Article

Stitching Together Creativity and Responsibility: Interpreting *Frankenstein* Across Disciplines

Megan K. Halpern[1], Jathan Sadowski[2], Joey Eschrich[2], Ed Finn[2], and David H. Guston[2]

Abstract

This article explores Mary Shelley's *Frankenstein* as an "object of care" for use in examining the relationship between creativity and responsibility in the sciences and beyond. Through three short sketches from different disciplinary lenses—literature, science and technology studies, and feminist studies—readers get a sense of the different ways scholars might consider Shelley's text as an object of care. Through an analysis and synthesis of these three sketches, the authors illustrate the value of such an object in thinking about broad cultural issues. The article acts as a kind of boundary object by creating distinct, yet overlapping narratives from an object that is owned by many social worlds. The three sketches reveal *Frankenstein* as a thoughtful consideration about what it means to care for, or fail to care for, one's creation, rather than as a cautionary tale about the evils of scientific hubris. Although infrastructures at universities often prevent interdisciplinary dialogue, the article concludes that purposeful boundary objects created around objects of care like *Frankenstein* can help build bridges and create shared meanings for new interdisciplinary spaces.

> For is it not possible that science as we know it today, or a "search for the truth" in the style of traditional philosophy, will create a monster?
>
> —Feyerabend (1975/1993, p. 154)

Introduction

For scholars in science and technology studies (STS), science fiction has productively played many roles. It can be a source of scholarly data about our cultural sociotechnical imaginaries, by both reflecting and influencing the stories we tell about science, society, technology, and humans (Jasanoff & Kim, 2009). It can be a venue for critical inquiry into the politics of gender and race (Lavender, 2011; Squier, 1999; Young, 2008). It can be used as an effective pedagogical instrument, in STEM and humanities classrooms alike, for revealing the thorny ethical and societal issues that emerge from sociotechnical systems (Berne, 2003; Berne & Schummer, 2005). It can be a spark of inspiration for new avenues of innovation and discovery (Bassett, Steinmueller, & Voss, 2013). It can be deployed strategically to demarcate the respectability of "real science" from the impropriety of the imaginative (Milburn, 2003). It can be a platform for creating "diegetic prototypes that demonstrate to large public audiences a technology's need, benevolence and viability"

(Kirby, 2010, p. 43). Alternatively, it can be a warning about paths we had best not tread down (Baccolini & Moylan, 2003).

In other words, science fiction, through the various roles it plays, is more than just a genre. It is also a medium that opens up avenues for reflexivity and discussion by providing representations of alternative future worlds, "reflecting enduring realities" of the human condition, and "illustrating fundamental moral dilemmas" (Miller & Bennett, 2008, p. 600). Because it depends on character-driven narrative, science fiction explores these boundary questions in the language of empathy, asking us to grapple with sociotechnical change in deeply human terms.

Mary Shelley's (1818/2012) *Frankenstein; or, the Modern Prometheus*[1] is particularly fertile ground for reflecting on the way humans wrestle with those moral dilemmas. In this article, we take Shelley's text as an object of care through which we can examine the dual roles of creativity and of

[1]Michigan State University, East Lansing, MI, USA
[2]Arizona State University, Tempe, AZ, USA

Corresponding Author:
Megan K. Halpern, Lyman Briggs College, 919 E. Shaw Lane, Room 35 E
East Lansing, MI 48825-1107, USA.
Email: mhalpern@msu.edu

responsibility in technological and scientific innovation. Shelley's subtitle aptly expresses the fear of repercussions for new knowledge by drawing on the myth of the Titan who brought fire to humankind and was punished gruesomely for his rebellion.[2] The common reading of Shelley's *Prometheus* is that Dr. Frankenstein harnesses the spark of life and thereby brings despair and retribution not only to himself but also to anyone in the path of his creation. But we, along with Latour (2012), do not believe this is the only, or even the best way to read the novel.

The story is already lauded as an enduring, provocative science fiction text that offers insight into cultural phenomena, but we hope to show that the multiplicity of stories told about and in conjunction with *Frankenstein* have something to say not just to their diverse original audiences but to one another. A rich artifact like *Frankenstein* offers an opportunity for many disciplines to unite around a set of ideas and motivating questions, thus finding ways to speak across disciplinary and cultural chasms. In this sense, *Frankenstein* might be taken as a *boundary object* (Halpern, 2012; Star & Griesemer, 1989): an object that not only may have unique meaning within a certain social world but also has a shared meaning among several intersecting worlds.

This reading, however, suggests that the groups interpreting and making meaning of the text overlap and intersect. *Frankenstein* does more than bridge these kinds of boundaries; it has grown into a prevalent cultural theme that reaches beyond the overlapping networks associated with boundary objects. *Frankenstein* occupies this larger cultural space as an "object of care" that transforms a number of related boundary objects into something more. An "object of care" enables or enacts or focalizes care—an "affective state, a material vital doing, and an ethico-political obligation" (Puig de la Bellacasa, 2011, p. 90). An object can be intimately linked with care in a number of ways: it can contain care (e.g., in the form of lessons, morals, and symbolism); it can be constructed with care (e.g., through skilled craft and responsible creation); it can provoke care (e.g., by eliciting attention, focus, and maintenance); and it can elicit performances of care (e.g., through study, personal investment, and group rituals). These objects enact their boundary role by establishing spaces, practices, and discourses that bring disparate people and groups together around common matters of care. As Puig de la Bellacasa explains, "Transforming things into matters of care is a way of relating to them, of inevitably becoming affected by them, and of modifying their potential to affect others" (p. 99). The object of care, then, is a transformative agent. It draws attention to matters that have been ignored, neglected, or misunderstood—not cared for in the proper ways—and unites a diversity of perspectives and disciplinary positions around the practice and performance of care.

Frankenstein is, we argue, a multivalent object of care—both the story itself and the complex network of history, culture, and scholarship that it has inspired. In this article, we will explore how the novel establishes, illustrates, and bridges common matters of care across different disciplines. Puig de la Bellacasa (2011) tells us that "matters of care can be found in every context" and that "exhibiting them is valuable especially when caring seems to be out of place, superfluous or simply absent" (p. 93). *Frankenstein* explicates the ethical importance of care, and elicits acts of care from diverse interpretive communities. The novel is a parable about the dire consequences of care's absence, which makes it an ideal fulcrum for interdisciplinary dialogue and debate about ethical quandaries related to the human capacity to create, to bring new life and meaning into the world.

In these pages, we present three different disciplinary interpretations—literary analysis, STS, and feminism—that overlap and collide as they are brought together by sharing the same object of care. This article represents the creation of a boundary object studying an object of care. The article is a boundary object because it is meant to be shared across social worlds, while *Frankenstein* as an object of care is a far more wide-reaching object that may be shared by many social worlds that do not necessarily overlap or intersect. This article becomes, in turn, an *act* of care connected to the diverse linkages of caring performances, creative works, and scholarly research surrounding *Frankenstein*. We chose literary analysis because a close reading of this classic novel, within its literary context, helps illuminate both its connections to other works and the thematic concerns that drive its plot and narrative structure. We chose STS because it helps to unpack the important socioethical and humanistic dimensions of Dr. Frankenstein's technoscientific work. And we chose feminism because it asks us to think carefully and critically about the explicit and implicit power structures within the text, and about indispensable themes of (pro)creation, privilege, and otherness. To be sure, a number of other disciplines could—and should—be represented in the shared world that *Frankenstein* helps construct and stabilize. Nevertheless, these three should provide sufficient evidence for our claims.

We frame our interpretations of the novel's matters of care through two key concepts: creativity and responsibility. By reading the novel as a parable about the mutual importance and deeply intertwined nature of these two concepts, we can orient the disciplinary approaches—with each one emphasizing different lessons related to creativity and responsibility in the novel—toward understanding *Frankenstein's* contemporary relevance.

The modern meanings of both creativity and responsibility originate in the late Enlightenment era, the same time period when Shelley wrote *Frankenstein*. Early Western conceptions of "creativity" were divine in nature, with the biblical story of Genesis (following and echoing earlier creation myths) as an especially powerful example. But a fleshed out sense of "creativity" as an action and quality possessed by humans—especially as it relates to imagination and originality—began to take shape during the Enlightenment (Runco

& Albert, 2010). Similarly, "In all modern European languages, 'responsibility' only finds a home toward the end of the eighteenth century" (Williams, n.d.). At that time, its meaning was political, primarily referring to the duties of a government to its people.

Enlightenment thought animates Shelley's novel, so the struggle between creativity and responsibility is not particularly surprising. If we now think of humans as capable of creativity—as not only a creation but also creators—then what responsibilities—what duties to govern, to oversee, to manage, to nurture—do they have to that which they create? Just as a government has responsibilities to its body politic, Dr. Frankenstein must also have responsibilities to his creature as a new social, scientific, and cultural presence in the world. He must have obligations to respond to his creature and care for it, rather than turn away in disgust, casting it back into the state of nature. As an object of care linking together intellectual and social worlds, *Frankenstein* creates an inclusive space for differently considering the meanings and consequences of what happens when care is absent and when it is not reciprocated.

Unraveling *Frankenstein* in the Disciplines

To experiment briefly with what it might mean to take *Frankenstein* seriously as an object of care, we created these three disciplinary sketches of possible interpretations or discussions of the text within these three disciplines. Much like the artistic meaning of the word "sketch," these three short pieces are meant to suggest disciplinary readings of the novel. We do not seek to flesh out each of these sketches into full-fledged analyses; however, we mean to show that the underlying concepts are robust enough to merit such a rendering in each case. Each sketch was written by one of the coauthors of this article, and each is meant to be an individual interpretation through a particular lens. While the three sections were written after conversations about the value of the themes, each author considered creativity and responsibility in light of his or her chosen disciplinary area and through a careful reading of the novel. We then collectively analyzed the three pieces to find common themes among them, as well as differences in approach. We based the final two sections on this analysis, and they are meant to synthesize insights about creativity and responsibility emanating from multiple perspectives, to comment on *Frankenstein* as an object of care, and finally, to create, within this essay, our own boundary object.

Literature

Frankenstein's cultural life, from film to animation to Halloween costumes, is usually framed in terms of its status as a foundational text for the literary genres of Gothic horror and science fiction. The novel is frequently interpreted as a warning against adventurous innovation and self-aggrandizing creativity: a parable about the disastrous consequences of hubris. A close reading, however, reveals that the central theme is a more subtle admonition about scientific creativity and societal responsibility.

From a literary perspective, the theme of creativity and responsibility is a particularly helpful way to account for *Frankenstein*'s many oddities in form and structure. This, in short, is a much weirder novel than readers might imagine, especially if they are familiar with Victor Frankenstein and his creature only through pop culture clichés of the mad scientist, his electrified laboratory, and his green, hulking, bolt-necked creation (Toumey, 1992). The idiosyncratic structure of the novel, in fact, is only scrutable as a way of demonstrating the responsibility of the scientist to care for the product of his creativity. Victor fails not as an innovator but as a caregiver.

To put the creativity and responsibility theme in context, we should look first to Milton's (1667) *Paradise Lost*, which provides the epigraph for the 1818 edition and is invoked variously throughout the text. If *Frankenstein* functions as an urtext for STS and considerations of scientific ethics, Milton's anguished, articulate (and eventually vengeful) antihero Satan and his emotionally distant Creator serve as a template for the novel's central emotional and narrative dynamics. In *Paradise Lost*, the reader is encouraged to identify with Satan precisely because his emotional needs are not met by God, who creates legions of angels without accounting in any way for their self-determination and autonomy. Milton's God expects his angels, whom he has endowed with otherworldly intelligence, to eternally bask in his splendor and unquestioningly accept his authority and plan for creation. The Creator's unwillingness to accept the angels as beings with ideas of their own, with intrinsic value other than as symbols for and carriers of divine glory, is at the root of Satan's rage. Similarly, in *Frankenstein*, Victor's utter abandonment of the creature in its nascence leads eventually to violent retribution. Victor's inability or unwillingness to accept his progeny as anything but a hideous abomination parallels Milton's God's unwillingness to acknowledge Satan's selfhood, his emergent consciousness and intellect.

Shelley's own intellectual lineage forms a second, equally important context for the theme of creativity and responsibility. The thinking of her parents—Mary Wollstonecraft, famous for her *Vindication of the Rights of Woman* (1792), and William Godwin, one of the fathers of philosophical anarchism—on the importance of family and education in moral and social development suffuses the book and forms the intellectual basis for understanding Victor's failure and the creature's consequent descent from curiosity and empathy to callous violence and despair.

Taking creativity and responsibility as *Frankenstein's* guiding light helps give meaning to some of the novel's most idiosyncratic and mysterious structural and formal characteristics. The frame story, a common device for novels of the period, serves to anchor the Gothic, science fictional elements of the story with Captain Walton, a clear-eyed

representative of the Enlightenment. Walton's crucial choice, whether to continue to pursue his quest for the North Pole and endanger his crew or to turn back and allow his crew to return home unharmed, becomes its own investigation of creativity and responsibility through the lens of scientific observation. Victor's advice to Walton, which swings wildly between warnings against hubris and exhortations to continue at any cost, reveals that he has still not entirely learned his lesson from his arduous campaign against the creature, whom he still sees as a "demon" rather than a fellow person and even an abused, neglected child.

The theme accounts equally well for the inclusion of the lengthy tangent to flesh out the backstory of Justine, the happy, grateful beneficiary of the kindness of an adoptive family. Justine works as a counterexample to Victor's treatment of the creature: She, beautiful and fully human, is accepted as a full-fledged member of a family to which she is not biologically related, while the creature, ugly and not quite recognizable as human, is scorned and abandoned. Victor's unhappy sojourn in Ireland, where he is rejected by the villagers because of suspicions that he killed his friend Clerval, also supports the theme. In this case, Victor's flagging spirits are buoyed by the sympathetic ministrations of the local magistrate, Mr. Kirwin. Neither of these lengthy passages does much to advance the novel's plot, but both episodes stress the importance of human kindness and acceptance in nurturing people's well-being and safeguarding their sanity. The creature's frustration, despair, and eventually rage could have been short-circuited at any time by just one moment of tenderness, understanding, and care. Victor created the Monster without a plan for its care or its integration into basic social structures like the family, the legal system, or the broader community, which are so central to these seemingly tangential episodes. The geographically marginal status of Victor's experiments with life, conducted out of view of his friends, family, and scientific colleagues, signals his own alienation from these structures—another aspect of the novel's preoccupation with the social context for scientific creativity.

Finally, the theme of creativity and responsibility shapes *Frankenstein*'s epistolary structure. Again and again we see the narrative's forward movement pause for lengthy, tender letters exchanged between loved ones. Full of personal details and endearments that do little to advance the plot, these letters manifest the web of social ties, intellectual exchange, and mutual obligation that define familial and social bonds: the often intense emotional labor that loved ones and fellow citizens perform on one another's behalf. Shelley's long description of how the creature acquires language and literacy through scavenged books and furtive eavesdropping only accentuates the gulf that separates him from social belonging. The letters show us, rather than just tell us about, exactly what the creature is missing. They demonstrate, structurally as well as rhetorically, the ties of mutual responsibility and care that make life bearable, and make us human.

Science and Technology Studies

If we look at *Frankenstein* through an STS-inflected lens, then we can read it against the grain of many popular interpretations, which see it as a story about the abominations created when man decides to play God. We can escape this conventional reading by shifting the focus from the question of what Dr. Frankenstein creates to the question of how he acts toward his creation. As Bruno Latour (2012) puts it, "Dr. Frankenstein's crime was not that he invented a creature through some combination of hubris and high technology, but rather that he abandoned the creature to itself." In other words, Dr. Frankenstein should be judged as both a creator and a caretaker.

The creature that we popularly give Dr. Frankenstein's name was not born a monster imbued with fiendish traits prior to his existence. He was made into a monster by those around him—his monstrosity is constructed. His first experience with the world is to be treated with shock and disgust, rather than wonder and care, by his creator. And he experiences these reproaches again and again. Nobody cares for the creature; nobody shapes him and guides his integration into society. The creature is a lively representation of "the plight of things that have been created but not in a context of sufficient care" (Winner, 1977, p. 313). These are the types of experiences, especially early in life, that breed psychopaths. Is it any wonder that the creature eventually feels nothing but hatred and resentment toward Dr. Frankenstein? It is easy to focus on the havoc the creature wreaks on others, that is, to see the creature as an embodiment of "unintended consequences" (Merton, 1936). But what is more difficult but more necessary is to criticize Dr. Frankenstein for his refusal to take responsibility for what he creates and brings into the world. The consequences might have been unintended, but they are not without reason and could have been anticipated.

The moral of *Frankenstein* is not a warning about ungodly technoscientific creation; it is a warning against taking a position that does not consider matters of care and concern for those technoscientific creations. This interpretation of *Frankenstein* follows from a constructivist reading of the politics and ethics of technology. "This version of caring for technology carries well the double significance of care as an everyday labor of maintenance that is also an ethical obligation: we must take care of things in order to remain responsible for their becomings" (Puig de la Bellacasa, 2011, p. 90). Through this STS approach, we can extract new meaning from the novel and revitalize its lessons by moving beyond romantic notions of nature and toward questions of human creativity and technoscience-in-society.

If Dr. Frankenstein was a "modern Prometheus," then we should also consider our own modern Frankensteins. And here I don't mean the creatures or monsters but rather the actors, practices, and organizations that take on a Frankensteinian disposition in the present. Rather than

enumerate them, I instead offer a provocation: Look for those who exhibit the Frankensteinian character, where creativity and responsibility are disconnected, and make it known that they have a duty to their technoscientific creations.

A modern Dr. Frankenstein will, of course, operate in a much different setting than his or her analogue from the novel; perhaps the careless, brash, and ambitious researcher will be part of a team dedicated to "innovation" rather than a lone genius seeking "discovery." And he or she is unlikely to be as melodramatic as Dr. Frankenstein. But the consequences of his or her actions are likely to be more widespread, more consequential. The writer Chris Mooney (2002) vividly describes a possible modern incarnation:

> If only Victor Frankenstein had some media savvy, he might have been J. Craig Venter. Rather than living in dread of his appalling creature, he could have assembled a panel of bioethicists and theologians to bless it, applied for a Swiss government grant to research it, and hired an investment bank to explore an initial public offering—FrankenCell Inc.—to exploit the results of his research. (p. B01)

Remember that a modern Dr. Frankenstein's creations are not limited to biotechnology. While the question of what is created is surely important, the novel's lessons also show us that it is crucial to ask, "How is the creation, whatever it might be, cared for after it is brought into being?"

Feminism

A feminist reading of creativity and responsibility might begin with Mary Shelley's role in creating the genre of science fiction. Mellor (1982) makes the case that it is the first example of science fiction and of feminist science fiction. She writes that *Frankenstein* "links a radical critique of a patriarchal society with a skeptical analysis of the extent to which a scientific or technological manipulation of organic life can be ethically justified" (Mellor, 1982, p. 245). But Shelley's feminist portrayal of the ethical problems of scientific progress runs deeper than a critique of scientific or technological advancement at the level of state and society. At its core, the book is a critique not of Victor's decision to imbue the creature with life but rather, of his decisions as an individual about parenting once his creation is in the world.

Dr. Frankenstein's creative impulse is both professional and personal: He aims to satisfy his professional curiosity by creating human life. The pursuit is an obsession for him, though it takes the form of a career. Isolated from friends and his family, Victor aims to create new life without his beloved Elizabeth, or any other woman. By attempting to create a human life, Victor attempts to usurp the power of woman; by attempting to reanimate life in lifeless bodies, he attempts to usurp God (Mellor, 1989). Thus, Shelley's novel might be seen as a condemnation of Victor as a scientist and, at the

same time, of Victor as a father. Both kinds of creation are within his power, and he handles them both poorly.

Victor's inability to take responsibility for his creation stems, in part, from his emotional separation of work and life. When describing his work to create the creature, he says,

> I could not tear my thoughts from my employment, loathsome in itself, but which had taken an irresistible hold of my imagination. I wished, as it were, to procrastinate all that related to my feelings of affection until the great object, which swallowed up every habit of my nature, should be completed. (Shelley, 1818/2012, p. 82)

This picture of the diligent scientist at work, detached from the rest of life, focused solely on the task at hand, is a well-rehearsed caricature of the scientific enterprise. Science happens in private places, at the hands of lone(ly) men who act as if they were gods. Victor's inability to consider his family while he is working, or to consider his parental responsibility to his creation, belies a separation between work and life that allows him to abdicate responsibility for the creature both personally and professionally. Though he has played mother and God, when the two roles meet, he quickly excuses himself from both, failing even to give his creation a name, a prerequisite for the creature to be treated as human.

Victor's act of turning away is a relinquishment of his responsibility for the creature's well-being and its future behavior. He fails to act or take responsibility for the sake of the creature or that of the other victims and potential victims of his actions, even when the creature threatens his own family. He takes no action to find the creature or to alert anyone or to protect others after his brother's death, nor does he stand up for Justine, the innocent woman the creature frames for the death of Victor's brother. Victor even forges ahead with his marriage plans in hopes that the creature will, as it threatened, kill him on his wedding night, abdicating responsibility for his own life along with all the others.

Thus far, I have focused on a feminist reading of Victor Frankenstein; however, a consideration of the creature's motivations and actions is equally, if not more revealing. Throughout the novel, the creature approaches the world with curiosity, innocence, and a strong desire to be a part of humanity. He is rebuked over and again—at first, by his maker, both mother and god, in a most cruel manner, and then by each of the humans he encounters in his travels. He educates himself from hidden spaces where he watches others teach and learn; he makes attempt after attempt to create meaningful relationships or at least moments of human interaction, and is driven away each time, not only by Victor but also by the man in the woods, by the De Lacey family, and finally, by Victor's young brother, a child he believes will be innocent enough to look past his appearance. The creature recognizes his own attempts at humanity, and his own potential to be good and kind, and understands the ways his treatment at the hands of all of the humans in his world has

affected him. He is more articulate, more reflexive, and more thoughtful than his creator:

> Once my fancy was soothed with dreams of virtue, of fame, and of enjoyment. Once I falsely hoped to meet with beings who, pardoning my outward form, would love me for the excellent qualities which I was capable of unfolding. I was nourished with high thoughts of honour and devotion. But now crime has degraded me beneath the meanest animal. No guilt, no mischief, no malignity, no misery, can be found comparable to mine. When I run over the frightful catalogue of my sins, I cannot believe that I am the same creature whose thoughts were once filled with sublime and transcendent visions of the beauty and the majesty of goodness. But it is even so; the fallen angel becomes a malignant devil. Yet even that enemy of God and man had friends and associates in his desolation; I am alone. (Shelley, 1818/2012, p. 219)

The creature's discussions of his own nature, as well as of human nature, suggest that his experiences provide him with greater insight into what it is to be human than most (if not all) of the humans in the story, especially Dr. Frankenstein. The idea that he operates from a particularly privileged position precisely because of his oppression follows feminist standpoint theories (Haraway, 1988; Harding, 1991; Sismondo, 1995; Smith, 1987). Standpoint epistemologies suggest that members of an otherwise oppressed or subjugated group exist in a position of privilege when it comes to recognizing discrimination, bias, and other forms of oppression. Though such privilege does not extend to all knowledge domains, it tends to be manifest when the oppressed examines social structures that lead to her own oppression. While feminists make this case strongly for women's privileged knowledge in fields where they are undervalued or underrepresented, other groups in similar subjugated situations may be equally capable of building knowledges invisible to those in power. This framework helps clarify how the creature comes to possess wisdom about love and human relationships that surpasses Dr. Frankenstein's own. The creature requests only a companion to love him in order to be a functional being, if not a contributing member of society. Without this companion, he says, he knows he will embrace the hatred and rage that he fights in spite of (or because of) his understanding of human nature and the human capacity for love.

Stitching Meaning Back Together

These sketches are brief windows into what longer treatments of creativity and responsibility in *Frankenstein* might look like across disciplines. They highlight *Frankenstein*'s power as an object of care because they begin from three different ways of thinking about the novel and its constellation of precursors and cultural descendants to yield deeply resonant ideas about creativity and responsibility. Though each voice is unique and brings a different lens to the text and key concepts, certain themes cross all three sketches, and might be found in other disciplinary treatments of Shelley's text.

The most evident, and perhaps the most important, theme drawn from these sketches is that Dr. Frankenstein's failure to care for his creation is his downfall—not his act of technological innovation. This conclusion means that bringing the creature to life might not necessarily be a moral failing but that the refusal to follow through by taking responsibility certainly is. All three sketches probe this failure in different but related ways, and offer complementary interpretations of Shelley's central commentary: The lack of care for new creations is what ultimately destroys us, not the creations themselves. In the literary sketch, we see how Shelley ties this distant-creator trope directly to a well-known literary antecedent, *Paradise Lost*. This sketch also illustrates how the structure of the novel serves as a microcosm of the stabilizing relationships ruptured and broken by Victor's actions. In the STS sketch, we are reminded of existing discourses about duties and responsibility that are bound to scientific and technological discovery. In the feminist sketch, the dual roles of Dr. Frankenstein as a failed mother and a failed god indicate his lack of responsibility.

Another important theme is love and care between humans—as well as the creature's alienation caused by his desire to experience that love, and his externally imposed inability to do so. Carefulness and carelessness are exhibited by different people in the world of *Frankenstein* in different ways. The literary sketch points toward the carefulness with which Justine is adopted into the Frankenstein family and the ways that care for other humans is embedded in the structure of written correspondence. Each of these subtle cues provides a road map for what we might see as Dr. Frankenstein's duty. His failure to follow that road map leads to his own destruction as well as that of several innocent bystanders and, finally, we are left to assume, to the destruction of the creature itself. In turn, the STS approach emphasizes the construction of the creature's monstrosity, which is a reflection of the monstrosity of his creator. Through the feminist lens, we glimpse the creature's reasonable expectations for care and his thoughtful understanding of how the other characters care for one another. By way of standpoint theory, we understand how the lack of care afforded him situates him as "other" and how that position brings with it a privileged perspective from which to observe and understand humanity.

Finally, the modern misapprehension that this is a cautionary tale about the perils of new technologies rather than of matters of care reveals a flaw in our current collective relationship with *Frankenstein*. This misapprehension is perhaps made most clear by how often the novel's title, *Frankenstein*, is mistaken for the creature's name, not the creator's. While it easy to ascribe the Miltonic role of Satan to the eloquent, outcast creature, Victor has as much claim to the role of fallen angel—too smart for his own good, isolated from the larger community, doomed by his own grandiloquent machinations. This common mistake in naming highlights the focus on the creature as the object of evil rather than the creator as the instrument of evil. A close reading

shows that the scientist who abandoned his progeny *is the real monster*, rather than the unfortunate being left to fend for himself.

In the end, perhaps we have always been right to use the name "Frankenstein" to refer to the monster—it's just that in doing so we mixed up the proper referent: Victor, not his creation, is the real monster. This important point also reveals and rebuts two tropes that persist. First, it rebuts the technological determinism that erroneously justifies claims about the inherent goodness or badness of objects and inventions, rather than about the humans who choose how to handle these objects. Second, it rejects the interpretation that by creating life, Dr. Frankenstein is meddling with forces he cannot understand and has no right to manipulate, and is therefore bound to create an abomination that goes against Nature or God. Rebutting these two unhelpful tropes means that the human actors are responsible for their own decisions and for what they do with the fire of creativity.

Conclusions

We set out to examine the themes that make Shelley's original 1818 text an important object of care to consider, and to develop a boundary object—this article—that might help us speak about the novel across several disciplines. The themes we introduced, like the story itself, can be traced through countless adaptations and interpretations, and continue to be explored and reexplored today. Through our analysis, we treat the original text and its cultural position as part of a network of ideas that are both closely related and uniquely situated within their disciplines. The transparency of our process makes this text a kind of deconstructed boundary object: one in which the boundary object is composed of both the constituent meanings emanating from a range of disciplines and an analysis of their overlap. Such self-consciousness could serve as a starting point for future attempts to think with objects of care like *Frankenstein*. By juxtaposing these disciplinary sketches and unearthing what they share in their interpretations of this object of care, we are opening space for new conversations.

Specifically, *Frankenstein* was already deeply embedded culturally as a symbol for what can go wrong when scientists "play god." By reexamining the original text, we came to the conclusion that one of our most pervasive cautionary tales was incomplete and without nuance. We have better lessons to learn from *Frankenstein* than the deterministic fear of technology as inherently evil or corrupt, or that danger awaits when humans become overly ambitious. Instead, we learned that this tale cautions us against abandoning our creations to the world; in order to protect both the creation and the world, we have to take part in the discourse and deliberation about how it is taken up and integrated into its social contexts.

Although only three disciplines are represented in this article, *Frankenstein* has the potential to reach far beyond these fields, into the social sciences, into studies of race (particularly important at this moment in history), into law and justice, and into new frontiers in science and engineering, where pioneers are grappling with the choices they make about how to care for their own inventions and discoveries. Indeed, the value of *Frankenstein* lies in its pervasiveness. The myriad interpretations, reinterpretations, and analyses of that story are evidence of its vitality as well as its materiality. Everyone has a personal history with this modern myth, and therefore a viable claim to its interpretation. This widespread feeling of ownership of the narrative highlights the value of *Frankenstein* as an object of care. As such, it is fertile territory for the creation of many boundary objects, which, like this article, foster interdisciplinarity that is personally rewarding to collaborators, and enriching to a broader conversation. Such an object creates space for new and more reflexive knowledge.

In addition to these epistemic benefits, such interdisciplinarity shines light on the complex social and ethical implications of new kinds of technoscientific work. Viewed through multiple lenses, it becomes easier to see 360 degrees around a problem, rather than seeing and understanding only one's own view. The pursuit of responsible innovation cannot be a solitary endeavor; rather, it requires that we take "care of the future through *collective stewardship* of science and innovation in the present" (Stilgoe, Owen, & Macnaghten, 2013, p. 1570). After all, if we attempt to innovate alone in a laboratory, with no concern for others, we risk becoming Dr. Frankenstein, the monster who made his creature evil not by creating it, but by failing to think, talk, and grow with it once it was in the world. The quotation by Feyerabend (1975/1993) that began this article continues as follows:

> Is it not possible that an objective approach that frowns upon personal connections between the entities examined will harm people, turn them into miserable, unfriendly, self-righteous mechanisms without charm or humour? 'Is it not possible,' asks Kierkegaard, 'that my activity as an objective [or critico-rational] observer of nature will weaken my strength as a human being?' I suspect the answer to many of these questions is affirmative and I believe that a reform of the sciences that makes them more anarchic and more subjective (in Kierkegaard's sense) is urgently needed. (p. 154)

Reform in the direction Feyerabend suggests requires that the sciences leave their privileged place within the academy and join other disciplines, especially those that embrace and seek to understand these "anarchic and subjective" natures of life. By understanding *Frankenstein* as an object of care, we may come to understand certain *Frankenstein*-related objects, like this article itself, as boundary objects to help people from different social worlds examine the importance of its themes and ideas.

There are many ways to create boundary objects around *Frankenstein*. The upcoming bicentennial of the original publication is likely to offer innumerable opportunities to revisit Shelley's *Frankenstein*, to reflect on subsequent creatures that

draw on the same mythology, and to build new creatures and creators to continue to think about the relationship between the two.[3] Taken as a whole, these interrogations of the Frankenstein myth, whether in the form of academic scholarship, cultural event, or popular culture, challenge the persistence of traditional ways of thinking about scientific and technological development in its social context. Infused with Feyerabend's subjectivity, such resituated and resuscitated sciences become not an endeavor apart or above the other parts of the academy but a form of knowledge deeply connected to others through shared social structures of language, epistemology, and care.

These structures define all quests for knowledge and understanding. So while we have implicitly directed this inquiry toward technoscientific creations in their material sense, as artifacts in the world, we wish to conclude by arguing that *Frankenstein*'s lessons about creativity and responsibility should also extend beyond physically bounded things and to the very notion of the future. Since futures, like artifacts, are constructed—made in the present, with elements of the past, and expectations about the future (Selin, 2008)—we should also apply these themes of responsibility and creativity to the act of constructing, and coaxing into being, futures. For it is equally important, if not more so, that we go about the business of creating futures—specifically, *the* future that we will inhabit—in a way that encompasses many different forms of life and knowledge. The act of caring belongs as much to the future as it does the present. "A care perspective," write Adam and Groves (2011), "acknowledges the way in which the present is always involved with the future, in the weaving of a common fate with others" (p. 23). We must be creative in imagining plausible futures that are "better" (what that means for whom is, of course, an open question) than the present, and the ways to get there. Yet we must also be responsible by recognizing that futures are always in the making, and we should therefore act with due care when engaging in processes of design and creation.

Authors' Note

Any findings, observations, or opinions expressed are those of the principal investigators and participants and do not necessarily reflect the views of the National Science Foundation.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This research is made possible, in part, by the U.S. National Science Foundation (Award Nos. 0937591, 1354287, and 1516684).

Notes

1. Our use of the Broadview Press printing of the novel is incidental. What is important, however, is that we draw from the

original 1818 text of the novel, rather than the 1831 edition—which, in our opinion, was edited and revised in such a way that many of the key philosophical themes are changed or watered down (Mellor, 1989). Among other changes to the 1831 edition that we believe attenuate the Promethean fire of the original, for example, is the deletion of the epigraph from *Paradise Lost*; the rendering of Dr. Frankenstein's actions as more a matter of fate or destiny, instead of choice and free will; and the consequent diminution of the importance of care and responsibility.

2. In some versions of this myth, in addition to the punishment that Zeus metes out to Prometheus for returning fire to humanity—having his liver eaten by eagles each day, only to have it regenerate each night—Zeus punishes humanity by sending Pandora who, like Eve, brought both knowledge and pain into the world through her curiosity (Hamilton, 2011).

3. The authors of this article are currently involved in a National Science Foundation–funded project numbers 0937591, 1354287, and 1516684 to create a transmedia environment that will facilitate public engagement around science in society themes through *Frankenstein* and its antecedents.

References

Adam, B., & Groves, C. (2011). Futures tended: Care and future-oriented responsibility. *Bulletin of Science, Technology & Society*, *31*(1), 17-27.

Baccolini, R., & Moylan, T. (2003). *Dark horizons: Science fiction and the dystopian imagination*. New York, NY: Routledge.

Bassett, C., Steinmueller, E., & Voss, G. (2013). *Better made up: The mutual influence of science fiction and innovation* (Nesta Working Paper No. 13/07). Retrieved from www.nesta.org.uk/wp13-07

Berne, R. W. (2003). Ethics, technology, and the future: An intergenerational experience in engineering education. *Bulletin of Science, Technology & Society*, *23*, 88-94.

Berne, R. W., & Schummer, J. (2005). Teaching societal and ethical implications of nanotechnology to engineering students through science fiction. *Bulletin of Science, Technology & Society*, *25*, 459-468.

Feyerabend, P. (1993). *Against method*. London, England: Verso. (Original work published 1975)

Halpern, M. K. (2012). Across the great divide: Boundaries and boundary objects in art and science. *Public Understanding of Science*, *21*, 922-937.

Hamilton, E. (2011). *Mythology: Timeless tales of gods and heroes*. New York, NY: Grand Central.

Haraway, D. (1988). Situated knowledges: The science question in feminism and the privilege of partial perspective. *Feminist Studies*, *14*, 575-599.

Harding, S. G. (1991). *Whose science? Whose knowledge? Thinking from women's lives*. Ithaca, NY: Cornell University Press.

Jasanoff, S., & Kim, S.-H. (2009). Containing the Atom: Sociotechnical imaginaries and nuclear power in the United States and South Korea. *Minerva*, *47*, 119-146.

Kirby, D. (2010). The future is now: Diegetic prototypes and the role of popular films in generating real-world technological development. *Social Studies of Science*, *40*(1), 41-70.

Latour, B. (2012, Winter). Why we must care for our technologies as we do our children. *Breakthrough Journal*. Retrieved from http://thebreakthrough.org/index.php/journal/past-issues/issue-2/love-your-monsters

Lavender, I. (2011). *Race in American science fiction*. Bloomington: Indiana State University Press.

Mellor, A. K. (1982). On feminist utopias. *Women's Studies*, *9*, 241-262.

Mellor, A. K. (1989). *Mary Shelley: Her life, her fiction, her monsters*. New York, NY: Routledge.

Merton, R. K. (1936). The unanticipated consequences of purposive social action. *American Sociological Review*, *1*, 894-904

Milburn, C. (2003). Nanotechnology in the age of Posthuman engineering: Science fiction as science. *Configurations*, *10*, 261-295.

Miller, C. A., & Bennett, I. (2008). Thinking longer term about technology: Is there value in science fiction-inspired approaches to constructing futures? *Science and Public Policy*, *35*, 597-606.

Milton, J. (1667). *Paradise lost*. London, England: Samuel Simmons.

Mooney, C. (2002, December 1). Nothing wrong with a Little Frankenstein. *Washington Post*, p. B01.

Puig de la Bellacasa, M. (2011). Matters of care in technoscience: Assembling neglected things. *Social Studies of Science*, *41*(1), 85-106.

Runco, M. A., & Albert, R. S. (2010). Creativity research: A historical view. In J. C. Kaufman & R. J. Sternberg (Eds.), *The Cambridge handbook of creativity* (pp. 3-19). New York, NY: Cambridge University Press.

Selin, C. (2008). The sociology of the future: Tracing stories of technology and time. *Sociology Compass*, *2*, 1878-1895.

Shelley, M. (2012). *Frankenstein*. Peterborough, Ontario, Canada: Broadview Press. (Original work published 1818)

Sismondo, S. (1995). The scientific domains of feminist standpoints. *Perspectives on Science*, *3*(1), 49-65.

Smith, D. E. (1987). *The everyday world as problematic: A feminist sociology*. Boston, MA: Northeastern University Press.

Squier, S. (1999). From Omega to Mr. Adam: The importance of literature for feminist science studies. *Science, Technology, & Human Values*, *24*, 132-158.

Star, S. L., & Griesemer, J. R. (1989). Institutional ecology, "translations" and boundary objects: Amateurs and professionals in Berkeley's Museum of Vertebrate Zoology, 1907-39. *Social Studies of Science*, *19*, 387-420. doi:10.1177/030631289019003001

Stilgoe, J., Owen, R., & Macnaghten, P. (2013). Developing a framework for responsible innovation. *Research Policy*, *42*, 1568-1580.

Toumey, C. P. (1992). The moral character of mad scientists: A cultural critique of science. *Science, Technology, & Human Values*, *17*, 411-437.

Williams, G. (n.d.). Responsibility. In *The Internet encyclopedia of philosophy*. Retrieved from http://www.iep.utm.edu/responsi/

Winner, L. (1977). *Autonomous technology: Technics-out-of-control as a theme in political thought*. Cambridge: MIT Press

Wollstonecraft, M. (1792). *A vindication of the rights of woman*. London, England: Walter Scott.

Young, E. (2008). *Black Frankenstein: The making of an American metaphor*. New York: New York University Press.

Author Biographies

Megan K. Halpern is an assistant professor at Michigan State Univesrity, where she has a joint appointment in Lyman Briggs College and the Residential College in the Arts and Humanities. Her work focuses on the intersection of art, science, and design.

Jathan Sadowski is a PhD candidate in the School for the Future of Innovation in Society at Arizona State University. He is finishing a dissertation titled, *Selling Smartness: Visions and Politics of the Smart City*. His work focuses on social theory and political economy of technology.

Joey Eschrich is editor and program manager at the Center for Science and the Imagination at Arizona State University, and assistant director of Future Tense, ASU's partnership with Slate magazine and New America on emerging technologies, policy, culture, and society.

Ed Finn is the founding director of the Center for Science and the Imagination at Arizona State University, where he is an assistant professor with a joint appointment in the School of Arts, Media and Engineering and the Department of English. He is also an affiliate faculty member of the Human and Social Dimensions of Science and Technology program. His work explores narratives at the intersection of literature, science and technology studies, and digital culture.

David H. Guston is professor and founding director of the School for the Future of Innovation in Society at Arizona State University, where he also directs the NSF-funded Center for Nanotechnology in Society (CNS-ASU) and co-directs the Consortium for Science, Policy and Outcomes. His work focuses on responsible innovation and the democratic governance of emerging technologies.