: Science, Social Welfare, and the Divergent Biotech Policy Landscapes in Europe and the United States." *Science as Culture* 12, no. 3 (September): 375–414. doi:10.1080/09505430309010.
- Kleinman, Daniel, Abby Kinchy, and Robyn Autry. 2009. "Local variation or global convergence in agricultural biotechnology policy?: A comparative analysis." *Science and Public Policy* 36 (5): 361–71. doi:10.3152/030234209x442043.
- Krimsky, Sheldon. 1982. *Genetic Alchemy*. Cambridge, MA: MIT Press.
- . 2015. "An Illusory Consensus behind GMO Health Assessment." *Science, Technology & Human Values* 40, no. 6 (November): 883–914. doi:10.1177/0162243915598381.
- Kuntz, Marcel. 2012. "The Postmodern Assault on Science." *EMBO Reports* 13:885–89.
- Lacey, Hugh. 1999. *Is Science Value Free?: Values and Scientific Understanding*. Routledge.
- . 2002. "Assessing the Value of Transgenic Crops." *Science and Engineering Ethics* 8 (4): 497–511. doi:10.1007/s11948-002-0003-8.
- . 2015. "'Holding' and 'endorsing' claims in the course of scientific activities." *Studies in the History and Philosophy of Science* 53 (October): 89–95. doi:10.1016/j.shpsa.2015.05.009.
- Lacy, William. 2002. "Agricultural Biotechnology, Socioeconomic Issues, and the Fourth Criterion." In *Encyclopedia of Ethical, Legal and Policy Issues in Biotechnology*. John Wiley & Sons, Inc. doi:10.1002/0471250597.mur058.
- Lang, John, Karen O'Neill, and William Hallman. 2003. "Expertise, Trust, and Communication about Food Biotechnology." *AgBioForum* 6 (4): 185–90.
- Longino, Helen. 1990. *Science as Social Knowledge*. Princeton: Princeton University Press.
- Lynas, Mark. 2015. "With G.M.O. Policies, Europe Turns Against Science." *New York Times* (October 24). Accessed December 14, 2015. <http://www.nytimes.com/2015/10/25/opinion/sunday/with-gmo-policies-europe-turns-against-science.html>.
- Ma, Michelle. 2012. "Anticipating and Reducing the Unfairness of Monsanto's Inadvertent Infringement Lawsuits: A Proposal to Import Copyright Law's Notice-and-Takedown Regime into the Seed Patent Context." *California Law Review* 100, no. 3 (June 10): 691–720. doi:10.15779/Z380Q52.
- MacGilvray, Eric. 2013. "Democratic Doubts: Pragmatism and the Epistemic Defense of Democracy." *Journal of Political Philosophy* 22 (1): 105–23. doi:10.1111/jopp.12017.
- Marco, Alan, and Gordon C. Rausser. 2008. "The Role of Patent Rights in Mergers: Consolidation in Plant Biotechnology." *American Journal of Agricultural Economics* 90, no. 1 (February): 133–51. doi:10.1111/j.1467-8276.2007.01046.x.
- McGloughlin, Martina. 1999. "Ten Reasons Why Biotechnology will be Important to the Developing World." *AgBioForum* 2 (3 & 4): 163–74. Electronic version does not include page numbers, accessed May 1, 2014, <http://agbioforum.org/v2n34/v2n34a04-mcgloughlin.htm>.

- McMichael, Philip. 2005. "Global Development and the Corporate Food Regime." *New Directions in the Sociology of Global Development* 11:265–99. doi:10.1016/S1057-1922(05)11010-5.
- Meghani, Zahra. 2014. "Risk Assessment of Genetically Modified Food and Neoliberalism: An Argument for Democratizing the Regulatory Review Protocol of the Food and Drug Administration." *Journal of Agricultural and Environmental Ethics* 27, no. 6 (December): 967–89. doi:10.1007/s10806-014-9511-1.
- Meghani, Zahra, and Inmaculada de Melo-Martin. 2009. "The U.S. Food and Drug Administration's Evaluation of the Safety of Animal Clones: A Failure to Recognize the Normativity of Risk Assessment Projects." *Bulletin of Science, Technology & Society* 29, no. 1 (February): 9–17. doi:10.1177/0270467608329950.
- Middendorf, Gerad, Mike Skladany, Elizabeth Ransom, and Lawrence Busch and. 1998. "New agricultural biotechnologies: The struggle for democratic choice." *Monthly Review* 50 (July-August): 85–96.
- Mill, John Stuart. (1859) 2008. *On Liberty*. Edited by Jonathan Bennett. Early Modern Texts. Accessed September 29, 2015. <http://www.earlymoderntexts.com/assets/pdfs/mill1859.pdf>.
- Misak, Cheryl. 2000. *Truth, Politics, Morality: Pragmatism and Deliberation*. New York: Routledge.
- Misak, Cheryl, and Robert Talisse. 2014. "Debate: Pragmatist Epistemology and Democratic Theory: A Reply to Eric MacGilvray." *Journal of Political Philosophy* 22 (3): 366–76. doi:10.1111/jopp.12033.
- National Academies of Sciences, Engineering, and Medicine. 2016. *Genetically Engineered Crops: Experiences and Prospects*. The National Academies Press. doi:10.17226/23395.
- Nestle, Marion. 2010. *Safe Food: Bacteria, Biotechnology, and Bioterrorism*. Second edition. Berkeley and Los Angeles: University of California Press.
- Norton, Bryan. 2005. *Sustainability: A philosophy of adaptive ecosystem management*. University of Chicago Press.
- Parthasarathy, Shobita. 2011. "Whose Knowledge? What Values? The Comparative Politics of Patenting Life Forms in the United States and Europe." *Policy Sciences* 44:267–88. doi:10.1007/s11077-011-9133-7.
- Pearce, Warren, and Sujatha Raman. 2014. "The new randomised controlled trials (RCT) movement in public policy: Challenges of epistemic governance." *Policy Sciences* 47, no. 4 (December): 387–402. doi:10.1007/s11077-014-9208-3.
- Rawls, John. 1993. *Political Liberalism*. New York: Columbia.
- Richardson, Henry. 2002. *Democratic Autonomy*. Oxford University Press.
- Sagar, Ambuj, Arthur Daemmrich, and Mona Ashiya. 2000. "The Tragedy of the Commons: Biotechnology and Its Publics." *Nature Biotechnology* 18 (January): 2–4. doi:10.1038/71861.
- Sappington, Thomas W., Kenneth R. Ostlie, Christina DiFonzo, Bruce E. Hibbard, Christian H. Krupke, Patrick Porter, Steven Pueppke, Elson J. Shields, and Jon J. Tollefson. 2010. "Conducting public-sector research on commercialized transgenic seed: In search of a paradigm that works." *GM Crops* 1 (March/April): 1–4. doi:10.4161/gmcr.1.2.10833.
- Sarewitz, Daniel. 2004. "How Science Makes Environmental Controversies Worse." *Environmental Science and Policy* 7 (5): 385–403. doi:10.1016/j.envsci.2004.06.001.
- Shrader-Frechette, Kristin. 1991. *Risk and Rationality: Philosophical Foundations for Populist Reforms*. Berkeley and Los Angeles: University of California Press.
- Strategic Plan 2015-2019*. 2015. Technical report. United States Department of Agriculture Animal and Plant Health Inspection Service.
- Talisse, Robert. 2009. *Democracy and Moral Conflict*. Cambridge, UK and New York: Cambridge University Press.
- The Impact of Genetically Engineered Crops on Farm Sustainability in the United States*. 2010. Washington, DC: National Research Council. Accessed December 11, 2011. [http://www.nap.edu/catalog.php?record\\_id=12804](http://www.nap.edu/catalog.php?record_id=12804).
- Thompson, Paul. 2014. "The GMO Quandary and What it Means for Social Philosophy." *Social Philosophy Today* (June 13). doi:10.5840/socphiltoday201461210.
- Thompson, Paul, and William Hannah. 2008. "Food and Agricultural Biotechnology: A Summary and Analysis of Ethical Concerns." *Advances in Biochemical Engineering/Biotechnology* III:229–264. doi:10.1007/10\_2008\_100.
- "Agriculture Biotechnology: A Look at Federal Regulation and Stakeholder Perspectives." 2015. United States Senate. October 21. Accessed December 14, 2015. <http://www.ag.senate.gov/hearings/agriculture-biotechnology-a-look-at-federal-regulation-and-stakeholder-perspectives>.
- "FDA's Response to Public Comment on the Animal Cloning Risk Assessment, Risk Management Plan, and Guidance for Industry." 2008. U.S. Food and Drug Administration. Version of record with actual publication date not available. Accessed December 14, 2015. <http://www.fda.gov/AnimalVeterinary/SafetyHealth/AnimalCloning/ucm055491.htm>.
- "Biotechnology Consultation Agency Response Letter BNF 000144." 2015. U.S. Food and Drug Administration. May 27. Accessed December 14, 2015. <http://www.fda.gov/Food/FoodScienceResearch/GEPlants/Submissions/UCM451465>.
- Whitty, Christopher, Monty Jones, Alan Tollervey, and Tim Wheeler. 2013. "Africa and Asia Need a Rational Debate on GM Crops." *Nature* 497 (May 2): 31–3. doi:10.1038/497031a.
- "Agreement on the Application of Sanitary and Phytosanitary Measures." 2016. World Trade Organization. Accessed January 21. [https://www.wto.org/english/docs\\_e/legal\\_e/15sps\\_01\\_e.htm](https://www.wto.org/english/docs_e/legal_e/15sps_01_e.htm).
- Wright, Susan. 1994. *Molecular politics: Developing American and British regulatory policy for genetic engineering, 1972-1982*. Chicago: University of Chicago Press.
- Wynne, Brian. 1991. "Knowledges in Context." *Science, Technology, & Human Values* 16, no. 1 (January): III–21.
- Young, Iris Marion. 2000. *Inclusion and Democracy*. Oxford University Press.