Reflecting on the Science in Science Communication

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ABSTRACT Science communication is often understood as the transmission of facts to ignorant audiences. Science and Technology Studies allows a different perspective on science—as open to negotiation with other knowledges and institutions—and therefore a different perspective on its communication. Within an STS perspective, what counts as scientific fact or legitimate expertise takes shape within communicative acts. This article demonstrates the analytical purchase given by taking such an approach to science communication by applying it to a case analysis of biotechnology resistance on the Canadian Prairie.

KEYWORDS Science communication; Discourse analysis; Constructivism; Biotechnology; Controversy

Introduction
The dominant approach to science communication assumes that science constitutes secure measurable knowledge that an unknowledgeable public lacks and needs. Historically, science communication campaigns have therefore aimed at educating the public about science and its benefits (Brossard & Lewenstein, 2010). Although public education approaches still dominate, they have long been subject to criticism for failing to account for rich public knowledge (for example, see Wynne, 1992) and for failing to bring publics on board with emergent technologies (for example, see Eichelbaum, Allan, Fleming & Anderson, 2001). Decades of education and advocacy around biotechnology, for instance, have yet to secure it as entirely unproblematic for all publics (Jasanoff, 2003; Eichelbaum, Allan, Fleming & Anderson, 2001).

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Western Canadian grain farmers’ resistance to biotechnologies became visible on the Canadian Prairie in 1998, when Percy Schmeiser received notice that Monsanto’s Roundup Ready™ canola was discovered growing on his property. For Monsanto, this constituted an infringement of its intellectual property. He had not signed the requisite contract nor paid to use their seeds. To Schmeiser, the presence of this canola was pollution contaminating his fields. He found crop biotechnologies expensive, and had developed his own methods and tools for successfully farming without relying on biotechnologies. At the time, this placed him among roughly one-quarter of all Saskatchewan farmers (Statistics Canada, 2006). Unlike the hundreds of farmers who every year settle out of court over out of place biotechnology (see Center for Food Safety, 2005), Schmeiser countersued, insisting that he had not intentionally planted Monsanto’s seed technologies nor benefitted from their presence on his land. The conflict between Schmeiser and Monsanto moved through the Canadian court system, ending in a five-four majority Supreme Court ruling against Schmeiser in 2004.

In this article, I focus on the countersuit between Schmeiser v. Monsanto to examine how science communication through the Canadian court system may be legitimating particular kinds of knowledge and servicing particular interests at the exclusion of others. I argue that using a Science and Technology Studies (STS) perspective as a basis for interrogating science communication focuses attention on how science is constructed—not just communicated as an *a priori* set of facts—in acts of science communication.

An STS approach is useful in revealing that the farmers mobilized into lawsuits against Monsanto (including Schmeiser) are primarily concerned with the social and political context of scientific facts used in biotechnology regulation, rather than the science *per se*. An STS approach also helps illuminate the ways in which legal actors’ representations of science have re-stabilized the normative boundary separating science from non-science within the Canadian regulatory context.

**An STS perspective on science communication**

Jane Gregory and Simon Jay Lock (2008) suggest that by the end of the twentieth century a “new mood” was struck in the developed world’s science-society relationship, such that scientific institutions were acutely aware of the need for public support for science. In 1985, the Royal Society of London published a report titled *The Public Understanding of Science* (known as the Bodmer Report, after its author Lord Bodmer), which was commissioned with the belief that general interest in, and support for, science could be enhanced if scientists communicated the benefits of science to the wider public. In typical historical accounts, the Bodmer report marks the beginning of the Public Understanding of Science (PUS) field that is characterized by vigorous efforts, in academic and policy circles, to use science education to instill confidence and support for the scientific enterprise among members of the public (Turner, 2008). Many of these educational and academic initiatives are published the official PUS journal, *Public Understanding of Science* (since 1992).

PUS approaches are informed by a deficit model of science communication within which publics are assumed to be deficient in technical matters relating to sciences and technologies. The deficit model is supported by normative ideologies that view science as a value neutral body of knowledge called scientific fact, to be transferred (Gregory
from experts to an ignorant public (often via mediators like policymakers and science journalists). Hence, only they possess the requisite expertise to guide scientific agenda-setting and policymaking. Brian Wynne (2007) labels this view “scientism” (see also Sarewitz, 2004). The operation of a deficit model of science communication is confirmed by a host of empirical studies that reveal scientists and policymakers conceptualize publics as “emotional and ignorant” (Cook, 2004, p. 38) and their opposition to technologies as a product of ignorance (see Collins & Evans, 2002; Cook & Robbins, 2002; Gregory & Miller, 1998; Priest, 2001).

In the 1990s, social science surveys of public knowledge of science were conducted in the U.K. to give purchase to the deficit model of science communication (Gregory & Lock, 2008). The most publicized of these efforts was conducted in 1989 by John Durant and colleagues, who later published their findings in *Nature* (see Durant, Evans, & Thomas, 1989). Such quantitative surveying of public knowledge has since been heavily criticized—including by John Durant himself (see Durant, 1999, as well as Evans & Durant, 1995)—for failing to show a definitive link between knowledge about and attitudes toward science (for example, see Lambert & Rose, 1996). The findings of these surveys also imply that decades of public education in science has failed to enhance the general literacy of publics or brought them on board with emerging scientific practices and technologies (Einsiedel, 2008).

Scientism also appears to inform the dominant approaches to science in the law. Just as “the conventional framing of public understanding of science misleadingly reifies scientific knowledge, as if it were objective and context-free” (Wynne, 1992, p. 282), empirical research shows that many judges and lawyers conceptualize science as purified from culture (Romanucci-Ross & Tancredi, 2007). The law’s definition of science is fairly uncluttered: “[t]he process by which knowledge is systematized or classified through the use of observation, experimentation, or reasoning” (Feldman, 2009, p. 98). Science and Technology Studies (STS) advances an approach for conceptualizing science in which scientific knowledge may be characterized as being *constructed*:

scientific knowledge is made rather than found (by “discovering” nature and simply gathering facts). Above all, this making involves a social process: science is human handiwork. This is not to suggest that it is only a social process … scientific knowledge relates to nature as a map relates to the real world. … Although various maps of the same part of the world can be equally valid, … not just any map is possible. (Bijker, Bal, & Hendriks, 2009, p. 29)

This “contextual foundation” (Bijker et al., 2009, p. 24; Collins & Pinch, 1993; Irwin, 1995; Wynne, 1992) means that STS scholars do not make an *a priori* distinction between (objective) scientific knowledge and other (subjective) knowledges. Within an STS perspective, science is not a neatly bounded entity but something that takes shape through communication processes, by various actors including non-scientists (e.g., activists, farmers, lawyers, policymakers, regulators) who participate in drawing boundaries around what comes to count as properly scientific (e.g., Jasanoff, 1995). Put simply, science takes shape in negotiation with other institutions and forms of knowledge.
Applying this view to the courts suggests that these institutions go beyond setting the normative standards for what people are permitted to do with technologies. It also positions legal discourses as political representations that effect changes in material practices, self-conceptions and everyday lives (Jasanoff, 1995). Calling a seed “intellectual property” protects the interests of its supposed “creators” via a stringent legal regime that directly conflicts with historical practices of seed-saving, and black-boxes (Latour, 1987), or makes invisible the historical contributions of farmers to seed science. Other research about the lawsuit being analyzed here tends to detail the normative standard-setting of the law (e.g., telling farmers what they are permitted to do with the patented seeds) (c.f. Bernhardt, 2005; de Beer, 2005; Garforth & Ainslie, 2006; Kershen, 2002; Muller, 2006; Sudduth, 2001; Ziff, 2005), while overlooking the social, political and economic sources of power derived from the authoritative distinctions made around science and technology in the courts.

To claim that conceptions of science are often fluid prior to being dealt with in court processes does not negate the existence of long-standing cultural conceptions of science. Those instances in which cases involving science and technology do arrive before the courts, however, represent potentially destabilizing moments in long-standing and dominant conceptions of science and technology.

**Methodology**

There were two phases in this study of biotechnology controversy on the Canadian Prairie. The first consisted of an ethnographic exploration of Western Canadian farmers organized into legal action against Monsanto. The second involved a textual analysis of decision law in *Schmeiser v. Monsanto*. In 2002, I moved to Saskatchewan to study a particular group of farmers resisting agricultural biotechnologies in the legal arena. Working against the notion that public opposition to science is caused by ignorance, my goal was to give voice to an oppositional public’s descriptions of biotechnologies and to detail the culture of farming in an era of high technologies (see Bronson, 2009). The method chosen to study this farming culture was a critical ethnography, or a politically motivated cultural description that uses qualitative analysis to interpret meanings from these descriptions (Morse & Richards, 2002).

Observational data about Saskatchewan farming that was organized in and around legal action against Monsanto was conducted throughout 2002–2004. The ethnographic data were gathered with the help of a camera, tape-recorder, and pen and paper, and was built over many hours spent in farmer’s fields, at farmhouses, at protests, and at a number of local “coffee row,” among other cultural sites. Most of the participant farmers in the sample followed organic farming methods and all avoided crop biotechnologies. This placed them, at the time, in a minority farming group (Statistics Canada, 2006). Twenty open-ended key informant interviews also were conducted. Reflecting the demographic distribution of the farming community in Saskatchewan, more than half of the participants were male.

Critical discourse analysis (CDA) was used to examine how science was communicated in legal texts from *Schmeiser*. Situated within a constructivist theoretical framework, CDA transcends transmission models of communication (Shannon & Weaver, 1949), viewing discourse as helping to shape material realities. It is overtly political,
and using this method within the current context meant attending to representations of science in legal texts with an eye to how interests are actually produced (or reproduced) through the text (van Dijk, 1998).

From an STS framework, and using CDA, the way in which science and technology are communicated in the courts is understood as political representations that shape ways of thinking (Foucault, 1977; Lakoff & Johnson, 1980). In other words, the mechanisms of science communication—and in particular the authoritative acts of science communication emanating from the courts—are seen as helping to shape and/or solidify conceptions of science and technology, as well as contributing to particular relationships of power around them. As Lawrence Grossberg (1987) puts it, texts set “the conditions of possibility that enable a particular practice or statement to exist in a specific social context and that enable people to live their lives in different ways” (p. 88). Sheila Jasanoff (1995) echoes this view, emphasizing the need for analyses of science in the law to pay attention to the “informal practices and techniques by which courts certify the facticity of some claims and deny the validity of others” (p. 44), instead of simply focusing on the formal legal rules (like the U.S. Daubert standard) in deciding what constitutes reliable scientific knowledge.

**Contextual public engagements with biotechnology**

By the time of the first Canadian release of crop biotechnologies in 1996, many Canadian farmers were well aware that exclusion from seeds is vital to the maintenance of corporate and political dominance over their lives. Smaller seed companies and seed science had been privatized with palpable effects on farmers (Kloppenburg, 1988; Kneen, 1995). Adding to farmer unease about seed contracts is the evidence that crop biotechnologies reseed themselves without intervention (Gepts, 2005), thereby making farmers vulnerable to infringement lawsuits.

The deficit model of science communication is not very helpful in making sense of the current biotechnology controversy in Western Canada because farmers’ concerns do not fit within the epistemic space that this model affords. Regulatory assessments often do not include consideration of the community or societal health implications of biotechnologies. As can be seen from a 1996 government of Canada report about public confidence in biotechnology, regulators describe risk as a technical problem for the laboratory rather than thinking about what is not yet known, about possible undesirable outcomes from technologies:

> The trigger we use to review a new product for its safety to human health and to the environment is not dependent upon the process [the techniques of gene transfer] that is used to develop it. It is dependent upon the risk the particular product poses ... if it poses a potential risk we are going to review it. (Standing Committee on Environment and Sustainable Development, 1996)

The farmers in my sample did not lack scientific understandings, but, unlike the regulators, they described crop biotechnologies within the context of a wide range of social, political and cultural implications. They described, in detail, the limitations of the current working conception of risk within biotechnology regulation: a reductionist
framing of biotechnological risk such that the laboratory process of inserting novel genes into organisms is incapable of creating yet unknown (or even unknowable) qualities in them (see also Kinchy, 2012). These individuals argued for consideration of an ecological model of risk, and were especially concerned about the ways in which community relationships change under corporate seed contracts, which grant farmers limited access to crop biotechnologies and prevent them, by law, from saving the seeds for use in subsequent years (Magnan, 2004, p. 306).

The participating farmers expressed concern over the limitations of the facts being used in regulatory decision-making, as well as the context in which regulatory “facts” are derived (corporate, not public, laboratories). They also outlined concern about the assumption that high technologies are the engine of individual farm as well as national wellbeing that seemingly drives government seed research funding. As one farmer reported, the problem is not gene transfer, but the domination of a crop biotechnology “value system” over the agricultural research and regulatory agenda at the expense of alternative ways of organizing life. She elaborated:

Biotechnology is a different value system. The whole value around clean fields, monocultures, maximizing production, not a weed in sight … the thousand apples all looking exactly the same way … it’s part of a general cultural bias which permeates the whole agricultural system from research to implementation towards privatizing, standardizing and industrializing everything.

At the root of this public’s resistance to crop biotechnologies and their legal mobilization against Monsanto was frustration with the lack of openness in biotechnological governance. They lamented the lack of public deliberation in policymaking processes, and the lack of transparency to the political and corporate context framing the science used in biotechnology policymaking. The farmers claimed that a lack of public deliberation about regulatory decisions, including decisions about the choice of scientific frameworks, was rendering invisible the fact that value-based decisions are being taken by people in particular social and political contexts.

Faced with a political system seemingly deaf to these kinds of concerns—a system that conflates these concerns with technical ignorance—Western Canadian grain farmers decided to bring their contestation into the legal arena. To this end, during the Schmeiser v. Monsanto proceedings, two Saskatchewan-based organic farmers—Larry Hoffman and Dale Beaudoin—filed for class status, Hoffman et al. v Monsanto in an attempt to pursue Monsanto in court on behalf of all of the province’s organic grain farmers. They claimed that Monsanto’s biotechnology canola had extensively “contaminated” non-biotechnology (notably, organic) crops but also, in the words of one farmer:

Despite years of lobbying efforts to get a full public hearing on the issue of GE [wheat] to date there has been no action, nothing. Nobody is listening to us and we hope the [Hoffman] lawsuit can do something to change this.

Qualitative studies of Canadian biotechnology regulators’ perceptions confirm their anxiety about the “irrational fears” of publics who supposedly are motivated
more by passion than rational and knowledge-based assessments of technology (see Shields & Sanders, 2006). Regulators, informed by deficit model assumptions, appear to only account for those biotechnology publics who celebrate biotechnologies (Montpetit & Rouillard, 2008; Shields, 2008).

The evidence presented above suggests that the concerns of Western Canadian grain farmers have little to do with the science of biotechnology per se. Rather, their concerns centre upon the social and political context of the science (i.e., the constitution of facts used in regulation). A central insight from Science and Technology Studies (STS) is that the harms and benefits arising from science have much to do with the particular socio-political and cultural contexts within which scientific knowledge is pursued and obtained. Within a narrowly understood scientific risk-management culture, the exclusion of such critiques coming from “non-expert” social groups like Western Canadian grain farmers in policy processes is not unexpected (Montpetit & Rouillard, 2008).

Taking an STS approach to examining Western grain Canadian farmers’ critical engagements with biotechnology situates their legal action as a form of communicative action (see also Kinchy, 2012). These farmers decided to use the courts to help communicate their contextually based scientific assessments of biotechnologies in a manner that can be understood as politically valid knowledge within a regulatory context conditioned by deficit model assumptions.

One farmer described the use of the courts as a tool for widening the discourse about biotechnologies, saying, “[o]ur class action lawsuit [Hoffman] here is just a part of a growing movement that combines all sorts of related issues, social, political, economic …” The majority of farmers interviewed talked about Hoffman as a potential means of opening biotechnological decision-making to a public engagement process. In other words, with the Hoffman lawsuit they hoped to challenge the technocratic arena for biotechnological knowledge and governance by ultimately putting decision-making bodies and processes on trial. When the farmers filed their Statement of Claim in 2002, they asked for a declaration of genetic engineering as a “development” within the meaning of the Environmental Assessment Act (EAA):

a successful declaration that the testing and development of GMOs was a ‘development’ within the meaning of the EA would operate to modify behavior because the Defendants can be enjoined if they should attempt to introduce future GM crops without ministerial approval. This would compel the Defendants to submit their engineered gene to a public environmental scrutiny rather than the behind closed doors approach they have been allowed to use with the federal government’s regulatory bodies.

(SKCA, Memorandum, 2003, para. 17)

The critical discourse analysis of a sample of the legal texts from Schmeiser focused on the ways in which science and scientific credibility were discursively distinguished from non-science and unreliable knowledge in the trials. To this end, the textual analysis was guided by a number of analytical questions: How are science and technology articulated by the legal actors in the case? What is the courts’ designation of expertise as they define certain people and topics as relevant, and others not? What is the
process by which the public concerns over biotechnologies are translated into the legal context? What is the degree to which the courts’ imagining(s) of biotechnology shows openness to science and technology as social processes? Might the rhetorical space created through the legal discourse and procedure either constrain or enable the ability of the affected public to collectively control the development of biotechnology? What is the relationship between this lawsuit and its relevant legal and political and social history? What institutional features in the law, of regulatory culture or of politics may correlate with these textual processes and logics?

In Schmeiser the boundaries around science (Gieryn, 1983; 1999) and expertise (Wynne, 1992) were established such that they re-stabilized the dominant conception of science held by regulatory actors. The Canadian courts constrained farmer practices, notably, seed-saving, through their application of the Canadian Patent Act 1985, and bolstered deficit model assumptions about publics as non-expert by discursively re-affirming farmers as irrelevant to biotechnology governance.

Within the documents he submitted to the courts and in his direct testimony, Percy Schmeiser attempted to establish himself as a scientific expert. In his original Factum to the Trial Court he writes: “After growing canola over many years, Mr. Schmeiser has developed his own farming practices particular to the land that he farms, which practices have withstood experimentation and the test of time” (2001, para. 14, emphasis added by author). “All in all,” he writes in his Factum, “Mr. Schmeiser’s farming practices have proved to be effective. His canola seed, and the crops grown from it, are a source of great personal pride and accomplishment. He is, by all standards, a successful canola farmer” (2001, para.14, emphasis added by author). Schmeiser’s conception of expertise expands beyond the deficit model to incorporate tacit knowledge belonging to the subject matter of particular domains of knowledge or a particular knowledge environment, rather than a kind of universal knowledge (Merton, 1973).

The Trial Court judge’s descriptions of the testimonial evidence in Schmeiser explicitly constructed a distinction between farm-level experimentation and laboratory-based expertise, thereby evoking a particularly narrow notion of scientific knowledge. The court ruling in this particular case was informed by the percentage of Roundup Ready™ crop thought to be growing in Schmeiser’s fields, with the measurement having been derived from “grow-out” and genetic testing of seed samples taken from his property. Both Schmeiser (via Dr. Lyle Friesen at the University of Manitoba) and Monsanto performed grow-out tests but their respective findings differed. The judge used the following language in comparing the conflicting results of the grow-out tests:

Numerous samples were taken … A series of independent tests by different experts confirmed that the canola Mr. Schmeiser planted and grew in 1998 was 95-98 percent Roundup™ resistant. Only a grow-out test by Mr. Schmeiser in his yard in 1999 and by Mr. Freisen on samples supplied by Mr. Schmeiser did not support this result. (2004, SCR, para. 64, emphasis added by author)

In labelling Monsanto’s tests as “independent” and its scientists as “experts,” the judge drew on and affirmed the dominant cultural conception of scientific knowledge
as decontextualized, operating outside of the influence of social or political values. This renders Percy Schmeiser a partial experimenter who is invested in the testing done in his “yard.” That the judge uses the latter term reinforces the notion of Schmeiser as parochial and folksy—qualities that are anathema to the idealized scientist. Put simply, the language of the court places Schmeiser on the wrong side of the credibility line denoting whether knowledge claims earn the imprimatur of science.

In his ruling the Trial Court judge also states that, “only three tests conducted by Schmeiser contravene the grow-out evidence supplied by Monsanto,” “more significant are the results of genetic testing by staff of Monsanto US at St. Louis” (2001, FCT, para. 48, emphasis added by author). This deference to laboratory-based practice is somewhat puzzling given that the agricultural practice in question—commercial growing of canola—takes place in fields, not laboratories. As further evidence of the primacy given to laboratory-based science, in the Facts used to inform the Appeal Court decision, Canola is described as “a valuable innovation developed for farmers … mainly by Canadian scientists” (2004, SCC, para. 8, emphasis added by author) even though histories of Canadian seed science (Kneen, 1992) show the vital involvement of farmers. In fact, early plant breeding in Canada was a clear instantiation of the production and acceptance of scientific knowledge (and its products) as a process of collective innovation involving local knowledge and flowing in and out of experimental and social settings. In their submission to the Supreme Court on behalf of Schmeiser, the interveners flagged this preference for laboratory-based science over farmer knowledge and practice as “unwarranted … in light of the absence of evidence that the investments of plant breeders using traditional breeding techniques are less substantial than those of companies relying upon biotechnology to invent new varieties of plants” (Council of Canadians, 2003, p. 5).

In addition to the grow-out test results, the courts drew upon the testimony of various actors in establishing how Schmeiser’s fields came to be populated in accordance with the grow-out test results. Schmeiser’s defense included testimonial and material evidence attempting to demonstrate that he did not knowingly acquire (i.e., purchase) nor segregate Roundup Ready™ seeds for future use. His testimony also sought to establish that any population of his fields in 1998 (the time of sampling and Monsanto’s intervention) was the result of, in his words, unwitting “contamination of Mr. Schmeiser’s seed supply” (1998, Defendant’s Factum, para. 10). In support of this assertion he presented photographs (as well as testimony as to their accuracy) detailing how he had made use of seeds on his land, and areas of perceived Roundup Ready™ contamination close to the roads and adjacent to the power poles. Schmeiser also provided the testimony of his co-worker, Carlyl Moritz, who claimed to have witnessed Roundup Ready™ contamination in action in the form of “wind-blown swaths” (or plowing debris) coming from a neighbour’s farm. At the Supreme Court, a neighbouring farmer, Elmer Borstmeyer, a licensed Roundup Ready™ canola grower, testified that in 1996 he had driven his grain truck by four of Schmeiser’s canola fields and on two of his trips a loose tarp on his truck caused him to scatter canola seed. “The tarp acted like a cyclone,” he recalled. “I lost some seed. That’s for sure” (2003, Appellant’s Factum, para. 105).
Monsanto presented evidence and testimony from two-dozen witnesses, key among them Barry Hertz, a mechanical engineer it had hired because of his expertise in road vehicle aerodynamics. Hertz told the court that, according to his calculations, canola seed blown off of the top of a moving grain truck would fly no more than 8.8 metres from the road. He based his mathematical simulation on weather conditions recorded at the Saskatoon airport in October and May of 1996, 100 kilometers from Schmeiser’s farm. From his testimony the courts were encouraged to infer that seed blown off of the top of passing grain trucks could not be responsible for the Roundup Ready™ canola plants that Schmeiser found growing on his land 100 feet from the road. Another key witness for Monsanto was Dr. Keith Downey, a canola plant breeder involved in the early seed-breeding programs. His expert opinion on typical canola breeding behaviour (i.e., the likelihood of its pollen outcrossing with Monsanto’s seed) was used to controvert Schmeiser’s accounts of contamination (Trans. CER Downey, 1998 esp. 716–717).

Upon considering testimonial evidence, the trial judge rejected the possibility that the Roundup Ready™ plants on Schmeiser’s property were the result of seed inadvertently blown or carried onto his land (2001, FCT, para. 188). The judge’s wording is revealing:

> It may be that some Roundup Ready seed was carried to Mr. Schmeiser’s field without his knowledge. Some such seed might have survived the winter to germinate in the spring of 1998. However, I am persuaded by evidence of Dr. Keith Downey … that none of the suggested sources could reasonably explain the concentration or extent of Roundup Ready™ canola of a commercial quality evident from the results of tests on Schmeiser’s crop. (2001, FCT, para. 65, emphasis added by author)

Again the court draws upon and affirms the dominant conception of science, parsing farmer testimony as mere opinion, while Monsanto witness testimony is treated as expert evidence (these rhetorical acts are rehearsed elsewhere, [2004, SCR, para 65, 66; 2001, SKQB, para. 19]). For the legal actors in Schmeiser, scientific truth is borne out by the formalized and technically mediated procedures of laboratory-based practice.

Articulations of science expressed by the courts in Schmeiser suggest that tacit knowledge and the senses, unmediated by genetic technique and laboratory equipment, are unreliable and unscientific. This certainly appears to be the case for farmers, who depend on a kind of situated/contextualized knowledge—what they see, feel, hear or smell in a complex environmental system—for information about seeds. By extension, oppositional publics who are not likely to be laboratory scientists are deemed as not having the requisite knowledge to weigh up the potential impacts of seed technologies. The resounding message is that the public can and should trust the experts. The legal actors in Schmeiser, therefore, re-stabilized the conception of science that had been circulating in regulatory culture.

**Conclusion**

Dominant approaches to science communication treat science as a fixed set of value-neutral facts to be transmitted to a technically ignorant public. In *Schmeiser v. Monsanto*, the courts discursively constructed clear boundaries separating laboratory-based sci-
cientific expertise from other knowledge, thus affirming regulatory assumptions about what constitutes valid regulatory knowledge, and justifying the continued exclusion of publics from biotechnology decision-making.

The findings of this study align with other empirical research, showing that judges and lawyers tend to hold an idealized and narrow conception of science (Feldman, 2009; Romanucci-Ross & Tancredi, 2007). In a Science and Technology Studies (STS) framework, science is perceived as something that achieves stability through processes that include struggles over the control and distribution of meanings (Latour, 1987). Language is central to this process. Using a constructivist perspective of science communication to analyze Schmeiser has helped to illustrate the role of legal discourse in stabilizing a normative conception of science that corresponds to an image of science’s publics as lacking knowledge. In so doing, we observe the pitfalls of viewing science as value-neutral and truth-producing.

The analysis reveals an opportunity lost. Lawsuits like Schmeiser present moments of destabilization in the conception of legitimate knowledge to be used in biotechnology decision-making. The Canadian courts, however, were not prepared to concede the possibility of scientific knowledge based on a farmer’s experience of his seed-saving practices or of his particular land. Although Schmeiser provides an invitation for re-appraising of the notion of a biotechnological fact as un-ecological, for the legal actors in this case, scientific truth is born from laboratory-based techniques and laboratory scientists who are experts, not farmers. In stabilizing “scientistic” conceptions of science, the courts thus confirm the assumption of biotechnology’s decision-makers that understandings of phenomena derived outside the laboratory have no place alongside expert claims to superior knowledge.

Justification and justice are cognate concepts foregrounded in Schmeiser, wherein struggles over definitions of scientific fact are at once struggles over the authority of particular forms of knowledge. In this context, the key question is: Whose knowledge ought to count as valid in setting the research agenda or informing regulatory decisions? Expert knowledge constructed as it is in Schmeiser cements the perceived exclusivity of biotechnology’s political and scientific culture, thereby solidifying the current biotechnological order that excludes outsider publics.

Political opposition to crop biotechnologies among Canadian farmers persists, bringing enormous pressure to bear on scientists, industry and policymakers. In 2004, Monsanto was forced to shelve its Roundup Ready™ wheat due to public pressure from collective farmer and farm organizations, and the Canadian Wheat Board. The seeming invisibility of public discourses and publics within processes of biotechnological governance is problematic for democratic science policy because it is precisely within governance discourses that expectations around technologies are defined and the parameters of power vis-à-vis our collective technological futures is set (Kitcher, 2001).

A Science and Technology Studies (STS) perspective can help us move beyond problematizations of the public as illogical and irrelevant to reveal the power of these representations, and those of science in shaping the wider social and cultural life of technologies. Regulatory assumptions rooted in the deficit model of science commu-
unication lurk behind unproductive relations between science and its publics. Western Canada’s biotechnology-resistant farmers are presumably like other members of the public in their complex and situated assessments of the sciences and technological products, and with their awareness and concern about the contexts within which science and technological products are constituted. These are engagements with technology that we, as communication researchers and practitioners, miss if we ourselves are not open to the negotiated nature of scientific knowledge production and the non-neutral nature of scientific texts.

Notes
1. I am not advocating a strong constructivist position even though these positions do exist within the STS cannon (Bloor, 2007). Words do not make realities. They are material-discursive (Barad, 2007). Social processes like communicative acts stabilize what comes to count as legitimate scientific knowledge, thereby producing meanings that empower some possibilities to act, while disempowering others.

2. Legal scholars presaged this use of the law (as a tool for regulatory reform) when they pointed out years ago that Canada’s lack of novel regulatory structure for biotechnologies makes them vulnerable to litigation (Canadian Institute for Environmental Law and Policy, 1999; de Beer, personal conversation, 2009).

3. This is a method for testing plants for the presence of chemical resistance by growing out seeds into plants in a controlled environment and spraying those seeds with particular chemicals. The surviving plants are deemed resistant.

4. Schmeiser took his own samples, detailing a careful methodology, and he grew these in his field under the conditions any in situ grow-out would hope to replicate. He then sent his seed samples, which he testified to carefully handling, to Dr. Friesan. Schmeiser’s grow-out tests revealed from 0 to 68 percent presence of Roundup Ready™ canola, whereas Monsanto’s tests found up to 98 percent contamination.

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