

Envisioning Complex Futures: Reasoning with Collective Narratives in Deliberations over Gene Editing in the Wild

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The discovery and proliferation of new tools for genetic manipulation, like CRISPR, have reorganized the possibilities for widespread genetic modification of plants and animals. Some of the most potentially transformative applications entail using gene drive, a system of biased inheritance that spreads traits quickly through a population. Using CRISPR, gene drive, and similar technologies on organisms for wild release offers large potential benefits, potentially saving hundreds of thousands of lives by reducing the prevalence of endemic diseases such as malaria,¹ lessening the threat of global warming by modifying plants to absorb more carbon dioxide,² or rectifying past damage to natural systems due to species extinctions.³

But the means to these laudable ends also raise serious questions, uncertainties, and concerns. Some are scientific. Controlled experimentation is limited in its ability to reveal much about longer-term impact of species modification on local ecologies, nor assess how such changes might affect the well-being of future generations. Experiments that alter the mix of genes in wild species can never respect political borders, making it unclear which polities or governance systems ought to have jurisdiction over the decisions about whether or when to experiment at all.

The inherent limitations of scientific expertise and conventional governmental arrangements make innovative forms of public deliberation seem appealing. Yet these same circumstances pose challenges for effective deliberation. Public understanding of complex issues is often shaped by reference to personal experience,⁴ but experiential learning is less available in this context: decisions and consequences about gene editing of wild organisms aren't tangible in the same way that public policies toward garbage collection or practices to reduce the prevalence

of wildfires would be. In addition, gene editing in the wild involves large-scale outcomes, like pandemic illness, species extinction, and climate change, that are frightening in their scope and their potential irreversibility. These anxieties can, if properly understood and addressed, enhance deliberation by encouraging the public to be more attentive to factors that it might otherwise overlook.⁵ But emotional reactions can also make it more challenging for deliberators to appropriately balance evidence regarding what is currently known against the anxieties induced by persisting unknowns.⁶ Finally, interventions of this sort inevitably evoke normative questions about humans' relationship with nature, questions that resonate with broader moral foundations or religious beliefs so widely shared that they are typically taken for granted, too deeply hidden to allow for thoughtful deliberation.⁷

Under these circumstances, public reasoning tends to fall back on various forms of heuristics, cognitively frugal ways of problem-solving that are based more on what "feels right" rather than rationalistic calculations of costs and benefits.⁸ In such contexts, narratives and narrative reasoning—that is, reasoning embedded within stories—offer access to insights about risks, processes, and fears that are otherwise difficult to convey and consider in deliberative settings. Complementing the exploration of personal narratives elsewhere in this issue,⁹ here we consider narratives and narrative reasoning that are related to our collective sense of selves and society.

We focus here on three forms of collective narrative: (1) cultural narratives, describing human's broader relationship with nature, (2) domain-specific narratives (in this case, narratives uniquely applicable to understanding of science and technology), and (3) contemporaneous narratives, accounts that characterize the current state of a polity or the world at large, setting the context within which particular policies or collective actions are being implemented. These

categories, which we see as distinctive but overlapping, are illustrated in this essay with a handful of specific narratives that seem particularly relevant to debates about modifying genes in the wild.

We call attention to narrative reasoning—and to particular collective narratives—with certain objectives in mind. We do *not* mean to privilege any one narrative or subset of narratives; rather, we believe that it is a shared understanding of a multiplicity of relevant narratives that creates the greatest potential for shared understanding and, potentially, for finding common ground across ideological or partisan divides. More specifically, we call for a commitment to “narrative transparency” that pays close attention to *all* the collective narratives that animate the public’s understanding of our relationship with nature and how it might be altered through genetic manipulation. Such transparency is a building block toward what we call narrative fluency, wherein people can more fully appreciate the meaning and import of the full range of collective narratives that are seen as salient, including those they do not personally embrace. Narrative fluency can also help deliberators more thoughtfully balance emotions and evidence in their assessments. In addition, narrative transparency can alert deliberators to the ways in which particular narratives—referred to here as “crafted narratives”—may be manipulated by powerful elites and concentrated economic interests for their own strategic ends. We suggest that deliberations regarding modifying genes in the wild may be particularly influenced by extensive marketing by the biotech industry,¹⁰ extolling its capacity to use genetic information and modification to promote human health. Calling attention to the influence of crafted narratives is, we argue, essential to ensure that they do not unduly influence discourse and the deliberative process.

How collective narratives might matter for reasoning and deliberation

While much has been written on the influence of a variety of narratives on individual decision-making,¹¹ research on the role of narratives in deliberation focuses almost entirely on personal narratives.¹² By shifting the spotlight to collective narratives that inhere in cultures, communities, and other social groups, we seek to enrich our thinking about the ways to incorporate narratives into deliberative settings. However, given the dearth of research on collective narratives in deliberative settings, most of our claims about the import of attending to collective narratives are based on extrapolation from research on narrative influence in other contexts: public discourse, media coverage, and public support for social policies.¹³

The Promise of Collective Narratives: Narratives can enhance engagement with complex social issues, particularly with outcomes that are otherwise too distal to seem salient to those involved in the deliberations. A half-million deaths from malaria each year is a statistic: large in magnitude, but a cold number, especially when the mortality is happening somewhere far away from those who might need to pay for the gene drives designed to ameliorate this toll. But if these deaths are seen as typically children being denied fundamental life-opportunities, it resonates more directly with the values embedded in various ideological and religious narratives that form the moral bedrock of public perceptions of a just society.¹⁴

In this way, collective narratives can give deeper meaning to scientific data, can infuse that meaning with values and feelings, thereby making the facts more actionable. Psychologists use the term “transportation” (i.e., the audience is “transported” into others’ worlds) to describe this process at the individual level and documented the impact of collective narratives.¹⁵ Sociologists have identified similar processes in studying how shared narratives can mobilize “social movements” to respond to contemporary issues.¹⁶

Narrative framing may also help people grapple with emergent issues fraught with uncertainty. People find it hard to make choices—or even to think in clear and actionable ways—about situations that are highly uncertain.¹⁷ When uncertainty is so great that it is difficult to assign realistic probabilities to expected gains and losses, many people avert their metaphorical gaze, hiding away from the anxieties induced by such ontological insecurity.¹⁸ Collective narratives can help reduce this immobilization. Though narratives cannot render future prospects any less murky, situating those unfolding events in the context of familiar storylines can make that insecurity feel more manageable by making it feel less novel.¹⁹

Understanding collective narratives can also help deliberators appreciate perspectives different from their own. Collective narratives are familiar to virtually everyone in a community or society.²⁰ Seeing how others' viewpoints are connected to their own narrative foundations, rather than just being capricious or disputatious, gives these competing claims a logic and moral grounding that everyone can understand, even if not everyone embraces particular narratives.

Finally, collective narratives can make it easier for people to share imagined futures. Psychologists have long recognized the capacity of shared narratives to open-up the moral imagination.²¹ By sharing in an interlocutor's narrative about the future, listeners gain an affective understanding of what such a world might feel like. Deliberation about emerging technologies are inevitable conversations about events not yet experienced. Collective narratives help deliberators to imagine, care about, and more thoughtfully grapple with those futures.

Cautions about the Influence of Certain Narratives: Promoting greater “narrative fluency” in deliberative settings must also attend to the ways in which collective narratives have already subtly altered participants perspectives, preferences, and predispositions about the world,

before they enter the deliberative setting.²² Some of these influences may “spill over” from other related domains, including other aspects of biotechnology and genetics.

The contemporary crafted narratives most likely to influence deliberations regarding interventions to alter genes in the wild involve the collective narratives about genetics and genetic based interventions into health, illness, and medical treatments that are constructed and conveyed by the biotechnology industry. This messaging is clearly evident in the direct-to-consumer advertising prevalent on television in the U.S. and ubiquitous on internet websites throughout the world.²³ When a child in a Bayer commercial blows dandelion seeds into the sunny air while a warm voice tells you that Bayer makes the future possible, they are telling a story about a particular vision of the future that is possible, but only if the corporation with expertise in particular technologies is given a central role in shaping what is to come.

Similarly many narratives currently accepted as the foundational elements of a given community, culture or polity are themselves a product or remnant of crafted narratives from the past. The most successful crafted narratives can become durably culturally embedded as collective narratives in future generations. For example, the notion that smokers had some “individual responsibility” for the collective costs and burdens caused by smoking was a direct outgrowth of media campaigns launched by the tobacco industry in the second half of the 20th century,²⁴ and campaign that was particularly effective in the United States precisely because it resonated with that nation’s deeper cultural of individualism.

Crafted narratives may be motivated by a pursuit of profit or brand-image—and certainly the concentrated economic power of large corporations gives them the capacity to project particular narratives through their marketing efforts. But crafted narratives might also serve social justice motives, and activists seeking to mobilize the public in favor of collective change

will often evoke collective narratives to foster mobilization.^{25,26} Whatever their origins, crafted narrative have the capacity to deeply shape public discourse. In so doing, they may distort public deliberation, unless deliberators are attentive to these influences and able to identify their origins, purposes, and influence.²⁷

Distinguishing three key forms of collective narrative

Three forms of collective narrative can most powerfully shape deliberations regarding genetic modification in the wild. We introduce each type in this section, applying them to gene editing in the wild in the section that follows.

Cultural narratives: Certain well-established collective narratives, often referred to as cultural narratives, define every polity's sense of collective identity and serve as guides for its collective actions. "To be in a culture is to share a canon of public narratives—religious, historical, ideology, and popular.... The canon of available public narratives helps to define common identity, determining who 'we' are (and who is the 'other') and what kind of people we are, and helps establish common beliefs about how the world works and what a community views as proper, just, and moral."²⁸

These long-standing cultural narratives—labeled in some academic disciplines as “meta-narratives” or “master narratives”—represent "transhistorical narratives that are embedded in a particular culture."²⁹ For example, cultural narratives have profoundly shaped discourse about the appropriate scope of American government by evoking long-standing concepts like “American exceptionalism,” which tie together narratives about the original ideals of European settlers, aspirations to a mythical, universally available form of the “American Dream” and comforting stories about America as a “shining city on a hill.”³⁰ Their reach can be quite extensive, argued to “influence scientific discourse, political action, and policy.”³¹

Cultural narratives pose particular challenges for deliberation. They are often so deeply embedded in a culture or polity that their influence is taken for granted. Cultural narratives can influence people's reasoning and emotional reactions in subtle and often hidden ways, making it harder for people to articulate why certain emergent technologies or options feel right or wrong. Some cultural narratives can become hegemonic frames of interpretation that silence alternative stories (a.k.a. counter-narratives), particularly in communities that have homogenous culture backgrounds or religious beliefs.³²

Domain-Specific Narratives: Every policy domain has a set of narratives that have, over time, become embedded in discourse about collective action. In American medicine, for example, there are three primary narratives that compete in shaping both public and policymaker's conceptions of an equitable healthcare system: health care as a societal right, health care as a marketable commodity, and health care as a professional service.³³ Americans are broadly familiar with all three frames regarding equitable medical care.³⁴ This allows multiple narratives to coexist over time in the public's thinking and discourse. But particular narratives may come to be accepted as most compatible with certain aspects of a given domain: for example, health services like optometry are generally seen to be most compatible with the marketable commodity narrative, others with narratives of professional service (e.g. emergency cardiac interventions) or societal rights (e.g. immunizations for infectious diseases).

Contemporaneous Narratives: Whereas cultural narratives are relatively stable over time, public awareness and expectations are also shaped by narrative representations of the current state of society (or the world). The impact of these contemporaneous accounts has been identified as powerfully influencing economic activities, expectations, and policies. These narratives can shift and fluctuate dramatically over time: "narratives are major vectors of rapid

change ...in zeitgeist and in economic behavior. Sometimes, narratives merge with fads and crazes. Savvy marketers and promoters then amplify them in an attempt to profit from them.”³⁵

Collective narratives and deliberations about gene editing in the wild

Each of these three forms of collective narrative has relevance to deliberations over gene editing in the wild; the examples presented in this section illustrate this applicability but do not exhaust all the collective narratives that are or could be relevant.

Cultural Narratives: Every society is fundamentally shaped by deeply rooted narratives that define humans’ relationship with nature. We illustrate this with three examples drawn from the dominant Anglo culture in the United States, each narrative emerging at a different stage in American history and each dominant in different eras. But all three persist – and continue to shape public discourse today.

The first to emerge, dating back to Colonial times, represented the new lands of North America as an embodiment of the Garden of Eden. It cast human’s relationship with nature in the context of a broader moral drama about human aspirations to new knowledge, potential for corruption, and human’s purportedly elevated moral standing in the eyes of the creator (who was, inevitably, disappointed by their subsequent behavior).³⁶

Two additional narratives became more influential during the 19th century; both also have roots that can be traced to the biblical creation story. The first to emerge, early in the 19th century, involved a representation of a “manifest destiny” that privileged human’s dominion over nature and European domination over native Americans.³⁷ Human’s relationship to nature were defined largely in terms of husbandry—to improving nature’s yield for the benefit of humankind.

By the final third of the 19th century, a third cultural narrative had emerged as influential, placing humans in a stewardship role that privileged the preservation of the natural order, free from human manipulation or intervention.¹⁹ The strong version of this precautionary cultural

narrative captures the view the humans should leave nature alone. This perspective shaped the ideals of Sierra Club founder John Muir, who argued for “preserving some places in the world in their natural state.” Although Muir wanted humans to experience the beauty of nature, he thought “humans and nature must be kept quite apart from each other.”³⁸ Within this narrative, human tinkering almost inevitably did harm—either to nature itself or to our own well-being.

The interplay of these three cultural narratives can powerfully influence deliberations about gene-editing in the wild. Each narrative resonates with different notions of how best gene editing might be deployed among wild species, though those who embrace each narrative may feel a real and legitimate desire to safeguard nature. In some of these conceptions, the protection takes the form of remedies that restore past damages by humans have “defiled” the natural order. In others, the preferred interventions will favor the creation of new capabilities within plant and animal species to adapt to an environment that humans have already dramatically altered.

Domain-Specific Narratives: In deliberations regarding gene editing in the wild, the “domain” in question involves the introduction of genetic technologies—and, by extension, the capacity for new technologies to bring good and ill into the world. Here again, there are multiple (and competing) narratives that shape public expectations. Since the mid-20th century, American culture in particular has embraced an optimistic view of technological change, particularly as it impacts human health.³⁹ In applications related to genetics, this promise has been further burnished by narrative appeals crafted by researchers associated with the Human Genome Project, who have sold the potential benefits of genetic research, often beyond the actual benefits that have been realized to date.⁴⁰

Juxtaposed against these powerful techno-optimist narratives stands a cautionary counter-narrative that emerged most powerfully in the final decade of the 20th century. It evoked long-

standing fears that the capacity for science to reshape nature risked a potential overreach, fueled by hubris and a lack of attention to the potential unexpected risks of tinkering with complex natural systems. Embodied in Mary Shelley's cautionary novel about Dr. Frankenstein and his monster, the public was reminded of these concerns in the 1980s and 1990s by repeated technological failures in the nuclear power industry – and the environmental catastrophes that this occasionally created.⁴¹

This second narrative suggests that, even when human beings intervene in an effort to protect nature and improve health, these efforts can backfire. A case in Borneo illustrates the delicate balance of nature and the unintended consequences of human intervention. An outbreak of malaria in the early 1950s led the World Health Organization (WHO) to bring in massive amounts of DDT to kill mosquitoes. The DDT killed the mosquitoes, but poisoned the cat population, leading to an increase in rates and an outbreak of typhus and plague.⁴²

These competing narratives regarding the applications of science create a tension that needs to be unpacked in order to carefully consider the application of new genetic technologies in the wild. Past debates over new technologies suggest that this process can be challenging, since it's easy for deliberations to focus exclusively on short-term benefits, neglecting potential longer-term consequences. Exactly this dynamic is evident with various new medical technologies, leading to the dominance of an “urgency narrative” in which the proponents argue that further delay is problematic because the health consequences of inaction (e.g., premature death, pain and suffering) are morally unacceptable.⁴³ A comparable urgency narrative could distort deliberations over applications of gene editing in the wild because of their potential to save millions of lives without a reliable means of assessing longer-term effects.

Contemporaneous Narratives: There are many accounts that represent elements of modern life as representations of some fundamental narrative about the state of the contemporary world. One common motif in mass and social media, for example, characterizes the current state of affairs in the United States as “pandemic America.” Though the full impact of the COVID epidemic is too recent and complex to fully assess, there is little doubt that the pandemic has left a deep imprint on collective psyches.⁴⁴ How this might shape deliberations over gene editing in the wild is likely multifaceted and difficult to predict: one can envision impacts on public attitudes that both might encourage support for genetic as well as some that could enhance the case for caution and delay.

Two considerations might predispose deliberative participants to favor genetic interventions. First, COVID has newly illustrated the extent to which nature represents a health threat, with viruses seeming to leap across species in ways not previously imagined. Second, the rapid and effective deployment of new genetic technologies for vaccine design (using messenger RNA to stimulate an immune response) adds luster to the potential for additional genetic manipulation to be viewed favorably.

Conversely, two considerations may promote caution about future deployment of genetic technologies in the wild. First, at least some are viewing the new genetic approaches to vaccine development with caution. Second, the fact that the COVID virus is widely presumed to have jumped from animals (exactly which remains unclear) to humans vitiates the wall between humans and nature. That, in turn, raises the specter that there could be unexpected consequences of gene manipulation in the wild that have delayed but direct impact on human health.

Taking collective narratives into account to enrich deliberations

Given the considerations identified above, one can identify seven “points of leverage” for promoting “narrative-enriched” deliberations. These points of leverage focus on two key issues. First, as with other essays in this special issue, we emphasize the importance of expanding participation—including of those representing alternative narrative frames, including those that depart from the hegemonic Judeo-Christian traditions that have so powerfully shaped environmental policies over the past centuries, particularly in the United States. Second, we identify factors that can affect the deliberative process. We can provide only a brief sketch of each here, which inevitably gives short shift to the challenges of implementation. But we hope this might be sufficient to offer some constructive ideas, worthy of further development.

Narrative Transparency, Understanding, and Pluralism: We believe that it is essential for those guiding the deliberative process to ensure that the relevant narrative influences are effectively identified, so that participants can thoughtfully assess their own judgment on these issues and understand the positions taken by others. This is particularly important for cultural narratives, where the influences on attitudes (and behavior) may be particularly subtle and complex, so deeply embedded in cultural norms that they are effectively taken for granted.

The obvious challenge here is promoting an awareness of and appreciation for multiple narratives (i.e. narrative transparency and fluency) without skewing the starting conditions for balanced, thoughtful deliberation. Two considerations make this seem feasible. First, multiple narratives regarding both technology and human’s relationship with nature are long-standing parts of discourse around environmental policy,⁴⁵ making it easier for the public to see and embrace the insights from multiple narrative frames.⁴⁶ Second, the narratives relevant to gene editing in the wild, identified above, represent a balance of technological optimism and caution,

making it possible to bring narrative to the forefront without unduly tipping the deliberative scales in favor or either action or inaction..

Promoting More Inclusive Deliberation: Scholars have long argued that deliberative fora that privilege quantitative evidence discourage participation by deliberators who rely more on experiential accounts gathered through social networks or narrative forms of knowledge.⁴⁷ We anticipate that introducing attention to fluency and transparency regarding collective narratives will provide a scaffolding that increases the salience of other forms of narrative—including personal narrative, as part of the deliberation. There is some evidence that when this happens, it does indeed level the playing field, promoting more balanced participation by those who might have otherwise be marginalized during deliberations.⁴⁸

Finding Common Ground: American politics has become famously—some might say tragically—polarized.⁴⁹ This is particularly troubling for successful deliberative fora, which depend upon an openness to considering others' perspectives. Fortunately, certain narratives, such as the notion of environmental stewardship, create potential bridges among seemingly disparate communities, including potentially connected values embraced by American Indians and Alaska Natives/First Peoples with certain denominations of Christianity.⁵⁰ But such promising commonalities should not obscure the importance of the deep differences in values—many anchored in religious traditions—that divide the public that favors human dominion over nature from those promoting environmental stewardship. Determining how best to address these divides to promote effective deliberation remains a crucial consideration.

Dispelling Hype: Particularly in the United States, the public is bombarded by direct-to-consumer advertising that highlights genetic insights in the latest pharmaceutical and biologic innovations. Combined with the genetic innovations embodied in the first-wave COVID

vaccines, it would be easy for much of the public to assume that scientists had achieved some level of mastery over genetic manipulation. To ensure more balanced deliberations, these external influences must be buffered, without taking away from the achievements of recent innovations in the treatment of cancers and other dread diseases.

Balanced Consideration of Outcomes: As we noted above, the literature suggests that much of the public, particularly in the United States, is predisposed toward technology that yields benefits to human health. That could reflect a reasoned and reasonable set of priorities. But it could also represent the unseen and ill-considered influence of cultural narratives which, if brought to light, would allow deliberators to consider other alternatives. If health-promoting narratives are favored, compared to those that protect or restore the natural environment, there remains the risk that narrative enriched deliberation may be biased toward human health benefits, both in the evaluation of benefits versus costs of gene editing in the wild but also in the prioritization of which such interventions (if any) deserved the earliest deployment. Facilitators must work carefully to guard against these potential biases.

Making Room for Emotion-laden Positions in Deliberations: Contemporary gene editing in the wild is laden with some irreducible forms of uncertainty, particularly regarding the long-term impact of genetic manipulation on various ecosystems. Because the uncertainties are substantial and the stakes are large (including potential extinction for some species), collective choices regarding these policies will always be fraught with anxiety. For members of indigenous groups whose identity consists in relationship with the land and its beings, that anxiety can be existential. Those fears have an important role to play in deliberation, whether or not they are “dressed-up” under the rubric of the precautionary principle.⁵¹ Being attentive to the relevant

collective narratives—including those that emphasize the risks of technology run out of control—will, we anticipate, create more deliberative “space” for attending to these concerns.

Sophisticated Readings of Narrative Influences: Facilitators and background materials should educate participants on human reasoning, including the role of collective narratives. This recommendation is analogous to one offered by Thompson and Hoggett (2001) who warned about the potentially destructive role of emotions for deliberative democracy unless participants understood the emotional dynamics of group decision-making.⁵² But calling attention to narrative influences poses challenges. It is one thing to ask people to respect positions that emerge from cultural narratives different from their own. It is another to ask them to open to question, in a deeply reflective way, their own narrative beliefs—particularly if these are grounded in faith traditions or deeply held cultural norms. Approaching this deliberative ideal may prove hard, yet is also seems essential for issues related to gene editing in the wild.

Conclusions

As a value-laden intervention with unknowable and potentially irreversible outcomes, gene editing of wild organisms is ripe for public deliberation. But the factors that make deliberation necessary also make it difficult. The same conditions that make deliberation difficult are those that make considering the impact of narrative reasoning essential. In this essay, we have explored how attention to various forms of collective narratives can enhance the capacity for deliberative gatherings to address gene editing in the wild. Designing deliberative processes that enhance narrative transparency and fluency can promote thoughtful deliberation, encourage mutual understanding, and potentially increasing the possibility of finding common ground.

Engaging with collective narratives most readily and fully enhances deliberation when participants embrace the value of narrative pluralism. This is no certain matter. There will always be some segments of the public who view the world through more monochromatic narrative lenses, unwilling to honor or learn from alternative narratives than the ones they embrace. These people pose particular challenges for deliberative arrangements, ones that are illuminated and addressed in the accompanying essay on the importance of cultural theory for deliberation.⁵³

But we remain optimistic about the potential to leverage a more pluralistic view of collective narratives. Studies of public opinion reveals that much of the public views complex social issues through multiple narrative lenses. They construct meaning by using collective narratives as a form of metaphor, each narrative highlighting particular aspects of a complex issue, but none fully defining that issue.⁵⁴ The limited evidence from deliberative settings suggests, similarly, that participants can transcend specific paradigms in finding common purpose and direction.⁵⁵ We believe that attention to narrative transparency and fluency holds the same promise for deliberations about gene editing in the wild.

Notes

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