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Frankenstein and “The Labours of Men of Genius”: Science and Medical Ethics in the Early 19th Century


Allison Lemley

Grand Valley State University, lemleya@mail.gvsu.edu



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Frankenstein and “The Labours of Men of Genius”: Science and Medical Ethics in the Early 19th Century

Cover Page Footnote

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Mary Shelley's *Frankenstein*, first published in 1818, used a sprawling network of allusions to contemporary literary and scientific works which strongly reflected Romantic scientific and literary ideology. The robust connections between Romantic artistic and scientific circles in the late Enlightenment and early Romantic period included personal and professional relationships, scientists writing literary works, and authors discussing scientific advances. The closely linked scientific and artistic community helped define science and the nature of life in the new Romantic era. *Frankenstein* is a conscious example of a writer critiquing prevailing scientific views of the day, namely, the materialist and vitalist debates. Materialism understood life as inherent to organisms and a mechanical function that could be scientifically explained. Vitalism formed a cohesive view of the world as one living organism in which the property of life was present in all living things, but not inherent. The ideological differences between materialists and vitalists led to heated disputes, often riddled with religious tensions. *Frankenstein* is written and published in the midst of a period of transition, approximately 1780 to 1830, between visions of science. Shelley provides insight into this period through the critiques of scientific debates presented in *Frankenstein*.

The debates that are most pertinent to this research are the ones concerning the nature of life, exemplified through the materialist and vitalist split that occurred in the late 1700s and early 1800s. Shelley incorporates work from

several figures in the debate: leading chemist Humphry Davy; the famous experimenter Giovanni Aldini; and physicians William Lawrence and John Abernethy. Medical historians have not fully discussed the debate in this period. Enlightenment and early Romantic medical ethics was concerned with hierarchies within the medical community; ethics defined the ways the various medical professionals interacted with each other to demonstrate clear divisions between traditional, established, and approved medicine and those outside of the medical community proper. Medical historians have also discussed later Romantic era medical developments as they more closely resemble modern scientific ethics which are concerned with doctor and patient relationships. The transition period discussed in this essay has no set beginning and end, but gaps in research specific to developing medical ethics tend to occur from approximately the early 1780s to the late 1820s. The transition period is not defined by either Enlightenment or Romantic thinking, but rather by the tension between scientists professing either materialist or vitalist ideologies. This tension is shown through their interpretations of galvanism, the movement of muscles when stimulated by electricity, and their efforts to develop new concepts of science and the scientist. In particular, as scientists struggled to define the nature of life, they questioned their place in relation to this study: the way science, or natural philosophy, had been defined in the past was changing. Several factors influenced this period: the professionalization of science; questions surrounding religion and spirituality's

place in science; and delineating science and metaphysics into separate fields of inquiry.¹

In *Frankenstein*, Shelley references literary and scientific works that comment on both perspectives in order to reveal gaps in the development of medical ethics. Victor Frankenstein's conduct as a scientist and his reaction to his creation critiques the secular and spiritual aspects of materialism and vitalism. This includes the ethical dilemmas with secular and spiritual science. By portraying this debate in *Frankenstein*, Shelley sought to comment on the rift in the scientific community and focus the debate on ethics, rather than vitalist and materialist definitions of life. Shelley's comments on the debate do not offer a resolution to the scientific differences between the materialists and vitalists. Instead, Shelley demonstrates through Victor Frankenstein's extreme scientific objectivity and his later extreme spiritual beliefs the potential damage to science and humanity. Shelley generalizes this message with the frame for her story told by her fictional explorer, Robert Walton, who encounters his own scientific ethical dilemma with different results. Walton's story offers a counterpoint to the warning embedded in Frankenstein's. While literary critics have discussed many significant contributions *Frankenstein* has made to their field of study, many have focused on how the novel represents the first—or among the first—work of

¹ Stephen J. Wykstra, "Religious Beliefs, Metaphysical Beliefs, and Historiography of Science," *Osiris* 16 (2001): 29-46; Ivan Waddington, "The Development of Medical Ethics—A Sociological Analysis," *Medical History* 19 (1975), 36-51.

science fiction. This offers a unique question to historians of this period: what factors in the development of science during this time helped inspire the first work of science fiction? Literary critics and historians alike have often recognized the relationship between events and ideas influencing authors' works; *Frankenstein* is no different in this regard. It grapples with many scientific debates and fears of its time, offering a view of extreme views without defined ethical boundaries.

One of the central themes in *Frankenstein* also reflects a major debate in the scientific community at the time: how separate religion and science can or should be. As Victor Frankenstein swings from scientific objectivity to religious revulsion towards his creation, Shelley demonstrates the possibilities that this debate could bring about. There is a myth that the Scientific Revolution removed religion from science and created the modern perception that they occupy very different spheres. This "separation" does not reflect historical understandings of the influence of religion in science, as the definitions of "religion" and "science" have changed.² "Science" as it is now understood would be unrecognizable in the 18th century. Science was known in this time as "natural philosophy," a field of study that dealt with questions surrounding the soul and divine providence as

² Margaret J. Osler. "Myth 10: That the Scientific Revolution Liberated Science from Religion," in *Galileo Goes to Jail: And Other Myths About Science and Religion* (Cambridge: Harvard University Press, 2009), 90-98.

much as it did the study of plants and animals.³ Religion refers to doctrines and practices, often associated with institutions, i.e., the Roman Catholic Church.⁴

Theology is the explanation of religious doctrines and practices.⁵ In order to better understand the changes that Romanticism made to science, Enlightenment science's close ties to religion must be stressed:

The debates about the new heliocentric astronomy, the arguments for a new philosophy of nature to replace medieval Aristotelianism, the development of a new concept of the laws of nature, and discussions of the scope and limits of human knowledge were all infused with religious commitments and theological presupposition.⁶

The concern with the "scope and limits of human knowledge" can be found in several significant places in the development of science. The late Renaissance and early Enlightenment debates concerning blood transfusions, both against and for the practice were often based on theological arguments.⁷ The earliest blood transfusions, for example, were animal-to-human: lambs were often used because they symbolized Jesus Christ. The theological implications were thought to bring

³ Margaret J. Osler. "Myth 10: That the Scientific Revolution Liberated Science from Religion," in *Galileo Goes to Jail: And Other Myths About Science and Religion* (Cambridge: Harvard University Press, 2009), 91-92.

⁴ Margaret J. Osler. "Myth 10: That the Scientific Revolution Liberated Science from Religion," in *Galileo Goes to Jail: And Other Myths About Science and Religion* (Cambridge: Harvard University Press, 2009), 93.

⁵ Margaret J. Osler. "Myth 10: That the Scientific Revolution Liberated Science from Religion," in *Galileo Goes to Jail: And Other Myths About Science and Religion* (Cambridge: Harvard University Press, 2009), 93.

⁶ Margaret J. Osler. "Myth 10: That the Scientific Revolution Liberated Science from Religion," in *Galileo Goes to Jail: And Other Myths About Science and Religion* (Cambridge: Harvard University Press, 2009), 93.

⁷ Holly Tucker, *Blood Work: A Tale of Medicine and Murder in the Scientific Revolution* (New York: W.W. Norton & Company, Inc, 2011).

a positive scientific result. Scientific practices were informed and limited by theology and often regulated by religious bodies, such as the Catholic Church. Over time, tracing back further through the Renaissance, religious power and political power became increasingly separated, creating a domino effect to the early Romantic period which continued this long-term trend. By the early 1800s, the emerging figure of the scientist was still concerned with finding limits, but relied less on traditional religious authority and theology to inform or regulate practices. While science had been acquiring a new definition, it had also lost some of the ethical boundaries inherent in natural philosophy because of its inclusion of theology. The tension lies in the struggle the shifting definition of science had in redefining new limits.

Shelley subtitled *Frankenstein* as a “modern Prometheus:” the Titan from Greek mythology who gave humanity fire. The gods considered fire a tool beyond humanity’s knowledge. For literary critics, there are also strong connections to the Faust story: the themes incorporated in *Frankenstein* are commonly found in Romantic works. The famous Romantic writer, Johann Wolfgang von Goethe, had published the first part of his retelling of the Faust story in 1805. Like Victor Frankenstein, Faust longs for knowledge and power through any means, including alchemy. He makes a deal with Mephisto, a demon, in order to gain unlimited access to knowledge and power outside of the reach of humanity. Frankenstein’s scientific experiments to create life use earlier

and contemporary understandings of the Prometheus and Faust myths within a scientific framework to illustrate the struggle between old and new ideas of science. These stories also demonstrate the struggle with religious and theological issues that were deeply entrenched in the era's scientific thinking as scientists tried to define science and ethics in more secular terms.

Frankenstein was as much a commentary on the nature of life as it was a critique of how the emerging figure of scientists in the early Romantic period treated life. Shelley demonstrates this through Victor Frankenstein's method of building his creature and his subsequent treatment of his creation. In constructing his experiment, Frankenstein describes his work as "dabbl[ing] in the unhallowed damp of the grave [and] tortur[ing] the living animal to animate the lifeless clay."⁸ His work is solitary and he spends more time collecting the raw materials for his creation from "the dissecting room and the slaughter-house" than he does with others. Frankenstein is both passionately focused on his task of creating life, to the exclusion of all other activities, while simultaneously being clinically detached from the harsh reality of using corpses to continue his work.⁹ In Frankenstein's physical creation of the monster, Shelley critiqued materialist views of life and experiments with galvanism. Materialists believed that life

⁸ Mary Shelley, *Frankenstein: A Norton Critical Edition* (New York: W.W. Norton & Company, 2012), 33.

⁹ Mary Shelley, *Frankenstein: A Norton Critical Edition* (New York: W.W. Norton & Company, 2012), 34; Frankenstein's isolation is also a critique of William Godwin's belief that scientific progress will make human interaction and collaboration less necessary.

could be explained mechanically: the components of “life” could be broken down. Echoing materialist’s view of objective science, Frankenstein dehumanizes the bodies he uses to craft his new being.

While Shelley critiques the detached, objective materialist, Shelley’s critique of vitalism begins with this “spark,” and continues with Frankenstein’s reaction to his own creation. He is racked with horror at his creation’s first movements and sounds; he refers to it as a “miserable monster,” a “demoniacal corpse,” and more horrifying than a “mummy again endued with animation.”¹⁰ Frankenstein worked hard to give life to a new creature, but only after the creature is alive does he consider life beyond a materialist, mechanic perspective. He understands his creation in terms of an animated or possessed cadaver. As the story progresses, Frankenstein’s creation demonstrates his ability to learn and to empathize with humans, especially the family he observes. Frankenstein conceptualizes the creature’s life as unnatural and outside of the natural world. In a scene where Frankenstein observes the creature in a storm, he notes how easily “its gigantic stature, and the deformity of its aspect... instantly informed [him] that it was the wretch.”¹¹ Frankenstein’s intentional design of an eight foot tall man composed of cadavers demonstrates mechanical skill, ambition, and

¹⁰ Mary Shelley, *Frankenstein: A Norton Critical Edition* (New York: W.W. Norton & Company, 2012), 36.

¹¹ Mary Shelley, *Frankenstein: A Norton Critical Edition* (New York: W.W. Norton & Company, 2012), 50.

scientific power, but it also marks his creation as one outside of the natural world. Against the background of the power of a lightning storm, part of Frankenstein's original inspiration, he is repulsed by his unnatural creature. In Romantic scientific philosophy, grappling with conceptions of a universal world soul, Frankenstein's created chimera has no place in the cohesive world-organism theorized by vitalists.

Yet Frankenstein's success in "infus[ing] the spark of being" into his creation represents a scientific coup, and one that materialists and vitalists alike would envy: he has found the source of life, a scientific miracle.¹² Frankenstein, however, refuses to tell Robert Walton, the explorer traveling to the North Pole who transcribes Frankenstein's story, how he achieved his goal:

I see by your eagerness... that you expect to be informed of the secret with which I am acquainted; that cannot be... Learn from me... by my example, how dangerous is the acquirement of knowledge and how much happier that man is who believes his native town is the world, than he who aspires to become greater than his nature will allow.¹³

Frankenstein's mistake, as he sees it, is the knowledge he has, more than how he mishandled his knowledge. In saying that knowledge makes man "greater than his nature will allow," Frankenstein reinforces earlier ideas of a natural hierarchy, found in works such as Agrippa, an early alchemist. Frankenstein withholds his

¹² Mary Shelley, *Frankenstein: A Norton Critical Edition* (New York: W.W. Norton & Company, 2012), 35.

¹³ Mary Shelley, *Frankenstein: A Norton Critical Edition* (New York: W.W. Norton & Company, 2012), 32.

knowledge from Walton, believing it to be somehow above humanity's reach, yet on his deathbed, Frankenstein both admonishes Walton to "avoid ambition" and still hopes that "another may succeed."¹⁴ Shelley effectively demonstrates the kind of split personality developing in science at the time: both the desire to reach for new and greater achievements and the metaphysical concerns of overreaching humanity's place.

Shelley's use of Walton introduces another branch of science into the novel and a foil for Frankenstein. Walton's desire for scientific achievement—and glory—run parallel to Frankenstein's, but their scientific endeavors have very different results. Walton writes to his sister before embarking to rationalize his reason behind his exploration to the North Pole:

...you cannot contest the inestimable benefit which I shall confer on all mankind... by discovering a passage near the pole... or by ascertaining the secret of the magnet, which, if at all possible, can only be effected by an undertaking such as mine.¹⁵

Walton's single-minded dedication to his task and grandiose ideas of what his discoveries will bring to the scientific world and humanity are similar to Frankenstein's ideas about his own creation. Walton's wish to discover the secrets behind magnetism, a related field to galvanism, furthers the connection between the two stories. His belief that he would provide significant knowledge

¹⁴ Mary Shelley, *Frankenstein: A Norton Critical Edition* (New York: W.W. Norton & Company, 2012), 157.

¹⁵ Mary Shelley, *Frankenstein: A Norton Critical Edition* (New York: W.W. Norton & Company, 2012), 8.

with his expedition also reflects Frankenstein's selfish motives. After experimenting on dead bodies and forming his plan to create life, Frankenstein "was surprised that among so many men of genius, who directed their inquiries towards the same science, that I alone should be reserved to discover so astonishing a secret."¹⁶ Both Frankenstein and Walton believe that they are uniquely able to give their knowledge to the scientific community and the world.

Neither Frankenstein nor Walton's dreams go as planned. Frankenstein succeeds in giving life to his creation, but he is horrified by what he has done, and "unable to endure the aspect of the being [he] had created," he abandons his creation. The creature's appearance already prevented him from acceptance into the world, and Frankenstein's spurning guarantees the creature's ostracism.¹⁷ Walton's own situation is troubled as well. As his ship progresses northward, it encounters more and more danger; the ship is trapped by ice, which "threaten every moment to crush [the] vessel" and only Frankenstein's "eloquence... rouses their [the crew's] energies."¹⁸ Walton is afraid of a mutiny and when his men do finally demand to return home once the ship has been freed from the ice, Walton feels that "in justice, I could not refuse."¹⁹ Walton understands that his desire for

¹⁶ Mary Shelley, *Frankenstein: A Norton Critical Edition* (New York: W.W. Norton & Company, 2012), 31-32.

¹⁷ Edward T. Oakes, "Lab Life, Promethean Science, and Mary Shelley's *Frankenstein*" *Logos: A Journal of Catholic Thought and Culture* 16 (2013): 59.

¹⁸ Mary Shelley, *Frankenstein: A Norton Critical Edition* (New York: W.W. Norton & Company, 2012), 153, 154.

¹⁹ Mary Shelley, *Frankenstein: A Norton Critical Edition* (New York: W.W. Norton & Company, 2012), 154.

scientific glory put others into danger, and chooses to give up his goal because of this. Frankenstein, however, is enraged that the sailors would demand to return, and tries to move them with the promise of glory: “your name[s] adored, as belonging to brave men who encountered death for honour and the benefit of mankind.”²⁰ To Frankenstein, to turn back, even when confronted with circumstances that ensure the loss of human life, the possible glory overrules everything else. Walton expresses his frustration at having to turn back, but acknowledges that he “cannot lead them unwillingly to danger.”²¹ The cost to his men does not justify the potential gain.

In these short scenes presented in Walton’s final few letters, Shelley makes her culminating statement about scientific ethics: Frankenstein’s single-minded search for power and glory was removed from any consideration of the ethical ramifications of his actions. Walton is also motivated by glory through scientific discovery, but in the end, his desires are overridden by his obligation to lead his men out of danger. Shelley uses Frankenstein and Walton to generalize scientific ethics as well as provide contrast between the differences in ethics that they demonstrate. As the leader or creator in both their scientific endeavors,

²⁰ Mary Shelley, *Frankenstein: A Norton Critical Edition* (New York: W.W. Norton & Company, 2012), 155.

²¹ Mary Shelley, *Frankenstein: A Norton Critical Edition* (New York: W.W. Norton & Company, 2012), 156.

Shelley establishes that Walton and Frankenstein have an obligation to those influenced by their experiment for their safety and well-being.

Walton and his men break free from the ice to return home. The image of the ice breaking and forming a passage to freedom is not one Shelley leaves with her readers. The final scenes are, instead, Frankenstein's death and his creature's self-banishment to the North Pole in order to die. This reinforced the consequences of neglecting ethics in science: a loss of values and self. While scientific debates at the time concerned whether forces such as galvanism were the force of life and could, therefore create it, few were asking whether scientists should attempt to or to what extent they should.

The critiques that Shelley weaves into her story are due to her immersion from a young age in the literary and scientific movements of the time. Mary Shelley was born Mary Wollstonecraft Godwin, the daughter of two philosophers and writers. Her mother, Mary Wollstonecraft, famous for her work *A Vindication of the Rights of Woman*, died eleven days after giving birth to her daughter. Shelley's father, William Godwin, was a significant influence on Shelley. Her father's work can be seen in the way Victor Frankenstein understands science and morality.²² Shelley uses *Frankenstein* to critique

²² D.L. MacDonald and Kathleen Scherf, *Frankenstein: The Original 1818 Text, 2nd Edition* (Peterborough: Broadview Literary Texts, 2000), 14; Shelley also dedicated *Frankenstein* to Godwin, who, after her elopement with Percy Shelley at the age of 16, had cut off contact with her.

Godwin's ideas, especially his belief that science will make human interaction less necessary; this is demonstrated through Victor Frankenstein's isolation throughout his experiments and the natural comparison to Robert Walton, the explorer who records Frankenstein's story.²³

Her father also provided access to important literary and scientific minds in England. As a child, she heard Samuel Coleridge, a friend of her father, recite his poem "The Rime of the Ancient Mariner," which is referenced throughout *Frankenstein* and provides allusions to mesmerism. She also attended lectures on chemistry given by Humphry Davy, a leading chemist of the day and also a friend of Coleridge's.²⁴ Davy's ideals and reflections on science's place in the world are echoed in *Frankenstein* through the titular character's university mentor. It was also through her father that she met her husband, Percy Shelley. She eloped with Percy Shelley in 1814, and while her father virtually disowned her, Shelley continued to read her father's work.²⁵ Percy Shelley also influenced her reading

²³ D.L. MacDonald and Kathleen Scherf, *Frankenstein: The Original 1818 Text, 2nd Edition* (Peterborough: Broadview Literary Texts, 2000), 14.

²⁴ J. Paul Hunter, ed, *Frankenstein: A Norton Critical Edition* (New York: W.W. Norton & Company, 2012), footnote 7; Richard Holmes, "The Power of Contemporary Science," in *Frankenstein: A Norton Critical Edition* (New York: W.W. Norton & Company, 2012), 183-194; Humphry Davy was also one of Godwin's friends; For further details on the extent of Shelley's inclusion and critique of Wollstonecraft's and Godwin's works, see D.L. MacDonald's and Kathleen Scherf's introduction to the Broadview edition of *Frankenstein*.

Walter D. Wetzels, "Aspects of Natural Science in German Romanticism," *Studies in Romanticism* 10 (1971): 44-59; Jennifer J. Baker, "Natural Science and the Romantics," *ESQ: A Journal of the American Renaissance* 53 (2007): 387-412.

²⁵ D.L. MacDonald and Kathleen Scherf, *Frankenstein: The Original 1818 Text, 2nd Edition* (Peterborough: Broadview Literary Texts, 2000), 14.

practices throughout their married life, until his death in 1822. The Shelleys had an extensive library and actively discussed literary and scientific achievements of the day; Mary Shelley recorded their conversations in her journal.²⁶

After eloping with Percy Shelley, Mary Shelley continued to be surrounded by people who intensely studied artistic and scientific works. One important connection was Percy Shelley's personal physician was Dr. William Lawrence, whom Percy Shelley was visiting before he and Mary Shelley left England in 1814.²⁷ The Shelley's connection with Lawrence is a significant direct link to the materialist and vitalist debates of the time. Lawrence was vocal materialist, while his mentor at the Royal College of Physicians in England, Dr. John Abernethy, was a staunch vitalist.²⁸

This split between mentor and protégé led to one of the most infamous feuds of this debate, which took place in very public forums. Abernethy subscribed to the vitalist proposal of a "mysterious but palpable life force that is the source of animation in living things;" German Romanticists had explained this as "*geist*"—the spirit of life within each person, as well as in nature.²⁹ The

²⁶Paula R. Feldman and Diana Scott-Kilvert, eds, "The Shelley's Reading List," in *The Journals of Mary Shelley, Electronic Edition, Vol. 2* (New York: Oxford University Press, 1987).

²⁷D.L. MacDonald and Kathleen Scherf, *Frankenstein: The Original 1818 Text, 2nd Edition* (Peterborough: Broadview Literary Texts, 2000), 43.

²⁸Edward T. Oakes, "Lab Life, Promethean Science, and Mary Shelley's *Frankenstein*" *Logos: A Journal of Catholic Thought and Culture* 16 (2013): 61-62.

²⁹Edward T. Oakes, "Lab Life, Promethean Science, and Mary Shelley's *Frankenstein*" *Logos: A Journal of Catholic Thought and Culture* 16 (2013): 61; Walter D. Wetzels, "Aspects of Natural Science in German Romanticism," *Studies in Romanticism* 10 (1971): 45-46; F.W.J. Shelling defines *geist* in *Naturphilosophie*, which is a cornerstone of German Romantic thinking; Edward

spiritual components of vitalist science were incompatible, in Lawrence's view, with true, objective science: "An immaterial soul and spiritual being could not have been discovered amid the blood and filth of the dissecting room."³⁰ Besides their philosophical differences, Lawrence had not followed proper scientific ethics: after Abernethy had helped develop Lawrence's career, Lawrence, in a series of lectures, had not given Abernethy his due respect and derisively attacked the vitalist viewpoint.³¹ Particularly, Lawrence criticized Romantic scientists' connection of electricity and magnetism to the soul. Lawrence and other materialists viewed this as mixing of metaphors, where neither phenomenon could fully articulate *geist*.³² As vitalists struggled to scientifically define *geist*, Lawrence critiqued their lack of scientific objectivity.

The materialist and vitalist debate began earlier than the Lawrence/Abernethy feud in the 1810s. Luigi Galvani, an Italian scientist, began experiments with electricity in the 1780s. Electricity, as the force Frankenstein uses to give life to his creation, was at the center of the real-life debate concerning the nature of life. Galvani noticed muscle contractions in frogs when electrical currents were passed through their limbs; the scientific world erupted into fierce

T. Oakes, "Lab Life, Promethean Science, and Mary Shelley's *Frankenstein*" *Logos: A Journal of Catholic Thought and Culture* 16 (2013): 61.

³⁰ William Lawrence, in Edward T. Oakes, "Lab Life, Promethean Science, and Mary Shelley's *Frankenstein*" *Logos: A Journal of Catholic Thought and Culture* 16 (2013): 65.

³¹ Edward T. Oakes, "Lab Life, Promethean Science, and Mary Shelley's *Frankenstein*" *Logos: A Journal of Catholic Thought and Culture* 16 (2013): 64.

³² Edward T. Oakes, "Lab Life, Promethean Science, and Mary Shelley's *Frankenstein*" *Logos: A Journal of Catholic Thought and Culture* 16 (2013): 61.

debate over the implications in defining life. Galvani, the original observer of the phenomenon, posited that galvanism existed because animals had innate electricity; the contractions caused when nerves were stimulated with electricity occurred because of innate electricity stored in the muscles.³³ Scientists were unconvinced this was the case, and further experiments with variations on Galvani's method were undertaken. These experiments, however, could not prove the existence of Galvani's elusive "animal electricity" or define the underlying cause of the muscle contractions.³⁴ As scientists sought answers to Galvani's discovery in the 1780s, the dividing point became where scientists believed the source of life originated: innate or external. Galvani and other materialists proposed an innate animal electricity, while vitalists believed this force was a part of all nature, flowing through everyone and everything in the universe, uniting it as one complete organism. Romantic scientists believed that galvanism and in the case of vitalists, magnetism, were the forces behind life.

This debate is carried throughout *Frankenstein*, as Victor Frankenstein uses electricity to give life to his creation—a fear many who observed galvanic experiments had, especially considering that the human cadavers used in demonstrations were recently executed criminals. Johann Wilhelm Ritter (1776-

³³ Maria Trumpler, "Verification and Variation: Patterns of Experimentation in Investigations of Galvanism in Germany, 1790-1800," *Philosophy of Science* 64 (1997), S77.

³⁴ Maria Trumpler, "Verification and Variation: Patterns of Experimentation in Investigations of Galvanism in Germany, 1790-1800," *Philosophy of Science* 64 (1997), S81.

1810), a German Romantic scientist who found a great deal of acceptance within Romantic literary circles, experimented with electricity as the source of all life in nature.³⁵ His, and others, experiments with galvanism yielded little provable evidence for electricity as the source of life. In fact, scientists had as much difficulty determining the reason behind muscle contractions as finding the elusive force behind life.³⁶ Because of the unresolved debate, the fear surrounding galvanism and its unknown potential continued.

Romantic perceptions of *geist* flowing in nature also informed Frankenstein's creation of the monster. Frankenstein was first inspired by seeing lightning strike a tree; he used electricity to give life to his creation, not innately, but externally.³⁷ The idea of a pervasive force throughout nature had an earlier precedent in Isaac Newton's theory of aether in the 17th century. Aether was explained as a fluid material found throughout the universe that explained how light travelled through space and the movement of the planets, as many scientists did not believe that a vacuum could exist. Romantic era scientists reconfigured aether into a medium through which the forces of magnetism, electricity, and *geist*

³⁵ Walter D. Wetzels, "Aspects of Natural Science in German Romanticism," *Studies in Romanticism* 10 (1971): 53. Ritter was also a favorite of Johann Wolfgang von Goethe, who used him as one of his advisors in the scientific field. Ritter was not just a fashionable favorite of Romantic authors, but as a result of his experiments he is also known as the father of electrochemistry.

³⁶ Maria Trumpler, "Verification and Variation: Patterns of Experimentation in Investigations of Galvanism in Germany, 1790-1800," *Philosophy of Science* 64 (1997).

³⁷ Mary Shelley, *Frankenstein: A Norton Critical Edition* (New York: W.W. Norton & Company, 2012), 23.

could flow.³⁸ The connection to Newton's aether is evident in scientists' explanation of both electricity and its movement through nerves. Experiments by John Hunter, a highly respected English surgeon, on what he termed "torpedo and gymnotus fish," or electric rays and zebra knifefish, revealed the organs which generated their electricity, transmitted through their nerves. These specialized organs used water as a medium to transmit electricity into another animal's nervous system. The experiments on electricity transmitting fish, *geist*, and galvanism seemed to fit into scientists' hypotheses about the nature of life. A young Humphry Davy, a rising star in the field of chemistry, was an early supporter of galvanism. He believed that electricity was simply "condensed light" and the nervous system was "light in an ethereal gaseous form."³⁹

In contrast to scientists such as Hunter and Davy, who worked in long-established scientific communities which often functioned as an extension of political power, undercurrents of antiestablishment feelings began to develop in the medical community and the public. This resulted in unconventional methods of practicing medicine. *Frankenstein* critiqued of the materialist and vitalist debate and the tensions within both officially sanctioned and alternative scientific

³⁸ Tim Fulford, "Conducting the Vital Fluid: The Politics and Poetics of Mesmerism in the 1790s," *Studies in Romanticism* 43 (2004): 63.

³⁹ Iwan Rhys Morus, "Radicals, Romantics, and Electrical Showmen: Placing Galvanism at the End of the English Enlightenment," *Notes and Records of the Royal Society of London* 63 (2009): 267-268; Tim Fulford, "Conducting the Vital Fluid: The Politics and Poetics of Mesmerism in the 1790s," *Studies in Romanticism* 43 (2004): 59-60.

communities. While the official scientific community disputed, factions who sought to define science in non-standardized ways also began to engage in the debate. The ideas fostered by Hunter and Davy would inspire a number of quasi-scientific doctors, claiming that electricity conducted through human bodies had healing powers which standard medicine could not offer. Many used machines, such as Leyden jars, to provide electricity, but the most notable, and most influential, practitioner was Franz Anton Mesmer. By the 1770s, Mesmer was channeling “animal magnetism” from his own body to his patients.⁴⁰

Mesmer claimed he had tapped into the “universal fluid that flowed throughout the world” and could channel it by laying his hands on his patients or by giving them his signature “mesmerizing” stare.⁴¹ Robert Darnton’s book *Mesmerism and the End of the Enlightenment in France* claims that Franz Anton Mesmer’s theory signals the end of the Enlightenment.⁴² Mesmer’s work with his “universal fluid” was an important part of the early beginnings of the Romantic movement, born from the early materialist and vitalist debate concerning galvanism. Mesmer stood as an antagonist to conventional medical science. The tension between Enlightenment and Romantic ideas, materialists and vitalists, and

⁴⁰ Tim Fulford, “Conducting the Vital Fluid: The Politics and Poetics of Mesmerism in the 1790s,” *Studies in Romanticism* 43 (2004): 62.

⁴¹ Tim Fulford, “Conducting the Vital Fluid: The Politics and Poetics of Mesmerism in the 1790s,” *Studies in Romanticism* 43 (2004): 62.

⁴² Robert Darnton, *Mesmerism and the End of the Enlightenment in France* (Cambridge: Harvard University Press, 1968).

establishment and antiestablishment scientific communities is represented in *Frankenstein*. By portraying further schisms, Shelley continued to demonstrate the gap created as religion was increasingly distanced from science and new definitions of science lagged in defining new borders.

Mesmer's influence in *Frankenstein* is tied to its connections to experiments with electricity and mesmerism's place in the scientific community as a whole. It is demonstrated through Shelley's references to Coleridge's *Rime of the Ancient Mariner*, which characterizes the Mariner as having a "glittering eye" that holds men at "his will," common phrases used to describe Mesmer.⁴³ Galvani's idea of innate animal electricity, and the theories scientists developed to explain electric currents, added the "scientific" elements of Mesmer's philosophy of animal magnetism. As scientists quibbled amongst themselves about the source of life, Mesmer used their work to promote his principle of animal magnetism: the theory that a person's will, or magnetism, could influence others.⁴⁴ His use of scientific premises made the experiments of those like Galvani a part of broader public consciousness.⁴⁵ Shelley's direct references to galvanism and her more oblique references to mesmerism use the public's

⁴³ Samuel Taylor Coleridge, *The Rime of the Ancient Mariner*, 1834, accessed December 1, 2014, <http://www.poetryfoundation.org/poem/173253>; Tim Fulford, "Conducting the Vital Fluid: The Politics and Poetics of Mesmerism in the 1790s," *Studies in Romanticism* 43 (2004).

⁴⁴ Tim Fulford, "Conducting the Vital Fluid: The Politics and Poetics of Mesmerism in the 1790s," *Studies in Romanticism* 43 (2004): 57-78.

⁴⁵ Tim Fulford, "Conducting the Vital Fluid: The Politics and Poetics of Mesmerism in the 1790s," *Studies in Romanticism* 43 (2004): 62, 66-70.

knowledge to make the scientific critiques clear to her audience. The “universal fluid” that connected all living organisms appealed to Romantic ideals and those with antiestablishment leanings.

While Mesmer’s work brought both mesmerism and galvanism to a wider audience, Mesmerism was rejected by many in the scientific community, notably doctors in Austria, the Academy of Sciences in France, and the Royal Society in Britain.⁴⁶ The official snubbing of mesmerism contrasts the recognition given to galvanism. The bodies of executed criminals were donated to science by the state, with or without the permission of the deceased or their families. From trial, sentencing, execution, to experiment: galvanism became a part of the official process. Despite the differences between establishment-approved experiments and Mesmer’s unsanctioned practices, both instilled fear in the public. Mesmerism was feared because of its unconventionality and its implications of absolute control using the theorized “universal fluid.” Shelley uses Coleridge’s *Rime* to connect fears surrounding mesmerism to galvanism: galvanism had the potential to give the “spark” of life, while mesmerism could potentially control the life that was created.

One aspect of mesmerism that many critiqued was its theatrical approach to healing that made it distinctly different from the idea of scientific objectivity

⁴⁶ Tim Fulford, “Conducting the Vital Fluid: The Politics and Poetics of Mesmerism in the 1790s,” *Studies in Romanticism* 43 (2004): 64-65.

which many Romantic-era scientists believed was a key component. As described by Tim Fulford in his article on mesmerism, treatment included being led into a “lavishly decorated room, filled with fragrance and with the eerie music of Mesmer’s glass harmonica” where they were then seated “around special tubs... filled with water that Mesmer had ‘magnetized.’”⁴⁷ Mesmer’s own entrance would rival any seen onstage: he was “clad in opulent robes, and like a wizard, [would] touch them with his hand or wand.”⁴⁸ Both mesmerism and the public experiments done with galvanism are defined by a kind of showmanship: science was used to shock and awe. Yet mesmerism was marginalized by many established scientific communities, while galvanism had the support of both amateurs dabbling in experiments, educated professionals, such as Humphry Davy, and even those with political power.

This kind of sensationalism was not unknown in the scientific world. Galvanic experiments were scientifically interesting, but also spectacular, public events: Giovanni Aldini, Galvani’s nephew and a scientist as well, traveled throughout Europe promoting his uncle’s ideas and conducting experiments in front of audiences. These experiments were typically done on animals specifically dissected for galvanic experiments, but when a human body—often

⁴⁷ Tim Fulford, “Conducting the Vital Fluid: The Politics and Poetics of Mesmerism in the 1790s,” *Studies in Romanticism* 43 (2004): 62.

⁴⁸ Tim Fulford, “Conducting the Vital Fluid: The Politics and Poetics of Mesmerism in the 1790s,” *Studies in Romanticism* 43 (2004): 62.

an executed criminal—was available, the results were even more sensational and publicized among both scientists and the larger community, even attracting members of the British royal family.⁴⁹ Aldini's experiments in the early 1800s continued the scientific bickering over the implications of galvanism and they also demonstrate the views favored by those who held political power.

Tim Fulford has pointed out in his article “Conducting the Vital Fluid: The Politics and Poetics of Mesmerism in the 1790s” that mesmerism, and other similar treatments, often had an undercurrent of antiestablishment feelings. Conversely, the galvanic experiments done on executed criminals represented an extension of state power into the scientific realm. These examples reveal the struggle during this period to define science—and the scientist—in more concrete terms: who had official state sanction. Science became increasingly defined as an empirical, objective process and way of gaining factual information, as opposed to the varied practices and beliefs encompassed by natural philosophy. The changes occurring in science at the time, particularly changes in the definition of science and its relationship to theology, and would now be called metaphysics, are exemplified in Davy's beliefs about science as a process of gaining knowledge.

As the looming scientific influence over *Frankenstein*, Humphry Davy informs Victor Frankenstein's concept of science. Shelley clearly draws on one

⁴⁹ Iwan Rhys Morus, “Radicals, Romantics, and Electrical Showmen: Placing Galvanism at the End of the English Enlightenment,” *Notes and Records of the Royal Society of London* 63 (2009): 268-270.

of Davy's introductory lectures which she attended—"A discourse, introductory to a course of lectures on chemistry, delivered in the theatre of the Royal Institution on the 21st of January, 1802"—to inform Frankenstein's perception and eventual conflation of knowledge and power. While Davy's lecture is focused on explaining how chemistry is influential in other branches of science rather than explaining chemistry itself, he also spends a great deal of time exploring how scientific knowledge has given humanity power and influence over nature. Davy views chemistry, and by extension, science, as a means that humanity has used "for the purpose of allaying the restlessness of his desires, or of extending and increasing his power."⁵⁰ Davy explicitly equates scientific knowledge with power, often in terms of how the scientist can influence nature.

This sentiment is reflected in Frankenstein's single-minded pursuit of the creation of the creature the God-creation relationship he envisions, connected with Davy's discussion of science.⁵¹ Davy reinforces how science:

enabled him [scientists] to modify and change the beings surrounding him, and by his experiments to interrogate nature with power, and not simply as a scholar, passive... but rather as a master, active with his own instruments.⁵²

⁵⁰ Humphry Davy, "A discourse, introductory to a course of lectures on chemistry, delivered in the theatre of the Royal Institution on the 21st of January, 1802." London: J. Johnson, 1802, 14-15.

⁵¹ Mary Shelley, *Frankenstein: A Norton Critical Edition* (New York: W.W. Norton & Company, 2012), 33.

⁵² Humphry Davy, "A discourse, introductory to a course of lectures on chemistry, delivered in the theatre of the Royal Institution on the 21st of January, 1802." London: J. Johnson, 1802, 16.

Frankenstein personifies Davy's ideal master scientist, actively seeking knowledge and applying it to influence natural forces, such as life.

Davy offers few warnings about the misuse of scientific knowledge, but they apply to past scientific efforts. In his longest warning about scientific pursuits, the problems that Davy does voice apply not the newly-emerging scientist, but to alchemists: “[they were] influenced by their dearest passions and interests by ambition, or the love of money.”⁵³ Davy claims “these views have passed away, and a new science had gradually arisen. The dim and uncertain twilight of discovery... has been succeeded by the steady light of truth.”⁵⁴ While “old science,” alchemy, was directly concerned with personal greed, Davy argues that his vision of science provides clear answers in nature's “true relations to human powers,” which, according to Davy, can be put into terms of a servant and master dynamic: nature is subject to humanity.

Davy also articulated, as many were attempting at this time, a definition of science further separated from earlier Enlightenment views of science—which included alchemy—and other issues that would be considered religious, theology, or metaphysical topics as modern science emerged in the mid and late 1800s. Science, over the course of the late Enlightenment to early Romantic periods, was

⁵³ Humphry Davy, “A discourse, introductory to a course of lectures on chemistry, delivered in the theatre of the Royal Institution on the 21st of January, 1802.” London: J. Johnson, 1802, 18-19.

⁵⁴ Humphry Davy, “A discourse, introductory to a course of lectures on chemistry, delivered in the theatre of the Royal Institution on the 21st of January, 1802.” London: J. Johnson, 1802, 18-19.

concerned with sorting “science” from “other.” In Davy’s case, alchemy is the “other.” The old desires which Davy associates with alchemy, namely self-interested ambition, were problems brought out in Goethe’s recently published *Faust, Part One*. While Goethe used a literal alchemist to critique unbridled ambition, Shelley applied it to the new scientist and demonstrated how Davy’s dismissal of the alchemist was premature.

Davy could not completely separate his definition of science from earlier definitions. He showed derision for alchemists, yet his rhetoric emphasizes the power and influence scientists have over nature; alchemists claimed that their knowledge also gave them similar abilities to manipulate the world. The early stages of the Romantic period was still explicitly concerned with achieving knowledge that was, in some sense, above humanity’s reach. The change occurred in what was considered “scientific.” Shelley emphasizes this idea explicitly: “my [Frankenstein’s] father had taken the pains to explain to me, that the principles of Agrippa had been entirely exploded, and that a modern system of science had been introduced...”⁵⁵ Davy’s rhetoric from his 1802 lecture is particularly evident through Shelley’s character M. Waldman, a university professor who inspires Victor Frankenstein. Waldman, unlike Frankenstein’s father, used Frankenstein’s early respect for alchemists. Just as Davy dismissed

⁵⁵ Mary Shelley, *Frankenstein: A Norton Critical Edition* (New York: W.W. Norton & Company, 2012), 22.

the alchemist and earlier definitions of science only to affirm their goals and ideologies, Shelley uses Waldman to echo these ideas, particularly his conflation of scientific knowledge and power. Waldman embraces the alchemists' efforts; he praises them and their intellectual ancestors as "men of genius."⁵⁶ Davy's concept of science as a benefit to mankind and the scientist as an integral part of subjugating nature for humanity's advantage is reflected in Waldman's speech further: "The labours of men of genius, however erroneously directed, scarcely ever fail in ultimately turning to the solid advantage of mankind."⁵⁷ Using Davy's language, Shelley revealed the kinship between Davy's power-centered vision of science and alchemy. This kinship resonated with scientific Romantic ideals of pushing the boundaries of human knowledge. The desire to go beyond what had been previously restricted by religion and the changing definition of what was or was not scientific also created questions about what was scientifically ethical treatment of those under science's influence. Where religion had supplied the answers in the past, the new boundaries of science had not yet been clearly defined.

As Davy illustrated in his lecture, concepts about scientists and science were influenced by earlier ideas about science. Both Frankenstein and his

⁵⁶ Mary Shelley, *Frankenstein: A Norton Critical Edition* (New York: W.W. Norton & Company, 2012), 29.

⁵⁷ Mary Shelley, *Frankenstein: A Norton Critical Edition* (New York: W.W. Norton & Company, 2012), 29.

creature live in the shadow of Frankenstein's earliest scientific readings, especially Cornelius Agrippa, an Early Modern alchemist and advocate of high magic. Alchemy holds an important place in *Frankenstein* as Victor Frankenstein's original inspiration and its place in the beginnings of science. The scientist in the transition period is the new magician, able to understand and manipulate the world. Scientific knowledge, such as galvanism and mesmerism, are the new alchemy. Waldman channeled much of Davy's rhetoric about the power of science, without his contempt for alchemy. Instead, Waldman, speaking about "these philosophers," claims that they "performed miracles," which modern scientists can no longer do:

They [alchemists] penetrate into the recesses of nature, they shew how she works in her hiding places... They ascend into the heavens... They have acquired new and almost unlimited powers; they can command the thunders of heaven, mimic the earthquake, and even mock the invisible world with its own shadows.⁵⁸

Instead of dismissing alchemy, Waldman gives these men a permanent and venerated place in the modern scientific community. Despite differing in their treatment of alchemy, the rhetoric that Davy and Waldman use to discuss science reveals their conflation of science and power, most significantly power over nature. These ideas are similarly reflected in earlier works, such as Agrippa's, in dealing with high magic. High magic had its roots in Christian theology and its

⁵⁸ Mary Shelley, *Frankenstein: A Norton Critical Edition* (New York: W.W. Norton & Company, 2012), 28-29.

own history with religion is complex, but ultimately defined and limited by its Christian beginnings. High magic included alchemy, but also the summoning of angels. Both of these goals required knowledge in order to gain power over nature and achieve feats that transcended humanity's place in the world—an important component of Davy's, and by extension, Waldman and Frankenstein's, view of science.

Shelley uses the desire for power as the connection to weave together past influences on changing scientific borders, materialism, vitalism, and mesmerism. Practitioners of alchemy sought power over nature through their knowledge how to transmute metals into gold; Romantic scientists were searching for power over life through their experiments with electricity. Society at large sought the power that mesmerism promised—over each other and the healing powers that were promised.⁵⁹ In itself, electricity was a powerful force, and by extension the scientists that understood it were powerful in that knowledge. The experiments with galvanism and the fascination with mesmerism were redefining science and humanity's place in relation to this knowledge. Mary Shelley uses the idea of scientific knowledge conferring power in *Frankenstein*, explicitly pulling them from both scientific minds of the day and broader cultural understandings of electricity and its popular culture cousin, mesmerism. Her critique of this

⁵⁹ Tim Fulford, "Conducting the Vital Fluid: The Politics and Poetics of Mesmerism in the 1790s," *Studies in Romanticism* 43 (2004): 57-78.

material also includes questions concerning how scientific knowledge should be handled and under what sort of authority it should be regulated. While the traditional scientific community would claim that political sanction gave it authority, antiestablishment practitioners would offer a variety of different authorities.

Victor Frankenstein's interest in Agrippa strengthens the parallels between science and religion, or in the case of Romantic scientist, the creation of a new "unifying mythology," "including a fusion of poetry and physics."⁶⁰ In the past, religion had provided a boundary and regulations for ethics, but as Romanticism and its looser ideals of spirituality emerged, religion's place in science became tenuous. Ideas of a new "unifying mythology" of science and art would provide a spiritual component with scientific evidence for the Romantic ideology. Primarily, spirituality was understood through science. The questions that many Romantic scientists sought to answer with their experiments concerned the nature and forces behind life; as society shifted towards secular thinking, both writers and scientists attempted to define "life" in non-religious ways while simultaneously reframing spirituality with scientific evidence. *Geist*, while a philosophical concept of the force behind life, was also believed to be a

⁶⁰ Walter D. Wetzels, "Aspects of Natural Science in German Romanticism," *Studies in Romanticism* 10 (1971); 44, 51; Wetzels' article discusses the Jena Romantics, a group of philosophers, writers, poets, scientists, and other intellectuals at the University of Jena. While German, British, and American Romanticism all had differences, the influences on *Frankenstein* are drawn from a variety of sources within the Romantic movement worldwide.

scientifically provable phenomenon. The idea of *geist* is a Romantic concept, but Agrippa also conceptualized a similar idea: “the Soul of the World is diffused through all things by the quintessence; For there is nothing found in the whole world that hath not a spark of the virtue thereof.”⁶¹ The spiritual connection that is inherent throughout alchemy experienced a resurgence of interest in the Romantic period; Agrippa describes the “Soul of the World,” and the Romantics latched onto the idea of *geist* to describe the world-organism and the force behind life.

Agrippa, in his introduction to his book on high magic, says that “magic is a faculty of wonderful virtue... containing the most profound contemplation of most secret things... as also the knowledge of whole Nature.”⁶² Magic and alchemy provide both insight into nature and unite “the virtues of things” through the scientists’ knowledge.⁶³ High magic sought to achieve certain actions, but the larger goal was the elevation of humanity’s place. In the Medieval and Early Modern periods, religion limited the knowledge that humans could have: God, as the supreme omniscient being, placed his created beings on different levels with limitations on their powers. Angels and demons are above humans in this

⁶¹ Henry Cornelius Agrippa, *The Philosophy of Natural Magic* (Chicago: The deLaurence Company, 1913), 41.

⁶² Henry Cornelius Agrippa, *The Philosophy of Natural Magic* (Chicago: The deLaurence Company, 1913), 16.

⁶³ Henry Cornelius Agrippa, *The Philosophy of Natural Magic* (Chicago: The deLaurence Company, 1913), 16.

hierarchy, and humans have dominion over animals. High magic was revolutionary in seeking knowledge beyond human's limitations. This same theme is explored in many Romantic literary works besides *Frankenstein*, such as Goethe's *Faust*.

Unseating religion and theology from their former place in the scientific world, experimental attempts to understand and articulate life, even redefining "science" around new ideologies meant that ethical considerations had to change. During the period in which Shelley writes *Frankenstein*, medical ethics was one of many components of science in transition. Ivan Waddington's assessment of British medical ethics from the end of the 18th century to the end of the 19th century is significant in focusing on the reason behind the changes in ethics: the professionalization of medicine.⁶⁴ Waddington defines the development of medical ethics around the change from a patronage system of medicine to one dominated by colleague relations. Medical professionals during the transition period were concerned with these colleague relationships as well as the philosophical redefining of spirituality and the nature of life. How medical professionals should treat life, however, was an ethical concern that was not the primary question in the medical community. Religious boundaries still provided a

⁶⁴ Ivan Waddington, "The Development of Medical Ethics—A Sociological Analysis," *Medical History* 19 (1975), 36-51.

framework for scientists' treatment of life, as well as public expectations of medical professionals and scientists.

Waddington's work provides a timeline for the discussion surrounding ethics and science as a whole. Shelley's novel was introduced during the early period of the professionalization of medicine and reflected on many of the questions that both the public and medical professionals were struggling to articulate. *Frankenstein's* affect in the literary community was mixed. In book reviews from the time of its release, *Frankenstein* did not garner high praise. Many at the time felt it was beyond question that scientists would treat human life with respect, given that the strong religious ideals still held sway. The consensus amongst several of the prominent reviews was that the writing itself was often excellent, even poetic, but the plot itself was absurd. The reviews that view the story as one trying to make a social or political statement, as it was doing, either relegate its message to the background or outright condemn it: its moral was irrelevant at best, and insulting at worst.⁶⁵ As a result, some felt that Shelley questioning the status quo was absurd and something of a non-sequitur.⁶⁶ While

⁶⁵ Croker, John Wilson. "Frankenstein, or the Modern Prometheus," *The Quarterly Review*, 36 (1818): 379-385. Accessed August 2, 2017. <http://knarf.english.upenn.edu/Reviews/quarter.html>; "Frankenstein, or the Modern Prometheus," *The British Critic*, 9 (1818): 432-438. Accessed August 2, 2017. <http://knarf.english.upenn.edu/Reviews/britcrit.html>; "Frankenstein, or the Modern Prometheus," *The Gentleman's Magazine*, 88 (1818): 334-335. Accessed August 2, 2017. <http://knarf.english.upenn.edu/Reviews/gentmag.html>; *The Edinburgh Scots Magazine, and Literary Miscellany*, 2 (1818): 249-253. Accessed August 2, 2017. <http://knarf.english.upenn.edu/Reviews/edinmag.html>.

⁶⁶ "Frankenstein, or the Modern Prometheus," *The British Critic*, 9 (1818): 432-438. Accessed August 2, 2017. <http://knarf.english.upenn.edu/Reviews/britcrit.html>

the scientific ideas were viewed in 1818 as outlandish, its publication helped to add and reinforce the struggle for scientific identity during this time period. The affect of Shelley's novel within the circles of literary criticism were not as strongly positive as its current reputation would suggest, but in looking at more modern discussions of science, Shelley's work has fundamentally shaped the ways that scientists and medical professionals are expected to treat the people under their influence and care.

Frankenstein has long acted as a cautionary tale of science—and the scientist—overstepping ethical borders. It is telling that William Whewell, an English scientist, when defining the term “scientist” for the first time laid out a scientist as not only someone who looks for knowledge and systematically organizes it, but applies it to a “useful purpose.”⁶⁷ While anecdotal evidence is often suspect, the sheer number of references to *Frankenstein* that are made when discussing new scientific discoveries by the public, the press, or even scientists themselves demonstrates how clearly this novel has become a part of the continuing evolution of scientific ethics. Shelley's novel helped to add further to the discussion in the 1800s and as a part of these tentative, formative years in the development of modern science has remained a part of it since.

⁶⁷ Allen, Glen Scott. Master mechanics & evil wizards: Science and the American imagination from Frankenstein to Sputnik. *Massachusetts Review*. Winter92/93, Vol. 33 Issue 4, p505. 54p. Accessed September 10, 2017.

Shelley's work provides insight into the struggle define the scientific process concretely, both in terms of what "science" was or was not and who was qualified to participate. She does not offer a resolution to the materialist and vitalist debate, or resolve the tensions between the disparate factions of the traditional and antiestablishment scientific communities. To expect that she would offer solutions would be to miss the larger point of her work. Her culminating statement ultimately concerns the larger, ethical questions that scientists left unanswered during this transition period. Shelley's work is significant, not only in a literary sense as both a complex novel and the first in the science fiction genre, but to historians seeking to better understand how modern science developed in the 1800s. The overlooked transition period represented in *Frankenstein* brings to life the origins of many of the concerns that were addressed later with the eventual formation of professional organizations with ethics committees. *Frankenstein* refocused discussions within the scientific community by questioning what the goal and ramifications of scientific discovery would be to individuals and society. Shelley sought to further this goal by revealing the close ties that new definitions of science still had to earlier interpretations of science, especially alchemy's place in the scientific world.

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