Frankenbug Meets the Conch Republic: Engagement, Expertise, and "Strategic Irrationality" in Public Scientific Controversies

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ABSTRACT: This paper develops a case study of the controversy surrounding release of genetically modified mosquitos in the Florida Keys to explore escalated conflicts between stakeholders who perceive themselves to be equally empowered and, therefore, justified in dominating public deliberations and policy decisions. The antagonistic discourse that characterizes the Keys controversy may be understood as a power struggle in which both the citizen-scientists and scientist-citizens wrestle for the same intellectual and jurisdictional turf. A description of this dynamic extends the discussion of asymmetrical institutional and social power relations to explicate the concept of "strategic irrationality" as a means of disrupting productive deliberations.

KEYWORDS: public scientific controversy, public deliberation, risk communication, expert discourse, citizen science

1. INTRODUCTION

In 2011, in Key West, Florida, a public scientific controversy erupted over the Florida Keys Mosquito Control District's (FKMCD) plan to release a genetically modified (GM) *Aedes aegypti* mosquito in Key Haven. Since that time, the controversy has been written about in both local and national news sources, and citizens dissenting to the release citizens have attended town hall meetings, written blogs, and circulated a petition on Change.org (de Meir, 2012) that to date has garnered over 160,000 signatures. Throughout the controversy, the FKMCD and Oxitec, the British biotech company that engineered the genetically modified mosquito, have argued that the new technology is the best strategy to prevent the possible outbreak of dengue fever and chikungunya, two tropical diseases vectored by the *Ae. aegypti* mosquito. The FKMCD and Oxitec also maintain that the GM mosquito, called OX513A by Oxitec, will not harm the Keys environment because the mutation is self-limiting in that both the modified mosquito and its offspring die in a single generation and do not persist in the ecosystem ("Florida Keys Project," n.d.). Adding urgency to the controversy is the fact that this same mosquito, the Ae. aegypti, also vectors the recently exigent Zika virus, which, according to the World Health Organization (WHO), is linked to the birth defects such as microcephaly, and also to an increase in occurrences of Guillain-Barré syndrome ("Zika virus," 2016). In its discussion of Zika, the WHO underscores the importance of vector control: "Mosquitoes and their breeding sites pose a significant risk factor for Zika virus infection. Prevention and control relies on reducing mosquitoes through source reduction (removal and modification of breeding sites) and reducing contact between mosquitoes and people" ("Zika

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virus," 2016). Dubbed by journalists and Keys locals as a "Frankenbug," the genetically modified mosquito is poised at the center of a controversy the resolution of which potentially impacts not only the Keys region, but also the debate about Genetically Modified Organisms (GMOs) in America, and the spread of the dengue, chikungunya, and Zika viruses on a global scale.

The core of this controversy is a question of risk, but the nature of this risk is complicated by scientific questions that lend themselves to conflation by all stakeholder groups. Specifically, there are two key risk factors orbiting each other--inextricable, yet individual and distinct. One is the risk of releasing a genetically modified organism into the local Keys environment, and the other is the risk of disease as a global public health threat.

Against this backdrop of environmental and epidemiological concerns, the value of scientific information--and authority predicated on an understanding of that science--is foregrounded. As such, conversations about science dominate the stage--physically and figuratively at two town hall meetings organized by FKMC.

This work focuses specifically on the notably vitriolic discourse that occurred at two town hall meetings organized by the FKMC, one in March of 2012 and the other in December of 2014. During these meetings the discourse became antagonistic, leading to a polemic dynamic between the FKMC and Oxitec on one side and a vocal group of Keys citizens opposed to the release on the other. Above and beyond the core question of risk embedded in the controversy, the discourse model to which both parties agreed contributed significantly to unproductive negotiations. Specifically, all stakeholder groups identified as experts on the grounds of education and affluence, and, as such, participants predicated a significant amount of the discussion about the release of the mosquito on rational, scientific grounds. By mapping Latour's "matters of fact" and "matters of concern" (2004) onto his visual model characterizing rational and irrational discourse (Latour, 1987), I show that this privileging of rational, scientific evidence leads to the exclusion of discussions about values or priorities outside the purview of "scientific fact." Further, I show that obviating values and priorities from deliberation resulted in the deployment a strategic irrationality that actually disrupted productive deliberation when participants attempted to discuss their values and lived experiences. As public scientific controversies arise among informed publics with increasing access to information and education, and who reside alongside institutionalized experts sanctioned as decision-makers, strategic irrationality may become a widespread disruptive tactic, and, as such, is worthy of consideration when entering the deliberative spaces of public scientific controversy.

To unpack strategic irrationality as a rhetorical tactic, I provide a history of the controversy in the Keys, develop the salient concepts of risk and expertise in play, and introduce strategic irrationality as a function of asymmetrical power relations in scientific deliberations. Finally, I discuss the implications of strategic irrationality, as well as avenues for future research that might serve as practical recommendations for mitigating potential negative consequences of strategic irrationality.

2. THE CONTROVERSY IN THE KEYS

In the early 2000s, a British bio-engineering firm called Oxitec engineered a genetically modified *Ae. aegypti* with the specific goal of controlling mosquito-vectored diseases like dengue fever, chikungunya, and the Zika virus. Since that time, Oxitec reports conducting lab

trials in Panama, and field trials in Brazil ("Ongoing field trials of OX513A," n.d.) and the Cayman Islands ("Oxitec and MRCU report 80% suppression," 2012). Following an non-fatal outbreak of dengue fever occuring between 2009--27 cases--and 2010--66 cases--(Fitzsimmons, 2011), the FKMC began collaborating with Oxitec to plan a field trial in the Keys targeting the local Ae. aegypti population. The need to consider vector control was further suggested by the fact that Ae. aegypti populations in the Keys were reported to have developed a resistance to four of the six insecticides used by the FKMC against them ("Florida Keys Project," n.d.).

At that time, FKMC officials hoped to begin the trial in May of 2011, but were delayed while as the agency sought the necessary permits (O'Hara, 2011). In March of 2011, FKMCD biologist Coleen Fitzsimmons described to the Key West City Commission the plan to release Oxitec's GE mosquitoes to help prevent the spread of dengue in the Keys (Fitzsimmons, 2011). In a New York Times article published shortly after Fitzsimmons' presentation to the city commision, Fitzsimmons was quoted as asserting that the GM mosquito was a more "ecologically friendly" mitigation measure than pesticides or other control measure, but even at that time, concerns about unintended consequences were voiced by scientific experts and the potential for negative public reaction was forwarded by legal experts, so release was moved to December of 2011, pending approval from the Agriculture Department (Pollack, 2011). When the FKMCD plan was announced to the public, citizens did, indeed, began to voice disapproval of the planned project, which obtained sufficient momentum to again postpone the release, and on March 15, 2012, a town hall meeting featuring presentations by Oxitec and the FKMCD was attended by concerned citizens, bringing questions regarding the safety and merits of the mosquito release plan (Keys Mosquito, 2012).

Following this first town hall meeting, citizens objecting to the plan gained traction on April 3, 2012, when, at a meeting of the Key West City Commission, Resolution #12-2433 "Say no to mosquitoes" was passed in a 5:2 vote. The resolution established the commission's opposition to "the introductions of genetically-altered mosquitoes until further research is provided and approval is obtained from the applicable regulatory body, and operational standards and a plan to demonstrate measurable outcomes are described to the public, opposing the introduction of GE mosquitoes until further research was conducted and approval from the applicable regulatory body obtained ("City of Key West," 2012).

On the same day, a Change.org petition was created by Key West citizen Mila de Mier, petitioning 33 local, state, and federal officials to oppose the plan "to use the Florida Keys as a testing ground for these mutant bugs" (de Mier, 2012). De Mier's petition argued that the plan went against local wishes. Using as examples "[a] recent news story reported that the monarch butterfly population is down by half in areas where Roundup Ready GM crops are doused with ultra-high levels of herbicides that wipe out the monarch's favorite milkweed plant," and observing that "[d]engue fever has been absent from the Florida Keys for years, which indicates the current methods of control and public education are working," the petition demanded "third-party, peer-reviewed research on effectiveness and safety of GM mosquitoes other than Oxitec's own claims of success," and exhorted, "Don't let Oxitec bully our community!" (de Mier, 2012). Taking into consideration the fact that the last reported case of dengue occurred in 2010, just two years earlier, the major themes characterizing the Keys controversy were foregrounded in this early document: the fragility of nature, unintended consequences, risk of disease, and, notably, an appeal for scientific allies to combat the bully science the citizens perceived as promulgated by Oxitec. This science-v.-science battle royale

is further underscored by an appeal FDA oversight unscored by a call to action: "We need to make sure the FDA does not approve Oxitec's patent" (de Mier, 2012). As resistant as the petitions suggests the group of citizen stakeholders is to the mosquitoes' release, a clear deferment to science and regulatory bodies as arbiters of the dispute evidences itself early on in the controversy.

Shortly after the petition was created, on April 19, 2012, consumer and environmental groups including Food & Water Watch, Friends of the Earth, the Florida chapter of the Sierra Club, the Florida Keys Environmental Coalition and GMO Free Florida signed a letter to Florida governor Rick Scott expressing their dissent to the release of OX513A. Citing "South Florida's environmentally sensitive landscape already endures many exotic and invasive species," they noted that "[t]his is the first genetically engineered insect to be introduced in the United States with the intent to wipe out a wild population in the name of disease control" ("Groups call on governor," 2012). Scientific expertise and risk, this time in conversation with trust, again present as fundamental concerns for Eric Hoffman with Friends of the Earth: "The risks genetically engineered mosquitoes pose to the local ecology and to human health have yet to be properly studied by independent experts, nor has this technology been proven to even work in limiting the spread of disease" (as cited in "Groups call on governor," 2012). The statement suggests that the scholarly publications made available to citizens on FKMC and Oxitec websites are not persuasive for these stakeholders; however, Hoffman's statement that "[r]ight now, the residents are left having to take Oxitec's word that its technology is safe. Citizens in the Keys deserve better science and deserve to be protected from this unproven and risky technology by their elected officials" (as cited in "Groups call on governor," 2012) again points to the privileging of scientific discourse and a willingness to mediate the conflict through regulatory channels. Marian Ryan, the Sierra Club Florida's Conservation Chair, echoes Hoffman's desire for regulatory oversight: "Since the federal government is not regulating these insects, Florida's government should step up to protect Floridians and prohibit the release of these unregulated and uncontrolled mosquitoes in South Florida," and the goes on to describe "grave and growing public concerns" that "there is no indication that the U.S. Food and Drug Administration or any other federal or state agency has evaluated the safety of the company's release" ("Groups call on governor," 2012). And the privileging of science is highlighted in the letter:

> The experiment raises serious concerns around the impact releasing genetically engineered mosquitoes could have on public health and the environment. For example, biting female mosquitoes could inject an engineered protein into humans along with other proteins from the mosquitos' salivary gland. Oxitec has yet to conduct or publish any study showing that this protein is not expressed in the salivary gland and therefore cannot be passed on to humans. This is a real concern, even though officials only plan to release non-biting males, as genetically engineered females can also be accidentally released. ("Groups call on governor," 2012)

They continue this scientific line of reason, using Oxitec's data to argue against the release:

> The company expects each batch to contain less than one percent females. This is because mosquito pupae are tiny and sorting them for a large-scale release leaves plenty of room for error. Additionally, 3.5 percent of the insects in an Oxitec lab test survived to adulthood despite presumably carrying the lethal gene. These two facts combined mean that there will be a significant number of genetically engineered female mosquitoes in the environment that bite humans and spread disease. Since *Aedes aegypti* females bite many people in one feeding, it is able to spread disease even at low population

> levels. This means Oxitec's technology might not even work in limiting the spread of disease while still exposing Keys residents to possible risks. ("Groups call on governor," 2012)

Irrespective of the seemingly speculative nature of the environmental groups' argument, this passage illustrates the desire of dissenting citizens to meet scientists on their own level and argue science with science. It is important to note here a salient difference between this dynamic between scientists and lay people and the more familiar identification of power relations in public scientific controversy--one in which the scientists are empowered as experts and the citizens are not recognized for either their *interactional expertise* (Collins & Evans, 2002) or *embodied knowledge* (Sauer, 1998) is devalued by one or both stakeholder groups. In the Keys, the citizens position themselves as not only seeking outside scientists to consult as *contributory experts* (Collins & Evans, 2002), but capable of disputing contributory science with scientific experts.

As a response to the local opposition such as that detailed above, on May 18, 2012, FKMC submitted project plans to CDC and the FDA to review the planned release ("Oxitec filed for a permit, 2012"). While this review was underway, public deliberation stalled, but the controversy continued in local newspaper articles and blogs. This smoldering dissent led to a second town hall meeting again hosted by FKMC on December 4th, 2014, to field local questions and concerns (Catherine, 2014). While the CDC had approved the Oxitec Keys lab facility ("Latest Information," n.d.), the FDA had not completed the review. As will be detailed below, the tenor of this meeting was even more antagonistic that the meeting held two years prior.

Subsequent to the second town hall meeting, in response to vocal public complaints, including more than 1,600 emails sent by local residents in early 2015 to the FKMC in protest (Alvarez), in April of 2015 the FKMC Board voted to "postpone final approval of the Investigational Agreement with Oxitec until review of either the FDA Draft Environmental Assessment or the Final Environmental Assessment (whichever is released first)" ("Latest Information," n.d.).

A new chapter of the Keys controversy began when, in 2016, reports of the Zika virus broke in major media channels. While this data currently is being collected and analyzed, and as such is beyond the scope of the current discussion, it is interesting to note that, on March 11th, 2016, four years after the request for review was submitted, the FDA published a tentative approval of Oxitec's planned field trial. As reported in the New York Times, the regulatory body's report indicates that "the field trial of the [GM] mosquitoes was unlikely to cause any harm to people, animals or the environment" (Pollack, 2016). The FDA is quoted in Pollack's article as stating, "The consequences of escape, survival and establishment of OX513A in the environment have been extensively studied: Data and information from those studies indicate that there are unlikely to be any adverse effects on nontarget species, including humans," (as cited in Pollack, 2016). Currently, the FDA approval is undergoing the mandated public comment period, which began on March 14th, 2016.

3. RISK AND EXPERTISE

At face value, a controversy such as this most clearly presents through the lens of risk—that is, does the risk of releasing a genetically modified insect outweigh the risk of contracting the diseases the mosquitoes' eradication is designed to control. In his 2009 book *World at Risk*, Ulrich Beck describes several scenarios of emergent risk and the decisions these risks drive

those involved to make. His work highlights that people will sacrifice freedom for increased security when confronted with compelling risks. In a key example detailing a thwarted attempt to bomb an airplane and the heightened security protocols subsequently implemented, he notes that "the passengers, in whose minds the terrorist threat has become lodged, accepted such restrictions on their liberties without demur" (Beck, 2009, p. 1). But this tacit acceptance of risk does not always occur, nor does there appear to be any definitive means to predict whether one risk decision is accepted without contest while another incites a heated controversy.

Existing literature identifies manufactured scientific controversies, including those flaring around climate change, smoking, and the hole in the ozone layer (Oreskes & Conway, 2010; Banning, 2009; Ceccarelli, 2011). But where these controversies are fanned by commercial, ideological, or political agendas, the controversy in the Keys differs notably in that it ignites as a conflagration of innovations in genetic engineering technology, local environmental concerns, and the public health risks of infectious agents that are difficult to control. The tensions between conflicting values, different risk cultures, and often asymmetrical relations of institutional social power play out in the Keys controversy. In his book *Why We Disagree About Climate Change*, Hulme (2009) describes this dynamic as "cultural circuits and their entanglement" (p. 221), and he posits the *tangled cultural circuits* metaphor in contrast to the *deficit model*, which he characterizes as a "one-way flow of knowledge and information" from scientist to citizen such that "[i]f the public are resistant to...scientific messages, [then] the public are exhibiting a lack of necessary knowledge" that can be rectified simply by communicating that knowledge (p. 217). As will be exhibited in the data from the Keys case study presented below, the FKMC officials and Oxitec scientists ground their argument for the release of the GM mosquito in scientific information which they disseminate in classic deficit model form, but an examination of the data also presents two salient factors that stymie productive discourse between the scientists and the citizens. One factor is the clear existence of Hulme's tangled cultural circuits actively in play in the controversy and evidenced in the town hall meetings, but the other factor is that, counterintuitively, the Keys citizens are, to varying degrees, willing to accept the viability of the deficit model as they combat the FKMC/Oxetic's science with science of their own.

Considering the dynamic noted above, namely the inclination of the Keys citizens to privilege scientific expertise as fundamental discursive currency in exchanges about the GM mosquito release, a discussion of expertise figures prominently into characterizing the Keys controversy. Given the one-way, top-down flow of scientific knowledge on which the deficit model is predicated, and putting that scientific hegemony in the context of the dominance of Science as the empirical "new god" of the post-Enlightment epoch, it is perhaps unsurprising that Science often is characterized as the bully pulpit in analyses of eponymous public scientific controversy. However, as these analyses have become more sophisticated, contravening theories have evolved. Prominent among these is *democratized expertise*. In "The Third Wave of Science Studies: Studies of Expertise and Experience," Collins and Evans (2002) use Studies of Expertise and Experience (SEE) to solve what they call the Problem of Extension, which they define as "a tendency to dissolve the boundary between experts and the public so that there are no longer any grounds for limiting the indefinite extension of technical decision-making rights" (p. 235). For Collins and Evans, "technical decision making" refers to the intersection of science and technology with the political domain, and SEE represents an opportunity to move discussions of science away from "truth" as an epistemic value and toward identification and prioritization of "expertise and experience" (p. 236). They identify

three types of expertise: No Expertise, Interactional Expertise, and Contributory Expertise in order to facilitate discussion of different types of expertise as a means of framing scientific deliberation in the interests of appropriately estimating and valuing the type of expertise best suited to making scientific and technical decisions.

This democratic model is enticingly egalitarian, but, like many idealistic theories, challenging to implement, as evidenced by Lindeman's (2013) study of "Subjectivized Knowledge and Grassroots Advocacy: An Analysis of an Environmental Controversy in Northern California." In his work, Lindeman argues that the case study of a grassroots opposition movement that stopped California's aerial spray program for controlling the light brown apple moth provides an illustrative example of the implications of an empowered citizen-scientist group in a public deliberation that was grounded in the "democratized expertise" model that often is lauded for giving equal voice to all types of expertise and experience. As Lindeman explores the scientific controversy, he focuses on the written, technical discourse created and circulated by the grassroots group throughout deliberations, which, he concludes, was successful less because of its relative scientific merit than because the group leveraged the "democratized expertise" model to contextualize technical discourse and scientific information as subjective and situated accounts for which verifiability was less important than "individual credibility and authority," which allowed the group to present this subjective knowledge as "settled fact" (p. 63). Lindeman's case study illustrates an issue that highly relevant to the Keys controversy. An open, democratic forum that weighs all voices equally can, and, arguably, by definition should, be open to persuasive voices leveraging information to achieve their own ends. It's a 2000-year-old conversation in rhetorical circles, and, in Lindeman's case, Gorgias gets the "I told you so." As will bear out in the discussion of the Keys, a savvy public is more than capable of understanding the rhetorical situation in play, and will use that situation to their advantage.

Also problemitizing a democratic expertise forum is Knight and Greenberg's (2011) "Talk of the Enemy: Adversarial Framing and Climate Change Discourse." Knight and Greenberg argue that adversarial discourse in climate change deliberations may be understood as "asymmetrical counter-movement relations" that "erode the trustworthiness, reliability, and credibility of an opponent" (p. 338). Knight and Greenberg perform a comparative analysis of two Canadian organizations, the Natural Resources Stewardship Project (NRSP) and DeSmogBlog (DSB), in as they disputed the anthropogenic causes of global warming to establish the five reputational discrediting practices—specifically, moral character, competence and qualifications, social associations, and real vs. apparent motivations. They advocate that a means of mitigating adversarial discourse would be to consider "the cognitive basis" of an opponent's position as outside the purview of a debate, but they acknowledge that the types of discrediting techniques they explore are likely to continue. Knight and Greenberg's characterization of the process by which stakeholder groups seek to discredit each other's reputation adds another illustration to the challenges of democratizing expertise, and the authors' acknowledgement that this, one of the oldest rhetorical tricks in the book--the character assassination--supports that, adversarial discourse is a disruptive, if common, characteristic in public scientific controversy. In the Keys, as well, discourse becomes vitriolic, but it is a different kind of asymmetry that constitutes the strategic irrationality disrupting public deliberation in the Keys, as analysis of the data shows.

4. STRATEGIC IRRATIONALITY

Illuminating the function of strategic irrationality within a deliberative space begins with a discussion of the network of competing interests that informs the Keys case. Specifically, what happens when what Latour (2004) calls a "matter of concern" is mistaken for a "matter of fact"—not by one or the other stakeholder groups, but by both stakeholder groups? In "Why Has Critique Run Out of Steam?" Latour argues that controversy emerges when a "thing" that gathers human and non-human actors together is mistaken an object of scientific knowledge. Latour asserts that critique—that is, critical analysis of ideas and actions—has become ineffective and, in place of critique, he argues, what is most necessary is pragmatic action. Central to his establishment of the increasing impotence of critique as a means of vetting the work of science scholars are the concepts of "matters of fact," which he characterizes as the type of ideological arguments that can be endlessly deconstructed and indicted with no more impact than the systematic destruction of the institutions that are fundamental to making change (i.e., the academy, the government, etc.), and "matters of concern," which he characterizes "states of affairs" or a more pragmatic, realistic approach to the complex network of social, political, and economic, as well as scientific and technological values and priorities that engender conflict in the world. Latour concludes that critique is useless when it "uncritically," by which he means unreflexively, divorces itself from the real-world situation that necessitated it. Latour argues that critique without the goal of action and change, critique for the sake of criticism, is unproductive and dangerous, and in its stead, Latour advocates for a Heideggerian "gathering" (pulling from the etymology of the word "thing" as "a moot" or "gathering") around "the thingness of the thing" (p. 245) that can lead to action in deliberations of matters of concern. As pointed out early, most commonly, it is the scientist who is identified as having presumed the "matter of fact" in relegating what actually is a contested collection of values to an accumulation of *a priori* truths, and the layperson as being marginalized by the scientists' dismissal of values and situated knowledge.

The interaction that plays out between the scientists and the citizens is further exacerbated by conceptions of the scalability of space and place. Henri Lefebre (1991) addresses scientists' conception of space and citizens' conception of place. Where science views specific sites of study as laboratory-like spaces in which all factors are fundamentally equal, and as such, transposable from one context to another, citizens view their place in the world as uniquely lived by and in themselves, a home that encompasses not only their physical surroundings, but also their values and collective identities as citizens.

It would be easy to map this conception of space/science and place/citizen onto the Keys controversy. However, taking into consideration each group's differing identifications of matters of concern (that is, that the matter of concern for the citizens is the genetically modified mosquito, and the matters of fact are the diseases, but for the scientists, the matters of concern are the diseases and the matter of fact is the mosquito), the core of this controversy might be more productively understood as a questions of scalable place. Where the Keys citizens are most concerned about their local lived place, the Keys, and the potential risks posed by the release of their matter of concern, the mosquito, the scientists are most concerned about a more global conception of place that is the earth viewing it, as they do, through the manifestly global epidemiological frame underpinned by their matter of concern, the diseases and their spread across the planet.

It becomes clear how this disconnect in concerning matters facilitates controversy by considering this dynamic through the frame of risk perception. How could the Keys citizens be

asked to see, let alone reach accord with the scientists' position, since they do not see the disease as a matter of concern or even a risk at all? And, on the other hand, how are the scientists going to reconcile their position with the citizens when they view the mosquito as a matter of fact and, if its release is a risk, that risk is far outweighed by the more significant risk of shifting global patterns of disease engendered by climate change? Obviously, no agreement is possible when they aren't even arguing over the same issue.

Complementing the confusion of risk perception is the question of expertise. As noted above, Collins and Evans (2012), Knight and Greenberg (2011), Ceccarelli (2011) and others highlights conceptions of expertise in which scientists are seen as experts in fact and truth, and the embodied of the citizen is not counted (Sauer, 1998). As has been illustrated, however, in the Keys, both stakeholder groups—citizens and scientists—claim both expertise (via education and economic capital) and situated knowledge (via residency in the Keys, experience with the disease, and loyalty/love for the Keys as a place). Since both groups identify as empowered experts, conflict escalates as a function of a power struggle in which both groups wrestle for the right to make the decision regarding the release based on the same credentials.

In *Science in Action*, Latour (1987) literally illustrates both how this dynamic plays out as a kind of deficit model in practice. The graphic is replicated below:

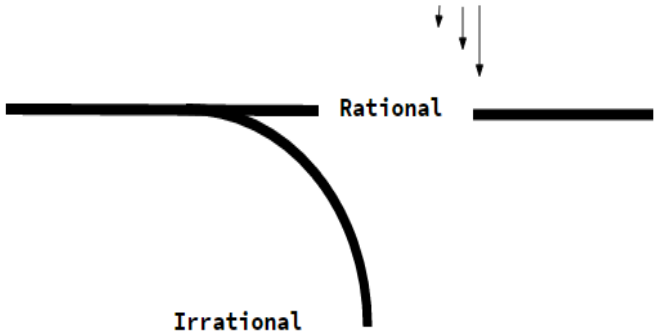

Fig. 1. The Asymmetrics of Irrationality (Latour, 1987, p. 183)

Latour uses this model to explain how a conversant in a scientific discussion may be found to be irrational. He describes, "The straight line [non-scientists] should have followed is said to be rational; the bent one...is said to be irrational" (Latour, 1987, p. 183). Latour continues, "These two adjectives ["rational" and "irrational"] are a staple of discourse about science [and] they appear only when an assumption is made by scientists about why there are non-scientists" (p. 183). Within this context, Latour notes that vertical arrows that cause deviation from the "rational," straight line represent "special forces" needed to explain "how people are pushed out of the right path they should have taken"--forces such as prejudice, differences in culture or faith (p. 183). Essentially, what Latour has done is provide an illustration of deficit model discourse puts "rational" *matters of fact* in conversation with the type of social, political, and economic values that constitute *matters of concern*, and he shows how, within this asymmetrical model of expertise, how discussions of matters of concern can come to be viewed as literally deviant and "irrational."

It is when embroiled in this asymmetrical dynamic that "strategic irrationality" appears. Pulling three quotes from Latour's discussion, a syllogism emerges:

(A) "Even if beliefs happen sometimes to be in accordance with knowledge, this is an accident and does not make them less subjective"
(B) As such, "the only way to know about [science]...is to learn…"
(C) "People who still hold beliefs about [scientific phenomena] are simply unlearned." (Latour, 1987, p. 182)

Hence, science is holding the keys to the kingdom of rationality, and it becomes easy to understand why the educated and affluent Keys citizens were willing to buy into this asymmetrical model that, unwittingly, perhaps, shackled both scientist-citizens and citizen-scientists in the orisons of what, in *Politics of Nature*, Latour (2004) calls Science, or "*the politicization of the sciences through epistemology in order to render ordinary political life impotent through the threat of an incontestable nature*" (p. 10, italics original). These "rational" orisons of Science created by the asymmetry in which, and like metaphor of Plato's Cave that Latour discusses, preclude discussion of the very matters of concern that might yield, at a minimum, a discovery of the disconnect between the scientists'(disease) and the citizens' (mosquito) respective matters of concern, and perhaps, could lead to productive deliberations, once the misunderstanding were to be uncovered.

However, as things stand, this asymmetry plays out such that both parties privilege the rational, straight line, and, inevitably, the equal claims to "rational turf lead to an old-school power struggle. It is in these moments, perhaps inevitably, when all people will resort to any viable tactic to break a stalemate. And since the matters of concern that wait around the bend of the "irrational" line are manifestly central to the Keys mosquito deliberation, both citizens and scientists, I argue, will strategically veer down that bend in both a) a sincere effort to articulate relevant matters of concern that the asymmetrical model of discourse has made it problematic for them to bring to the table; and b) a rhetorical "land-grab" designed to lay claim to value-based turf (e.g., beliefs or lived experience) that cannot be refuted by "rational" expertise. This, then, is the rhetorical tactic of *strategic irrationality*, as I am defining it.

The graphic below maps onto Latour's asymmetrics of irrationality the concepts of "matters of fact" and "matters of concern" to illustrate how the participants' agreement to focus on science prevented them bringing relevant non-scientific issues of importance into their discussions:

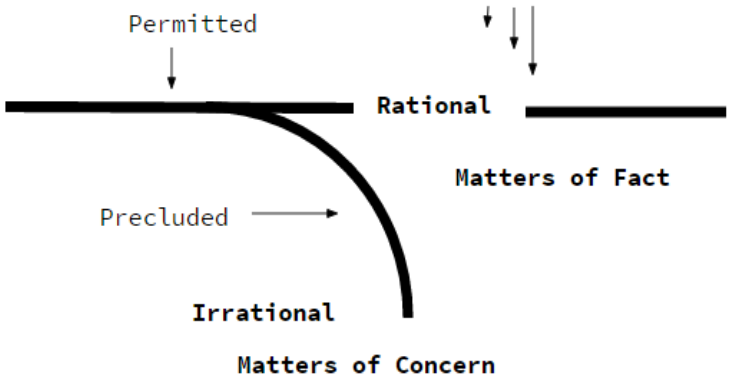

Fig. 2. Matters of Fact and Concern mapped onto Asymmetrics of Irrationality

Statements from Keys citizens support their identification as empowered to discuss the mosquito as rational peers with scientific participants:

> **Participant 1:** In Key West we have a funny saying here, 'Land of the Overqualified.' To give you a good example of that, I had lunch at the Outback a couple of weeks ago. It turns out our waiter at the Outback is actually an emergency room doctor who quit practicing medicine. So when we say Land of the Overqualified, we're really overqualified here...I go to these meetings and you hear who these people are and what they have to say, it's like, geez, amazing, you know? They're not just a bunch of people who fell off a rock and said, 'Gee, I have this idea.' These are people with science backgrounds and plenty, plenty of experience.
> **Participant 2:** But I think the perception of people in Key West being ignorant and anti-science and having a knee-jerk reaction to the words GMO, I don't think that's accurate. I think a lot of people here are actually very well read on the subject...I think we're not getting credit for being as smart, and well educated, and open-minded as we really are.
> **Participant 3:** People think about the Keys, especially Key West, they know it's party people and people here like to party, but it is also very expensive to live here, so people are really smart. They have to be some kind of high IQ to be living in the keys because of the prices and all of that.

By identifying as equally empowered with experts from FKMCD and Oxitec, they have tacitly agreed to the rational discourse that follows the straight line in Latour's diagram, and, by privileging this type of evidence--these matters of fact--all participants have made is difficult to broach matters of concern without seeming irrational. As such, efforts to discuss matters of values, priorities, and lived experiences brought into the discussion often have disruptive impact. This is strategic irrationality, as, consciously or not, the move to enter matters of concern rhetorically impacts the dynamic of any "rational" discourse.

This tactic of "strategic irrationality" plays out most clearly when, for example, the citizens abandon their position as educated, entitled, and empowered, rational citizen-scientists for highly pathos-infused performances of rancor at the scientists for not listening to or providing answers to their questions, when the coding of the data clearly evidences that the scientists are answering their questions. In the example below, a participant foregrounds her scientific expertise and asks a "rational," fact-based question, but the response is contextualized "irrationally":

> **Question from citizen:** I'm here from Miami. My partner lives in Key Haven and we were thinking about buying to KH which now I'm not sure we are going to do. I am a professor of public health at

> Miami U. I'm published researcher but not a PhD. I attended the last meeting. Thank you Michael and Derek and Bill. Some of you I received the information. Bill, I'm still waiting on you. I did my own literature review and I did find some studies. I would have liked to have found studies from higher impact journals. Or third party studies. My biggest concern . . . I spoke with an epidemiologist from Brazil and my question for Oxitec is have you been criticized before for not using the most up to date sorting methods for differentiating between the males and females? [Read: sorting error might result in release of more mosquitoes than intended]
> **Second question from same participant:** Have there been any studies of the health impact of the human population after the releases? I worked at the CDC for 4 years so I'm pretty familiar with the government and how that works. [Citizen seems about to continue.]
> **Moderator:** [Citizen], you asked a question and I don't want you to run out of time so maybe the panel can answer it.
> **Citizen:** Oh you're cutting me off already. That's not 'patronistic' at all [said sarcastically]. [Citizen continues.] What's the long term studies done on the health of the people in a population where a release has occurred?
> **Oxitec Scientist 1:** We have developed our own sorting method bc there wasn't one available to sort male and female mosquitoes. This is the best in the world at the moment. It's 99.97% accurate and this is confirmed around in several trials the world. It has been confirmed actively during a trial. For the second question, we have done the studies to show that it is nontoxic and non-allergenic.
> **FKMCD:** She wants to know about the long term effect.
> Oxitec Scientist 1: We are starting those. We haven't done a large enough trial to really see those points. Decreasing Dengue can only increase the health of a population, not decrease it.
> **FKMCD:** How many people and how long to get long time data?
> **Oxitec Scientist 2**: In the region of 1/4 million people to demonstrate statistical control of Dengue.
> **Oxitec Scientist 3:** Have to start with small trial and then build bigger and bigger--that's how the science works. [Extended grumbling from the audience.]

In this exchange, the audience member is asking questions that suggest she is interested in rational, scientific answers, but she adopts a hostile, antagonistic posture when she perceives her authority to speak is compromised. She acts out this hostility by bringing to bear questions of sexism and/or asserting that the moderator is patronizing her. Further, the scientific answer provided by the panel does not appear to satisfy the audience, as the discontented murmuring suggests, although the answer does address the issues raised by the audience member in her questions. The model of strategic irrationality could be employed to suggest that the audience member's question was only partially about science. The audience response suggests that the science was unsatisfactory because the answer did not speak to concerns about the local, lived experience of the Keys inhabitants and the value they have invested in their environment.

Because the asymmetrical model of discourse dominates the town hall meetings, at which matters of concern might serve to facilitate productive deliberations, the scientists also deploy strategic irrationality when they clearly predicate their authority to make decisions regarding the GM mosquito release on deficit model scientific authority in their presentation of facts, and graphics, as well as the foregrounding of their credentials at the town hall meeting, but also attempt to position themselves as Keys citizens who reside in the community, have kids who like to bike around, and who have been risked their families in doing this disease research.

Strategic irrationality employed by Oxitec might be evidenced by the following example:

> **Oxitec Scientist responding to citizen's question:** A degree of incorrect info has been put out about some of these things. The female release, we were not releasing that many females (1 female per 1500 males). We were releasing less; we do inevitably release some and the numbers are far lower. What happens if bitten by one of these? Have analyzed the mosquitoes in the lab. They are the same

> as the normal mosquitoes. They are not injecting genes into people. From a 'human, anecdotal' angle, I have been bitten them and nothing different has happened. They are shorter lived in the wild, but otherwise they are essentially the same in terms of what happens if they are eaten by other animals or if they bit humans.

In either case, both citizens and scientists will abandon the appearance of rational, "straight-line," matter of fact, discourse for the irrational in an effort to discuss values and priorities as "matters of concern." However, their discourse model leads to characterizations of these "matters of concern" statements as "irrational," and, as such, not persuasive.

5. CONCLUSION

This work leverages the concept of strategic irrationality to lend insight into the complexity of the Keys controversy and why it is so challenging to resolve. Two groups in the same debate arguing about different "things," in the Latourian sense (i.e., mosquito vs. disease) and in different places, in the Lefebvre's terms, but with similar claims on expertise leading to a power struggle that encourages deployment of strategic irrationality with the goal of claiming the right to make the final decision.

Of consequence, then, is that public scientific controversies increasingly may happen at sites in which the impacted populations are educated and affluent, and in which educated and affluent scientists live (i.e., developed countries, major cities, etc.), and so understanding the dynamics in play when two educated/empowered groups conflict will be invaluable to negotiating closure.

It is important to note that strategic irrationality obtains as a tactic not because there's anything inherently wrong or flawed or inaccurate about being both citizen-scientists or scientist-citizens, but because, at least within the context of the town hall meetings, both parties have bought into the asymmetrical model (rational is the straight, true line and the bend is irrational) that creates a power imbalance and renders issues existing outside the scientific context ineffective within the deliberative space. Most salient is the realization that a pervasive acceptance of Science (i.e., facts and quantitative data) as the sole currency of scientific issue is reductive, unproductive, and unnecessary. It then falls to future research to discover means of discussing issues in which scientific and technological concerns can be discussed within a broader context that encompasses both the matters of their facts and the concerns they engender.

As genetic engineering of mosquitoes emerges as a strategy to control not only dengue fever and chikungunya, but also diseases such as the Zika virus, public controversy over the release of these engineered organisms is likely to spread. Understanding the rhetorical dynamics of the first planned release of a genetically engineered mosquito in the United States is an important first step in managing the environmental policy challenges of this new technology.

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REFERENCES

Aedes aegypti OX513A. (n.d.). Retrieved from http://www.oxitec.com/health/our-products/aedes-agypti-ox513a/

Alvarez, L. (2015, February 19). A mosquito solution (more mosquitoes) raises heat in Florida Keys. *The New York Times*. Retrieved from http://www.nytimes.com/2015/02/20/us/battle-rises-in-florida-keys-over-fighting-mosquitoes-with-mosquitoes.html

Banning, M. E. (2009). When poststructural theory and contemporary politics collide—The vexed case of global warming. *Communication and Critical/Cultural Studies*, 6(3), 285–304. http://doi.org/10.1080/14791420903049736

Catherine, C. (2014, December 6). *FKMCD town hall meeting - 120414* [Video file]. Retreived from https://www.youtube.com/watch?v=fO31wLQoCJ0

Ceccarelli, L. (2011). Manufactured scientific controversy: Science, rhetoric, and public debate. *Rhetoric & Public Affairs*, 14(2), 195–228. http://doi.org/10.1353/rap.2010.0222

Chikungunya. (2016, April). Retrieved from http://www.who.int/mediacentre/factsheets/fs327/en/

City of Key West, FL--Meeting of City Commission on 4/3/2012 at 6:00 PM. (2012, April 3). *City of Key West.* Retrieved from https://keywest.legistar.com/MeetingDetail.aspx?ID=192357&GUID=5E61409A-390E-4919-A7C0-39B7A7EEF57E&Options=&Search=

Collins, H.M. and R. J. Evans. (2002). The third wave of science studies: Studies of expertise and experience. *Social Studies of Sciences*, 32(2): 235-296.

De Meir, Mila. (2012). Say no to genetically modified mosquitoes release in the Florida Keys. Retrieved from https://www.change.org/p/say-no-to-genetically-modified-mosquitoes-release-in-the-florida-keys

Dengue and severe dengue. (2016, April). Retrieved from http://www.who.int/mediacentre/factsheets/fs117/en/

Fitzsimmons, C. (2011, March). Mosquito control activities and response to dengue. Presentation at City of Key West Meeting of City Commission, Key West, FL.

Florida Keys Project. (n.d.). Retrieved from http://www.oxitec.com/health/florida-keys-project/

Glaser, B. G., & Strauss, A. L. (2009). *The Discovery of Grounded Theory: Strategies for Qualitative Research*. Piscataway, NJ: Transaction Publishers.

Groups call on governor to protect Floridians and block release of unregulated, risky GE mosquitoes. (2012, April 19). Food & Water Watch. Retrieved from http://www.foodandwaterwatch.org/news/groups-call-governor-protect-floridians-and-block-release-unregulated-risky-ge-mosquitoes

Hulme, M. (2009). *Why we disagree about climate change: Understanding controversy, inaction and opportunity*. Cambridge: Cambridge University Press.

Keys Mosquito. (2012, December 11). *Townhall meeting* [Video file]. Retrieved from https://www.youtube.com/watch?v=5WQkM-yc7QI

Knight, G., & Greenberg, J. (2011). Talk of the enemy: Adversarial framing and climate change discourse. *Social Movement Studies*,10(4), 323–340.

Latest information on the proposed Oxitec GM mosquito project. (n.d.). *Florida Keys Mosquito Control District*. Retrieved from http://keysmosquito.org/latest-gm-information/

Lefebvre, H. (1991). *The production of space.* (D. Nicholson-Smith, Trans.) (1st edition). Cambridge, MA: Wiley-Blackwell.

Latour, B. (1987). *Science in action: How to follow scientists and engineers through society*. Cambridge, MA: Harvard University Press.

Latour, B. (2004). *Politics of Nature*. Cambridge, MA: Harvard University Press.

Latour, B. (2004). Why has critique run out of steam? From matters of fact to matters of concern. *Critical Inquiry*, 30(2), 225–248. http://doi.org/10.1086/421123

Lawrence, H., Hausman, B., & Danenberg, C. (2014). Reframing medicine's publics: The local as a public of vaccine refusal. *Journal of Medical Humanities*. 35, 111-129.

Leal, A. (n.d.). Mosquito control measures for *Aedes aegypti* and *Aedes albopictus*. Retrieved from http://www.floridahealth.gov/diseases-and-conditions/mosquito-borne-diseases/_documents/mosquito-control-measures-chik.pdf

Lindeman, N. (2013). Subjectivized knowledge and grassroots advocacy: An analysis of an environmental controversy in Northern California. *Journal of Business and Technical Communication*, *27*(1), 62–90. http://doi.org/10.1177/1050651912448871

O'Hara, T. (2011, February 24). Battling the bugs: Birth control project set for dengue mosquitoes. *The Key West Citizen.* Retrieved from http://keysnews.com/archives

Ongoing field trials of OX513A *Aedes aegypti*. Retrieved from http://www.oxitec.com/health/our-products/aedes-agypti-ox513a/ongoing-field-trials-of-ox513a-aedes-aegypti/

Oreskes, N., & Conway, E. M. (2010). *Merchants of doubt: How a handful of scientists obscured the truth on issues from tobacco smoke to global warming*. New York: Bloomsbury Publishing USA.

Oxitec and MRCU report 80% suppression of a dengue mosquito population in Grand Cayman by release of engineered sterile male mosquitoes – Nature Biotechnology. Retrieived from http://www.oxitec.com/press-release-oxitec-and-mrcu-report-80-suppression-of-a-dengue-mosquito-population-in-grand-cayman-by-release-of-engineered-sterile-male-mosquitoes-nature-biotechnology/

Oxitec filed for a permit to USDA on 18 May. (2012, June 22). *Change.org.* Retrieved from https://www.change.org/p/say-no-to-genetically-modified-mosquitoes-release-in-the-florida-keys/u/1720335

Oxitec Science. (n.d.). Retrieved from http://www.oxitec.com/ridl-science/

Pollack, A. (2011, October 30). Concerns are raised about genetically engineered mosquitoes. *The New York Times*. Retrieved from http://www.nytimes.com/2011/10/31/science/concerns-raised-about-genetically-engineered-mosquitoes.html

Pollack, A. (2016, March 11). Test of Zika-fighting genetically engineered mosquitoes gets tentative F.D.A. approval. *The New York Times*. Retrieved from http://www.nytimes.com/2016/03/12/business/test-of-zika-fighting-genetically-altered-mosquitoes-gets-tentative-fda-approval.html

Sauer, B. (1998). Embodied knowledge: The textual representation of embodied sensory information in a Dynamic and Uncertain Material Environment. Written Communication, 15(2), 131–169. http://doi.org/10.1177/0741088398015002001

What is killing the mosquitoes? (n.d.). Retrieved from http://www.oxitec.com/faqs/what-is-killing-the-mosquitoes-2/

Zika virus. (2016, April). Retrieved from http://www.who.int/mediacentre/factsheets/zika/en/