

# ***Networks, Genres, and Complex Wholes: Citizen Science and How We Act Together through Typified Text***

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**ABSTRACT** *This article explores the intersection of Rhetorical Genre Studies (RGS) and Actor-Network Theory (ANT). These two traditions are particularly important in the Canadian research context. We examine genre and ANT to uncover what we believe is a complementary relationship that promises much to the study of science, especially in the age of the internet. Specifically, we see RGS as a way to account for how objects come to “be” as complex wholes and so act across/among levels of network configurations. Moreover, the nature of these objects’ (instruments’) action is such that we may attribute them to a kind of rhetorical agency. We look to the InFORM Network’s grassroots, citizen science-oriented response to the Fukushima Daiichi nuclear disaster as a case that exemplifies how a combined RGS and ANT perspective can articulate the complex wholes of material/rhetorical networks.*

**KEYWORDS** *Rhetorical theory; Genre theory; Actor-network theory*

**RÉSUMÉ** *Cet article examine Rhetorical Genre Studies (RGS) et Actor-Network Theory (ANT). Ces deux modes d'étude sont importants dans les contextes de la recherche Canadienne. Nous prenons genre et ANT, pour retrouver une perspective que nous croyons puisse contribuer beaucoup aux études de la science dans l'âge de l'internet. On comprend les genres de textes comme une moyenne de rendre compte de la façon dont les objets deviennent des ensembles complexes et donc agir entre les différents niveaux de configuration réseau. En plus, la nature des actions de ces objets (ou instruments scientifique) est telle qu'on puisse attribuer à eux une sorte d'agence rhétorique. Nous voyons le citizen science réponse de l'InFORM Network à la catastrophe au Fukushima Daiichi comme un exemple de la puissance d'un perspectif RGS/ANT pour articuler les “entieres-complexes” des networks qui sont material/rhetorical au meme temps.*

**MOTS CLÉS** *Rhétorique; Genres de textes; Théorie de l'acteur-réseau*

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## Introduction

In 2011, a massive tsunami resulting from a 9.0 magnitude earthquake crashed over a ten-metre-high seawall and devastated the already stricken Fukushima Daiichi nuclear power generation site. Some five years after the multi-reactor failure, the crisis at the site continues, and the environmental, health, and safety risks borne of the disaster continue to be debated and studied. Nuclear disaster has been attended to for decades in scientific and science studies literature, of course. For social studies of science, both the accidents at Three Mile Island and Chernobyl provide important cases for understanding the social construction of risk (Goodnight, 1982; Wynne, 1992), risk and crisis communication, and the inevitability of disaster in technoscientific modernity (Beck, 1992). However, as the disaster at Fukushima unfolded, new possibilities for responding to the disaster and its risks did as well. We can characterize these possibilities in terms of technological affordances that provided new ways of organizing people, information, and knowledge-making practices, namely through networked technologies. For example, Twitter spread news as it unfolded and Wikipedia allowed for various information to be documented (Kelly & Miller, 2016). New media forms and their affordances do not exist in material form alone, but also within the rhetorical possibilities we imprint on them. To better understand how the material affordances of new media are taken up, a rhetorical account helps document the exigencies to which we respond, the situational constraints of our responses, and the forms or patterns that constrain our possible utterances (cf., rhetorical situation in Bitzer, 1968; Miller, 1984, 1992; Vatz, 1973).

To productively engage and entangle these areas of study we first explore a number of intersecting literatures in an effort to productively align and challenge theoretical constructs that help us understand where and how we find possibilities for utterance, information sharing, knowledge production and sharing, and ultimately scientific research within networked new media forms. Bringing together the work of genre theory and actor-network theory in rhetorical studies of science and social studies of science, we offer an illustrative theoretical account of useful and complex analytical strategies and theoretical entailments we have uncovered at the intersections of these fields. Building on our previous work in this area (Kelly & Maddalena, 2015), we suggest by way of a case study that these new forms and possibilities are complicated by new technologies and new genres.

Exploring the Integrated Fukushima Ocean Radionuclide Monitoring (InFORM) Network as our case, we investigate how Actor-Network Theory (ANT) and Rhetorical Genre Studies (RGS) highlight different aspects of the network and its actors. InFORM is a Canadian research network that studies radiological risk in coastal seawater in the Pacific Ocean following the disaster at Fukushima Daiichi Nuclear Power Plant (FD-NPP), which released radionuclides into seawater through atmospheric and water-based contamination. Models predicting the arrival of these radionuclides, InFORM argues, include a great deal of uncertainty. Given uncertainty in models, InFORM works to collect on-the-ground—or, rather, in-the-ocean—data to monitor arrival times and contamination levels of seawater along the Canadian Pacific coast. Data collection is accomplished with the use of a sampling kit and the labour of academics and citizen scientists. In this article we explore how InFORM reveals a complex case

of actors, agents, and networks that formed in response to uncertainties in the aftermath of the Fukushima nuclear disaster.

In the pages that follow, we review pertinent literature in rhetoric of science, technology, and medicine in both Canadian and U.S. contexts, as well as intersecting work from science studies broadly conceived. We focus specifically on ANT and RGS perspectives as a means to describe how networks are produced by (and produce) objects, or “complex wholes,” that act *suasively*. We then turn to the InFORM network as a response to the events at Fukushima and focus very narrowly on the tool that InFORM citizen scientists use to sample ocean water for the purpose of data collection. Our analysis yields several insights about how ANT and genre theory complement each other. The concept of the material “complex whole” (Mol, 2003) allows us to see a data-collecting instrument as a genre in itself; the concept of rhetorical genre may allow us to conceptualize agents and their agency more completely. Finally, we see the combined method as an argument for the uptake of Rhetorical Genre Studies in science studies, a turn being taken in the rhetoric of science, but that remains mostly absent from broader science studies.

### Science as social action

When the 2011 Tōhoku earthquake and tsunami hit the coast of Japan, natural disaster and modern risks combined in the cascading failures at the Fukushima Daiichi nuclear generation station. Three of six reactors at the site were badly damaged, and as the situation unfolded a great deal of uncertainty drove speculative discourses and proleptic reasoning. Will the reactors meltdown? What does meltdown mean anyway? Will radiation reach foreign coasts? (For examples of such discourse, see Kinsella, Kelly, & Kittle Autry, 2013) While some efforts to dispel fear focused on informing publics about nuclear science and engineering in energy production through broadcast media and direct encounter (Ionescu, 2012), others used this event to create an opportunity for publics to help inform scientific research (Kelly 2016, Kelly & Miller, 2016).

The Canadian Integrated Fukushima Ocean Radionuclide Monitoring (InFORM) Network is one example of a project involving citizens in the production of scientific knowledge. A press release from August 2014 describes the project, led by chemical oceanographer Jay Cullen at the University of Victoria, as a “new marine radioactivity monitoring network that will engage scientists in Canada and the US, health experts, non-governmental organizations—and citizen scientists along the British Columbia coast” (University of Victoria, 2014). As the press release continues, and as the project unfolds, the complexity of the network begins to unfold. Constituting the network is not only the human actors—the organizational actors—but also a multitude of materialities; geographies; conceptual and theoretical constructions and norms; and textual productions. The shape of coasts, patterns of habitation and points of access, ocean currents and wind patterns, roads and transportation systems, scientific methods, scientific training, training and reporting documentation, and scientific tools are central to the construction and reconstruction of the InFORM network, or similar enterprises.

What spurred such a complex network is of significant rhetorical interest because the exigence is likewise complex. A lack of information about the condition of the

Fukushima nuclear site generated much speculation. Such a lack of information and reliable data from which to draw conclusions generates an exigence to which InFORM and others (Kelly & Miller, 2016) respond by developing strategies to collect and interpret data on their own. InFORM takes up the particular problem of radionuclides in the Pacific Ocean, saying “an urgent *end-user demand* for quality, timely, monitoring data that can be used to estimate public health risks associated with the presence of FD-NPP derived radionuclides in the marine environment and to *provide citizens with reliable information* so that they may minimize their exposure to potentially harmful levels of radiation” (InFORM, 2015, emphasis ours). Data collection alone, as the emphasized phrases indicate, is not the sole response of InFORM. Rather, we see here that collecting and producing data for citizens is cited as an important part of their work. Such a move to provide publics with data about resulting contamination from the Fukushima disaster is not unprecedented (c.f., Kelly, 2014; Kelly, 2016; Kelly & Miller, 2016), but this is an important trend in rhetorical responses worth noting. Part of the rhetorical situation to which InFORM and other radiation contamination sensing projects respond is an exigence for publicly available and useable data. Or, perhaps, we might say a continuing exigence. In early April 2015 the first traces of radioactive material originating from Fukushima were detected in seawater off the coast of British Columbia. Reports in the mainstream media covering the findings cite the InFORM project’s Jay Cullen, who discusses the significance and some of the science behind the findings (see, for example, Stueck, 2015). Media coverage highlights the continuing exigence to which InFORM responds.

With a general sense of the exigencies—the need for information, for data, for publicly accessible and useable data (Kelly & Miller, 2016)—we can look more closely at the composition of the response. Though there are many kinds of rhetorical objects produced by the InFORM network we could theorize, many of them appear to fall into traditional categories of scientific genres, including proposals, lab notebooks, or instructions and procedure manuals. These traditional genres of science communication have been studied in their various forms and fall into what we might describe as “internal” genres of science communication. As one might expect, where there are internal genres there are also external, and we could explore how newsletters, newspaper articles, and press releases are used to share scientific knowledge. We could also explore emerging genres of science communication found on the web as unique objects of study: the website (where resources, news, and affiliates are detailed and a blog is housed); the blog itself with its multimodal embedded genres, such as video and images; social media sites, including Facebook and Twitter, put to work for sharing; community computing for data production; or even the forum for citizen scientists to discuss their work (see Kelly, 2016; Kelly & Maddalina, 2015; Kelly & Miller, 2016). All of these are interesting and worthy of study, certainly, but we are specifically interested in attending to the rhetorical situation by examining the intersection of the material and semiotic, exemplified in data collection genres.

Residing at the nexus of human actors, organizations, geographies, norms, and texts are the tools used to collect data: sampling kits. For citizens to participate in the InFORM network’s coastal monitoring for radionuclides there needs to be some mech-

anism whereby water samples and data are collected and returned to the academic team for processing. Providing self-contained kits and sampling instructions means prescribing and proscribing what counts as data, and importantly what counts as good data. Sampling kits, then, become objects rhetoricians of science and science studies researchers broadly can use to understand complex configurations of scientists, citizens, and socio-discursive and also material objects, including geographies.

Actor-Network Theory, which we will consider momentarily, can tell us much about how these sampling kits function within a network. We can theorize relationships and their effects through a “flat ontology” in ANT that helps us understand the interactional effects among humans and non-human objects. Such an approach has been usefully employed to study cultures of science and scientific knowledge production in a variety of contexts by science studies scholars in Science and Technology Studies. Related science studies in the field of Rhetoric of Science have sometimes employed such terminology, but often approach cultures of science and scientific knowledge production using the rhetorical tradition as a foundation for critical concepts. Each approach offers important perspectives to help understand the complex systems of scientific knowledge production and changing cultures of science we find in the case of InFORM. To better articulate this point we now turn to some of the previous work that helps build the framework we use to investigate InFORM.

### **Intersecting literatures**

To begin mapping out rhetorical deployment of Actor-Network Theory, and where that intersects with rhetorical deployment of Rhetorical Genre Theory, we first look to the study of Rhetoric of Science, Technology, and Medicine (we, in fact, begin this work in Kelly & Maddalena, 2015, which offers the foundation for our work here). As rhetorical studies of science and technology expand to include health and medicine (Keränen, 2013), we find productive conversations already bringing together ANT and rhetorical theories. Rhetoric of health and medicine in the U.S. has recently recognized ANT and related Latourian approaches as a useful language for rhetorical studies of health. Studies of medicine provide examples of the successful blending of disciplinary lenses, i.e., combinations of ethnographic work and textual analysis, to “get at” discursive and socially constructed objects and experiences in health. Christa B. Teston’s (2009) method is such an approach; though her work does not explicitly reference Actor-Network Theory, she writes a grounded-theory study of documents’ roles in cancer care decision-making that notes similar entanglements between genre, phenomenon, and action in healthcare, examining “the ways that [the standard of care document] rhetorically excludes and includes ways of seeing and doing” (p. 346). Teston claims that medical practitioners must balance patient experience and institutional expectations via documentation to categorize and produce actionable phenomena. Annemarie Mol (2003) theorizes patients’ bodies as “complex wholes”: network effects (i.e., objects) in themselves that are also points of intersection for multiple other networks. We employ Mol’s concept of a “complex whole” later to conceive of how material objects may come together to constitute instantiations of genres.

As Mol and others argue, once networks produce objects, those objects are able to become actors in other networks, and the problem of agency arises. S. Scott Graham

(2009), in a consideration of how medical practitioners establish phenomena, uses ANT and theories of rhetorical/material action to discuss the once-contested disorder fibromyalgia and the multiple subject positions enacted by patients and professionals to effect “change in the status quo” (in this case, the acceptance of fibromyalgia as a legitimate medical disorder). The ability to effect such changes is how Graham defines the term “agency,” and we take Graham’s definition as our own in a later discussion of issues of agency. Many of the critical questions in these texts become questions of social construction, ontology, and ethics: who or what is the patient, and what constitutes the patient’s body? What suite of symptoms constitutes a given disorder, and whose experiences establish that phenomenon? Ultimately, the responses to those questions depend upon a separation between subject and object positions. Scholars who employ an ANT framework to describe networked action must also inevitably deal with the fact that ANT requires that no such separation be theorized (see Read & Swarts, 2015)—that is, ANT requires “symmetry” between what other frames might categorize as object, subject, and/or agent—what Graham (2009) calls “actor-actant symmetry.” Graham notes that rhetorical scholars deal with this conflict by incorporating rhetorical theories of agency with the “flat,” or symmetrical, frame of ANT, most notably Carolyn R. Miller (2007), who sees rhetorical agency as a “kinetic energy of rhetorical performance” (p. 147, emphasis original) and Ronald Greene (2004), who theorizes agency as work. The combination of ANT and genre approaches presents us with new questions about how (rhetorical) agency is enacted by (material) objects. The consideration of genre can lead, we maintain, to a more robust conception of agency in social studies of science more broadly.

All told, ANT has proven a productive alliance for rhetorical studies of health communication, an area of research with intersections along rhetorical studies of science and technology. Another important feature of ANT is that it has been used as a frame for rhetorical action, but it is often paired with a theoretical language that can account for distinctions between rhetorical actants and subject entities adequately (Graham, 2009; Greene, 2004; Miller, 2007). Sarah Read and Jason Swarts (2015), writing for scholars in technical communication, for example, have recently paired ANT with network analysis, proposing that network analysis is a way to “understand the form and mechanism of [network] connections as a subset of possible connections within a networked space” (p. 15). Similar to Read and Swarts, we find ANT productive in terms of rendering networks—and the objects enchainned in and produced by those networks—visible, but lacking in terms of how networks stabilize and maintain. More importantly, we also want to know what invisible social factors determine the activation of new networks.

How do we talk about pre-existing, “example” networks that influence the activation of new ones? What ANT provides is a way to reveal complexity in some entity—a system, situation, case, an object, et cetera—an actor. But if we want to attend not to the attributes that constitute the actor but the rhetorical worlds from which actors draw their persuasive power, we must return from flat ontologies to rhetorical axiologies in an effort to determine how we construct our scientific epistemologies. Or, rather, we must return to axiologies with the actors we found in flat ontologies. A particularly

useful way to understand these rhetorical dimensions is through Rhetorical Genre Studies because genre studies provides a language to talk about rhetorical decisions as social actions.

Rhetorical Genre Studies are especially pertinent to Canadian studies of science, health, and medicine. Judy Segal (2000) explains, “rhetoricians of science are not easily distinguishable from genre rhetoricians [in Canada]” (p. 66). In Canada genre has been a critical framework favoured by those studying and teaching the rhetorical nature of science, technology, and medicine (e.g., Artemeva & Fox, 2010, 2011; Artemeva & Freedman, 2001; Freedman & Smart, 1997; Giltrow & Stein, 2009; Graves & Graves, 2012; Schryer, 1994; Schryer, Lingard, & Spafford, 2007; Segal, 2002, 2007). Further, Canada has been central to the development of genre studies, with the 1992 “Rethinking Genre” colloquium and the Genre 2012 conference, both held at Carleton University. Genre studies broadly describes a multidisciplinary area of research that continues to gain traction in discourse studies around the world, from three early traditions (Hyon, 1996) to emerging Brazilian and Scandinavian traditions (Miller & Kelly, 2016). Genre studies have been especially insightful ways to study knowledge-making and knowledge-sanctioning practices in scientific, medical, technical, and other professional discourses (Artemeva & Fox, 2010, 2011; Bazerman, 1988; Berkenkotter, 2001; Berkenkotter & Huckin, 1995a; Bhatia, 1993, 1995; Devitt, 1991; Geisler, Bazerman, Doheny-Farina, Gurak, Haas, Johnson-Eilola, Kaufer, Lunsford, Miller, Windsor, & Yates, 2001; Schryer, 1994, 2000; Schryer & Spoel, 2005; Spinuzzi, 2003, 2004; Spinuzzi & Zachry, 2000; Swarts, 2006; Yates & Orlikowski, 1992; Zachry, 2000). Given the attention to genre as a rhetorical concept for understanding how epistemic work in science and medicine is conducted through recurrent situations and typified rhetorical responses, it is valuable to engage this approach once again. However, we diverge from genre studies traditional objects of analysis—texts, in the broadest semiotic sense of the term—to study a material-semiotic genre, the sampling kit. But before we make the case for this genre we ought to pause and define more carefully the concept of genre.

By genre we mean a rhetorical concept that describes “typified rhetorical actions based in recurrent situations” (Miller, 1984, p. 159). Our definition of genre thus departs from more common notions of the term where the classification of texts within a pre-defined set is a primary concern. Attention to taxonomy and classification draws on a kind of formalist tradition found in a good deal of literary scholarship, but here we are rather concerned with a kind of pragmatic tradition that understands genres as products of discourse communities (Miller & Kelly, 2016). For scientific genres we can say writers, usually scientists, “find in existing models the solution to the recurring rhetorical problems of writing science” and “As these solutions become familiar, accepted, and molded through repeated use, they gain institutional force. Thus though genre emerges out of contexts, it becomes part of the context for future works” (Bazerman, 1988, p. 8). Understanding genre in this way means genres, as Amy Devitt, Anis Bawarshi, and Mary Jo Reiff (2003) suggest, “become less transparent and more constitutive, less the means of classifying texts and more the sites at which language’s social character can be understood” and thus “genres are as material as the people using them” (p. 542).

But still we remain in the realm of language, written and spoken, and the notion of discourse remains somewhat restricted. It seems, we speculate, easy to imagine genres of writing, such as the novel or a poem, speech, such as a eulogy, painting, such as portraiture or in another sense of genre, Flemish Baroque, video games, such as the role-playing game, and of course television series, films, and theatre, et cetera. Creative works are familiar grounds for genre discourse. Even non-creative written works such as patient medical-history forms (Devitt et al., 2003), scientific articles (Bazerman, 1984; Berkenkotter & Huckin, 1995b; Gross, Harmon, & Reidy, 2002), grant proposals (Ding, 2008; Tardy, 2003), et cetera, have been characterized as genres. Charles Bazerman (1988) helps us understand where rhetorical attention to scientific genres in particular has been drawn when he writes “Knowledge produced by the academy is cast primarily in written language—now usually a national language augmented by mathematical and other specialized international symbols” (p. 18). Our science, medicine, and other professional genres are spaces where we can explore the concept of genre and understand how written communication shapes knowledge production, but still we wish to extend our vision beyond written text. To that end, we will turn to sampling kits for a more expansive account of scientific genres.

### **Integrating approaches**

We now take an integrated approach to our example case: the InFORM sampling kit. Our approach contributes to ongoing work that reveals productive alliances between genre and ANT and articulates ways of knowing through non-discursive, typified rhetorical actions in recurrent situations (following Miller, 1984, on genre). As communication scholars, and rhetoricians in particular, continue to integrate concepts with broader science studies, and science and technology studies in particular, (see, for example, Hasian, Paliewicz, & Gehl, 2014), key concepts from both traditions must be put into conversation, and we attempt to address some of those concepts in the following analysis.

#### *Complex wholes and systems*

One way to uncover sampling kits as objects within the InFORM knowledge-producing network is to understand something of the object’s nature. We could, of course, talk about objects as “quasi-objects,” as Bruno Latour (2002) argued, taking up the work of Michael Serres, in *We Have Never Been Modern*. Quasi-objects are not merely dumb objects to which we ascribe meaning, but rather are those that remind us of the reciprocal relationship between material forms and construction of social norms and understandings. Moving through, and thus acting in and upon, the world, quasi-objects remind us of the rather jejune object-subject distinctions of modernity. But objects in this tradition, and even the idea of ANT “actors” pose something of a problem to the particular aspects we wish to explore here. To call an object an “actor,” as proposed in the first ruminations of Latour’s now-famous theory, is to ignore the problem of scale, that is, the fact that most actors are in fact networks, themselves. Several approaches to networks and networked objects could offer language for such an understanding. We could, for example, take John Law’s (2002) concept of the network-object and its famous example of the Portuguese war ship, which helps to render “invisible” or

ephemeral work more visible for analysis. Instead, we have chosen to turn to Mol's (2002) *The Body Multiple: Ontology in Medical Practice*, which considers problem in terms of "complex wholes," such as patients' bodies in healthcare systems when the body is at once an object of knowledge, a point of negotiation for the establishment of a phenomenon, and a subject position. Mol's methodological territory is applicable to most considerations of the intersection of experience, mediation, and epistemology. What we learn from Mol is that "objects" are indeed a matter of scale, dependent upon what level of configurations is attended to. It is well and good to claim that reality—or social reality, if you like—is a system of interdependent, contested, dynamic, relational effects, but at what point do these effects start to hang together with stability? When can we name them and use those names as components of larger sets of relations? And what do we render invisible by taking a relational effect and calling it an "object"? Mol's concept, the "complex whole," helps us see the separate objects that compose a sampling kit as one object in concert. The kit, like Mol's body multiple, is at once a group of objects and one object; at different levels of configuration, any of these objects may be activated by more than one network (of action).

InFORM's network is a complex whole with several potential levels of configuration to choose from in terms of a focus for analysis. For example, we might choose to analyze from the perspective of global ecologies, at which scale InFORM itself might be seen as one self-contained actor that influences others, or even fades into a larger actor of "policy" at the global scale where policy actually affects ecology. Moving to a finer-grained scale, we could look at InFORM as a (again self-contained) network of organizations: funders, universities, nongovernmental organizations (NGOs), and the like. That scale would allow us to talk about a network of political economy. But we want to focus on data collection genres and knowledge making, and so we narrow our focus once again and see two levels of configuration that might be productive: 1) a network of academic knowledge making that interacts with a network of "non-academic" activists and citizen scientists, and 2) a network of humans, instruments, and environmental features.

Both the academic/citizen scientist network and the human/instrument/environment network share a particularly important actor as a node: the sampling kit. The sampling kit is a complex whole itself, but for our purposes we take it as a self-contained object in the network that includes the scientists of InFORM and the citizen scientists who deploy the kits for data collection. A straightforward ANT approach to the sampling kit would maintain that it was a powerful actor, an object that produces inscriptions (data) that can then be translated and circulated in the knowledge-producing and policy-producing networks we list above. However, the ANT account is lacking from a rhetorician's point of view. We maintain that part of what gives the sampling kit its power is the fact that it is also a rhetorical object of a certain type that both academic and citizen scientists recognize: an instantiation of a data-collecting genre.

### *Rhetorical objects*

Our claim—that the sampling kit is the instantiation of a genre—requires some unpacking. First, we should establish the sampling kit as a rhetorical object. That is, it is a semiotic object, a "readable" text, which acts suavisly on its user. The kit is a very

simple assemblage of bucket (for scooping water), funnel (for pouring water into bottle), crated water bottle (for containing water), green shipping container (for shipping the sample for analysis), and a shipping label (also for shipping the sample to a lab for analysis). While there are certain traditional rhetorical objects within the kit (namely texts) we are interested in strategically overlooking them to look beyond them for the moment. Kits are sent already assembled to InFORM volunteers, and sampling activity is reported on the InFORM blog in the form of reportage-style posts, a citizen-science feature page, and a more formal “results” page (InFORM, 2015). Many posts feature photography of the sampling kits in action (InFORM, 2015).

Written text is pervasive in the project, as is true for most scientific work. What is especially interesting for this citizen science project is the way that written text is used to communicate among scientists, citizen scientists, and broader audiences. Newsletters offer information about data collection and analysis, data collect methods, how analysis is performed once data is sent into InFORM scientists, and even short profiles of scientists and citizen scientists are offered. Each page of InFORM’s website is a potential site for analysis in terms of emerging genres of science communication, including a blog, informational videos, and data collections (cf., Kelly & Miller, 2016). While rich textual rhetorical resources are offered by InFORM, we are especially interested in those objects that may be overlooked by our rhetorical vantage. If we imagine rhetoric in Aristotelian terms, “the faculty of discovering in any particular case *all* of the available means of persuasion,” (Kennedy, 1991, p. 36, emphasis ours) then we might move beyond language and even texts more broadly construed. Taking an expansive view of Kenneth Burke’s (1969) conception of rhetoric as “symbolic means of inducing cooperation” (p. 43), and expanding the domain of symbolic production to the level of cultural phenomenon—which is, of course, not new; cf., Barthes’ (1972) *Mythologies*—our expansive engagement allows us to refigure our rhetorical lens and grasp new modes of persuasion and associated cultural phenomenon.

Rhetorical Genre Theory in concert with Actor-Network Theory allows us to look beyond more traditional objects of rhetorical inquiry and see materials as making arguments by rhetorical enchainment. We can find some provisional justification, or at least some metaphorical alignment anyway, in Miller’s (1994) case for genre as a rhetorical concept when she writes that “Calling a genre a ‘cultural artefact’ is an invitation to see it much as an anthropologist sees a material artefact from an ancient civilization, as a product that has particular functions, that fits into a system of functions and other artefacts” (p. 69). Specifically she provides us with a way to understand how sampling kits function as suasive complex objects through their typified response to a recurrent rhetorical situation, through their patterning. Using a similar approach and seeing objects as inseparable from their rhetorical associations, we look at the materials of the kit itself and see a genre (a data-collecting genre) in a larger genre system (a scientific knowledge-producing system).

The kit is found at the interface between what we might call the arhetorical ocean—or, rather, perhaps the ocean to which we are unattuned—and obvious rhetorical human organization and perception. Sampling ocean water is an action that does not immediately produce written text as such, but the sampling kit’s con-

figuration ultimately renders the sampled water into a kind of readable text. More importantly for the present analysis, the component parts of the kit have syntactic and semantic effects on users and work together (rhetorically) to convince the user to act. The crate inside the box is a syntactical arrangement, and the bucket's relationship to the user's hand and the water can be seen, similarly, as a material syntax. Semantically, the simplicity of the kit allows for little confusion in terms of meaning making: the bucket is for scooping, the funnel for pouring in, the bottle for containing, and the green shipping container and label for mailing. Arguably these components are already material genres, and our expectations around them combine in a composition to create a new, meaningful object (cf., semiotic text or cultural artefact) through an arrangement of context, text, and recurrence. These components would not make the same argument taken separately; scoop, store, and send are effectively unified in the kit under one social action: "sample" or "collect data." Volunteers who have joined the InFORM community will recognize the sampling kit as a typified object used for a particular action in a recurrent situation. The online InFORM community references the kits in text and image; via the text-based network of the blog, volunteers' conceptions of what the kit is and what it is for are maintained and reinforced. Having established the kit as a rhetorical object, we can then move to argue that it is an example of a data-collecting genre. Where we locate the notion of sampling kits as genre is in their rhetorical shape and function. Recurring rhetorical opportunities are responded to by the typified action, indeed rhetorical action, of collecting samples through kits for the purposes of inscription. What this means for the genre user is that they are moved to respond in particular ways and understand their role within the larger data collection process through the lens of scientific discourses.

Further, we should consider how the progression of data (or, rather, sample) collection moves through analysis to become the data through which we know. In some ways the apparatus of a citizen science project such as InFORM un-boxes methods and approaches to analysis and representation that would perhaps otherwise be obscured from publics. InFORM provides not only an overview of methods, including both how gamma spectrometry is used and even how a gamma spectrometer works. Beside a photo labelled "A disassembled germanium detector with exposed germanium crystal and electrical connections through which the voltage gradient is applied," a description on the InFORM website reads: "This gamma spectrometer has been taken apart so that you may see the large crystal of pure germanium metal and two electrodes inside. When a photon hits the crystal, it produces a tiny electrical current." (InFORM, 2016). So the efforts to look inside the "black box" that Latour and Steve Woolgar (1979) told us about almost 40 years ago seem to be intensified in at least this citizen science project. We also find that the presentation of data through InFORM's online platform (its website) allows those who have collected samples to learn something of the outcome of the analysis. All of this, of course, is part of a changing rhetorical landscape and new rhetorical opportunities.

Data collection is a highly rhetorical activity because it provides the initial crafted response to the situation. Indeed, this crafted response shapes how subsequent in-

scriptions will be produced; thus we find that the rhetorical possibilities for inscriptions are shaped by the initial decisions about what data will be collected, by whom, and how that data will be shared. In this sense we could say that other instruments could be understood in the context of material-semiotic data collection genres, including tagging devices that geolocate animals or an app that identifies a birdsong and logs data into a census database. While it is certainly possible to suggest expanding genre to include these cultural artefacts, it may extend the concept beyond its intended design, if you will allow the metaphor, which is not a new problem for the concept of genre. Indeed, genre in formalist traditions, such as literary studies, certainly did not account for the kind of pragmatic rhetorical work that Miller (1984) advocated for in her formulation of what constitutes rhetorical genres. What we are suggesting here, and hopefully illustrating to some degree, is that genre can help us understand another part of the scientific knowledge-making process, and specifically it can help us understand typified suasive responses to recurrent situations.

#### *Agency and extensions*

Whether rhetoric, and rhetoric of science and technology specifically, benefits from cross-pollination with the field of science studies is a current question among U.S. scholars of the rhetoric of science and technology. A recent debate between rhetorician Leah Ceccarelli (2013) and philosopher-sociologist Steve Fuller (2013) in the pages of *Rhetoric and Public Affairs*, and later at the Association for the Rhetoric of Science and Technology 2014 National Communication Association meeting, has renewed some of these debates and reminds us that the chasm between rhetorical studies of science and technology and should-be allied fields remains great. This is, of course, bad business for rhetoricians, but it is also bad business for science studies. Rhetoric is a dirty business dealing in moving epistemological, ontological, and axiological targets. And this, we want to suggest, is especially important as rhetoric of science and technology and science studies are thinking not about science and society, but science and societies. Both fields must come to terms with different epistemological, ontological, and axiological commitments of those societies, or publics, not in a relativistic tradition but in a pragmatic tradition concerned with complex negotiations among scientists, publics, and the material world we so precariously inhabit.

Our analysis of the sampling kit employs the concept of genre to explain how non-human objects might achieve agency in networks, an explanatory problem that arises constantly in purely “flat” actor-network arrangements common to science studies/studies in science, technology, and society (STS). Graham’s (2009) definition of agency, “the process of instantiating change in the status quo” (p. 379), is closest to the one we operationalize here, via the concept of genre change. Our version of agency derives from pre-existing (and rhetorical) notions of what things are and what they are for. That is, like Miller (2007), we see agency as a product of rhetorical construction that reflects post hoc application and not an a priori status. The blended method we employ to better see how such agency operates suggests that rhetoric, at least in the form of genre theory, has much to offer science studies through its articulation of suasive appeals.

### Informed actions and agency

Rhetoric's long-standing attention to what Aristotle called artistic proofs might draw our attention away from what seems inartistic—artless science invested in the program of discovery, not invention (Miller, 1979)—but the distinction between artless and artful obscures the complicated interaction of discovery and invention at work in the process of data collection. As Miller reminded us in 1979, and decades of scholarship in rhetorical studies of science elaborated upon,

Reality cannot be separated from our knowledge of it; knowledge cannot be separated from the knower; the knower cannot be separated from a community. Facts do not exist independently, waiting to be found and collected and systematized; facts are human constructions which presuppose theories, (p. 615)

and, importantly to our questions of typification and recurrence, “We bring to the world a set of innate and learned concepts which help us select, organize, and understand what we encounter” (p. 615). When we understand such concepts of organization to our rhetorical activities, whether discourse or other modes of persuasion, we are indeed engaging in artful construction. When we decide to craft a text or speech into a particular genre or when we deploy a complex object in the service of knowledge construction, including later inscription, we engage in persuasive activities. As Miller (1984) suggests, genres are not important simply because they tell us about different forms but rather “what ends we may have,” including the ability to “eulogize, apologize, recommend one person to another, instruct customers on behalf of a manufacturer, take on an official role, account for progress in achieving goals” (p. 165)—and, perhaps, collect data and share it with a broader community.

ANT's contribution to the blended-theory approach presented here is to give us a map (or a multitude of possible maps) of possible locations for analytical focus. The Latourian way of seeing does not allow us to exclude any actors as unimportant or outside of our scope, and so we consider things that we may not otherwise see. The very simple, even rudimentary, sampling kit is an example of just such an actor: it may seem liminal or negligible from the point of view of a “traditional” rhetorician. The kit is not a “traditional” text, rather it is a stop along the way to producing the text. By flattening our ontology, however, we see the kit as an actor on equal footing with the scientists, volunteers, and texts included in the network. With ANT, we *find the kit*. When we revisit the kit from a rhetorical point of view, we see that its very simplicity *persuades volunteers to act*. In fact, the kit may be a rhetorical agent.

With Actor-Network Theory we have located the kit, and genre helped us to understand syntax(es) by which the kit persuades its user to (re)produce knowledge by collecting data and contributing to an epistemology grounded in scientific thinking. Genre, as a concept, also helped us explore how objects participate in, perhaps even direct a good deal, of this knowledge making through typification of rhetorical response. If an object is the sum effect of a group of networked actions, then genre allows us to talk about how the networked object is/acts as an object in another network: it is recognized, the recognition is suasive, and the object is taken up, as a whole, as an

actor. So genre, as a pre-existing network of social expectation, also helps explain how objects such as instruments gain a kind of agency unto themselves.

Put another way, when we want to learn something about the material world we learn through a combination of rhetorical lenses, relational interactions, and acts by material objects. InFORM reveals the complex ways we can come to understand modern technoscientific risks (Beck, 1992) through a combination of science, citizen science, and the innovative science communication that results from this new rhetorical landscape that involves both experts, non-experts, and materialities that persuade us to act and act upon us. Questions remain about the agency of objects, the agency of non-experts and publics, and even the agency of experts or scientists to persuade and act. As we continue to explore how science communication is changing it seems evident that the complexity of our topic will increase as the complexity of our technoscientific knowledge and risks, and their intersections with broader material, geographical, social, and discursive landscapes increase too. As InFORM's work, and the whole problem of nuclear risk, remind us, C.P. Snow's (2012) two cultures problem persists, but there are great efforts to find a bridge for it. Our theoretical vantage for examining how science communication is changing will likewise require such adaptability. Bringing together ANT and genre we hope to explore one possible way to explore multiple intersecting forces through which and by which we communicate.

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