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This essay details relationships between Mary Shelley's work and the scientific theories and innovations of her time, connecting the genesis of the creature to "bad" scientific practices and suggesting that this connection causes, at least in part, the creature's monstrosity. In addition, the essay elucidates nineteenth-century patriarchal society's fears of female sexuality, particularly those of Britain's scientific community. These fears are revealed as Frankenstein attempts "to usurp the function of the female in the reproductive cycle." As you read this essay, consider how modern scientific advances are often demonized in literature, television, and movies.

FRANKENSTEIN: A FEMINIST CRITIQUE OF SCIENCE

By Anne K. Mellor

In *One Culture: Essays in Science and Literature*, ed. George Levine and Alan Rauch (Madison: Univ. of Wisconsin Press, 1987), pp. 287–312

[*This essay was subsequently reprinted as Chap. 5 of* Mary Shelley: Her Life, Her Fictions, Her Monsters *(1988): up to subsection II in this version, with one exception linked as an addendum, differences between the texts are essentially stylistic. Where the texts eventually diverge at subsection II, then, the simplest solution has seemed to be that of representing the 1988 text as a separate, linked entity. Up to that point, for convenient reference to this second version, its page demarcations are given in double curled brackets* {{--}}.]

{287} {{89}} From a feminist perspective, the most significant dimension of the relationship between literature and science is the degree to which both enterprises are grounded on the use of metaphor and image. The explanatory

models of science, like the plots of literary works, depend on linguistic structures which are shaped by metaphor and metonymy. The feminist reader is perhaps most sensitized to those symbolic structures which employ gender as a major variable or value. When Francis Bacon announced, "I am come in very truth leading to you Nature with all her children to bind her to your service and make her your slave,"[1] he identified the pursuit of modern science with a form of sexual politics: the aggressive, virile male scientist legitimately captures and enslaves a passive, fertile female nature. Mary Shelley was one of the first to comprehend and illustrate the dangers inherent in the use of sexist metaphors in the seventeenth-century scientific revolution.

Mary Shelley grounded her fiction of the scientist who creates a monster he can't control upon an extensive understanding of the most recent scientific developments of her day. More important, she used this knowledge both to analyze and to criticize the more dangerous implications of both the scientific method and its practical results. Implicitly, she contrasted what she considered "good" science—the detailed and reverent description of the workings of nature—to "bad" science, the hubristic manipulation of the forces of nature to serve man's private ends. In *Frankenstein, or the Modern Prometheus*, she illustrated the potential evils of scientific hubris and at the same time challenged any conception of science and the scientific method that rested on a gendered definition of nature as female. Fully to appreciate the {{90}} significance of Mary Shelley's feminist critique of modern science, {288} we must look first at the particular scientific research upon which her novel is based.

I

The works of three of the most famous scientists of the late eighteenth and early nineteenth century—Humphry Davy, Erasmus Darwin, and Luigi Galvani—together with the teachings of two of their ardent disciples, Adam Walker and Percy Shelley, were crucial to Mary Shelley's understanding of science and the scientific enterprise. While no scientist herself (her description of Victor Frankenstein's laboratory is both vague and naive; apparently Victor does all his experiments in a small attic room by the light of a single candle), Mary Shelley nonetheless had a sound grasp of the concepts and implications of some of the most important scientific work of her day. In her novel, she distinguishes between those scientific researches which attempt to describe accurately the functionings of the physical universe and those which attempt

to control or change that universe through human intervention. Implicitly, she celebrates the former, which she associates most closely with the work of Erasmus Darwin, while she calls attention to the dangers inherent in the latter, found in the work of Davy, Galvani, and Walker. [...]

[...] In relation to *Frankenstein*, Erasmus Darwin's most significant evolutionary concept was that of the hierarchy of reproduction. Darwin insisted that sexual reproduction is at a higher evolutionary level than hermaphroditic or solitary paternal propagation.

This concept of the superiority of sexual reproduction over paternal propagation was so important to Erasmus Darwin that it forced him radically to revise his concept of reproduction in his third, "corrected" edition of *Zoonomia.* In 1794, Darwin had argued, following Aristotle, that male plants produce the seed or embryon, while female plants provide only nourishment to this seed, and by analogy, had contended "that the mother does not contribute to the formation of the living ens in normal generation, but is necessary only for supplying its nutriment and oxigenation" (*Zoonomia*, 1794, I: 487). He then attributed all monstrous births to the female, saying that deformities result from either excessive or insufficient nourishment in the egg or uterus (p. 497). But by 1801, Darwin's observations of both animal and vegetable mules had convinced him that both male and female seeds contribute to the innate characteristics of the species (see *Zoonomia*, 1801, 2: 296–97. Interestingly, while Darwin no longer attributed monstrous births to uterine deficiencies or excesses, he continued to hold the male imagination at the moment of conception responsible for determining both the sex of the child and its outstanding traits. [...]

II

[...] Reading *Frankenstein* against the background of Darwin's work, we can see that Mary Shelley directly pitted Victor Frankenstein, that modern Prometheus, against those gradual evolutionary processes of nature described by Darwin. Victor Frankenstein wants to originate a new life form quickly, by chemical means. In his Faustian thirst for knowledge and power, he dreams:

> Life and death appeared to me ideal bounds, which I should first break through, and pour a torrent of light into our dark world. A new species would bless me as its creator and source; many happy and excellent natures would owe their being to me. (F, p. 49)

Significantly, in his attempt to create a new species, Victor Frankenstein substitutes solitary paternal propagation for sexual reproduction. He thus reverses the evolutionary ladder described by Darwin. And he engages in a notion of science that Mary Shelley deplores, the idea that science should manipulate and control rather than describe and understand nature.

{299} Moreover, his imagination at the moment of conception is fevered and unhealthy; as he tells Walton,

> Every night I was oppressed by a slow fever, and I became nervous to a most painful degree; . . . my voice became broken, my trembling hands almost refused to accomplish their task; I became as timid as a love-sick girl, and alternate tremor and passionate ardour took the place of wholesome sensation and regulated ambition. (*F*, p. 51)

Under such mental circumstances, according to Darwin, the resultant creation could only be a monster. Frankenstein has further increased the monstrousness of his creation by making a form that is both larger and more simple than a normal human being. As he acknowledges to Walton, "As the minuteness of the parts formed a great hindrance to my speed, I resolved, contrary to my first intention, to make the being of a gigantic stature; that is to say, about eight feet in height, and proportionably large" (*F*, p. 49). {{101}} Darwin had observed that nature moves "from simpler things to more compound" (*Phytologia*, p. 118); in defying nature's law, Victor Frankenstein has created not a more perfect species but a degenerative one.

In his attempt to override natural evolutionary development and to create a new species *sui generis*, Victor Frankenstein enacts a parody of the orthodox creationist theory. While he denies the unique power of God to create organic life, he confirms the capacity of a single creator to originate a new species. Thus he simultaneously upholds the creationist theory and parodies it by creating only a monster. In both ways, he blasphemes against the natural order of things. He moves down rather than up the evolutionary ladder; he reverses human progress and perverts the law of the survival of the fittest. And he denies the natural mode of human reproduction through sexual procreation. [...]

[...] Mary Shelley's novel implicitly invokes Darwin's theory of gradual evolutionary progress to suggest both the error and the evil of Victor

Frankenstein's bad science. The genuine improvement of the species can result only from the fusing of both male and female sexuality. In trying to have a baby without a woman, Frankenstein denies to his child the maternal love and nurturance it requires, the very nourishment that Darwin explicitly equated with the female sex. Frankenstein's failure to embrace his smiling creature with maternal love, his horrified rejection of his own creation, spells out the narrative consequences of solitary paternal propagation. But even if Frankenstein had been able to provide his child with a mother's care, he could not have prevented its social ostracism and misery.

Moreover, in trying to create a human being as God created Adam, out of earth and water, all at once, Victor Frankenstein robs nature of something more than fertilizer. "On a dreary night in November, . . . with an anxiety that almost amounted to agony," Victor Frankenstein infused "a spark of being into the lifeless thing that lay" at his feet (*F*, p. 52). At that moment Victor Frankenstein became the modern Prometheus, stealing fire from the gods to give to mankind and thus overthrowing the established, sacred order of both earth and heaven. At that moment he transgressed against nature.

To understand the full implications of Frankenstein's transgression, {301} we must recognize that his stolen "spark of life" is not merely fire; it is also that recently discovered caloric fluid called electricity. Victor's interest in legitimate science is first aroused by the sight of lightning destroying an old oak tree; it is then that he learns of the existence of electricity and replicates Benjamin Franklin's experiment with kite and key and draws down "that fluid from the clouds" (*F*, p. 35). In the late eighteenth century, there was widespread interest in Franklin's and Father Beccaria's discoveries of atmospheric electricity, in static electricity, and in artificial or mechanical electricity generated through such machines as the Leyden jar. Many scientists explored the possibility, derived from Newton's concept of the ether as an elastic medium capable of transmitting the pulsations of light, heat, gravitation, magnetism, and electricity, that the atmosphere was filled with a thin fluid that was positively and negatively charged and that could be identified as a single animating principle appearing under multiple guises (as light, heat, magnetism, etc.). [...]

[...] {303} Fully to appreciate the science that lies behind Victor Frankenstein's endeavors, however, we must remember that in the 1831 Preface to *Frankenstein*, Mary Shelley specifically associated electricity with galvanism. [...]

In 1791 the Bolognese physiologist Luigi Galvani published his *De Viribus Electricitatis in Motui Musculari* (or *Commentary on the Effects of Electricity on Muscular Motion*),[2] in which he came to the conclusion that animal tissue contained a heretofore neglected innate vital force, which he called "animal electricity" but which was subsequently widely known as "galvanism"; this force activated both nerves and muscles when spanned by an arc of metal wires {{105}} connected to a pile of copper and zinc plates. Galvani believed that his new vital force was a form of electricity different from both the "natural" form of electricity produced by lightning or by the torpedo and electric eel and the "artificial" form produced by friction (i.e., static electricity). Galvani argued that the brain is the most important source of the production of this "electric fluid" and that the nerves acted as conductors of this fluid to other nerves and muscles, the tissues of which act much like the outer and inner surfaces of the widely used Leyden jar. Thus the flow of animal electric fluid provided a stimulus which produced contractions of convulsions in the irritable muscle fibers.

Galvani's theories made the British headlines in December 1802 when, in the presence of their Royal Highnesses the Prince of Wales and the dukes of York, Clarence, and Cumberland, Galvani's nephew, disciple, and ardent defender, Professor Luigi Aldini of Bologna University, applied a voltaic pile connected by metallic wires to the ear and nostrils of a recently killed ox head. At that moment, "the eyes were seen to open, the ears to shake, the tongue to be agitated, and the {304} nostrils to swell, in the same manner as those of the living animal, when irritated and desirous of combating another of the same species."[3] But Professor Aldini's most notorious demonstration of galvanic electricity took place on 17 January 1803—On that day he applied galvanic electricity to the corpse of the murderer Thomas Forster. The body of the recently hanged criminal was collected from Newgate, where it had lain in the prison yard at a temperature of 30 degrees Fahrenheit for one hour, by the president of the College of Surgeons, Mr. Keate, and brought immediately to Mr. Wilson's anatomical theater where the following experiments were performed. When wires attached to a pile composed of 120 plates of zinc and 120 plates of copper were connected to the ear and mouth of the dead criminal, Aldini later reported, "the jaw began to quiver, the adjoining muscles were horribly contorted, and the left eye actually opened" (p. 193)—When the wires were applied to the dissected thumb muscles, they "induced a forcible effort to clench the hand;" when applied to the ear and rectum, they

"excited in the muscles contractions much stronger . . . The action even of those muscles furthest distant from the points of contact with the arc was so much increased as almost to give an appearance of re-animation." And when volatile alkali was smeared on the nostrils and mouth before the galvanic stimulus was applied, "the convulsions appeared to be much increased . . . and extended from the muscles of the head, face, and neck, as far as the deltoid. The effect in this case surpassed our most sanguine expectations," Aldini exults, and remarkably concludes that "vitality might, perhaps, have been {{106}} restored, if many circumstances had not rendered it impossible" (pp. 194–95). Here is the scientific prototype of Victor Frankenstein, restoring life to dead bodies. [...]

II

[...] Mary Shelley based Victor Frankenstein's attempt to create a new species from dead organic matter through the use of chemistry and electricity on the most advanced scientific research of the early nineteenth century. But *Frankenstein* reflects much more than merely an intelligent use of the latest scientific knowledge. Perhaps because she was a woman, Mary Shelley understood that much of the scientific research of her day incorporated an attempt to dominate the female.

Francis Bacon heralded the seventeenth-century scientific revolution as a calculated attempt to control and exploit female Nature: "I am come in very truth leading to you Nature with all her children to bind her to your service and make her your slave." Bacon's metaphor of a passive, possessable female nature radically transformed the traditional image of female nature as Dame Kind, the "all creating" and bounteous mother earth who single-handedly bore and nourished her children. As Brian Easlea concludes, many seventeenth-century natural philosophers and their successors viewed the scientific quest as a virile masculine penetration into a passive and by herself uncreative female nature, a penetration that would, in Bacon's words, not merely exert a "gentle guidance over nature's course" but rather "conquer and subdue her" and even "shake her to her foundations."[5]

A product of the scientific revolution of the seventeenth century, Frankenstein had been taught to see nature the way Bacon did, as female but inert. He sees nature "objectively," as something separate from himself, a passive and even dead "object of my affection"[5] that can and should be penetrated, analyzed,

and controlled. He thus accords nature no living soul or "personhood" that requires recognition or respect.

Mary Shelley perceived a potentially dangerous metaphor inherent in the scientific thought of her day. {307} Nature is female, Dame Kind, Mother Earth. As "all creating nature," she can be seen as the abundantly providing, ever nurturing mother, the blessed source of life itself. But this sacramental view of female nature has been foresworn by Waldman, Frankenstein, and many of the leading scientists of Mary Shelley's day. As Professor Waldman proclaims, scientists "penetrate into the recesses of nature, and shew how *she* works in *her* hiding places" (*F*, p. 42, my emphasis). Nature has become the passive female whose sole function is to satisfy male desires. The scientist who analyzes, manipulates, and attempts to control nature unconsciously engages in a form of oppressive sexual politics. Construing nature as the female other, he attempts to make nature serve his own ends, to gratify his own desires for power, wealth, reputation.

Frankenstein's scientific project is clearly an attempt to gain power. He is inspired by Waldman's description of scientists who "have acquired new and almost unlimited powers; they can command the thunders of the heaven, mimic the earthquake, and even mock the invisible world with its own shadows" (*F*, p. 42). He has sought the power of a father over his children, of God over his creation. "A new species would bless me as its creator and source; many happy and excellent natures would owe their being to me. No father could claim the gratitude of his child so completely as I should deserve theirs," he exults (*F*, p. 49). More subtly yet more pervasively, Frankenstein has sought power over the female. He has "pursued nature to her hiding {308} places" (*F*, p. 49) in an attempt not only to penetrate nature and show how her hidden womb works but actually to steal or appropriate that womb. In effect, Frankenstein has tried to usurp the function of the female in the reproductive cycle and thus eliminate the necessity, at least for the purposes of the biological survival of mankind, of female sexuality.

But Mary Shelley portrays Frankenstein's desire to penetrate and usurp the female as monstrous, unattainable, and finally self-destructive. For nature is not the passive, inert, or "dead" matter that Frankenstein imagines;[34] she resists and revenges his attempts. During his research, nature denies to Victor Frankenstein both mental and physical health: "my enthusiasm was checked by my anxiety, and I appeared rather like one doomed by slavery to toil in

the mines, or any other unwholesome trade, than an artist occupied by his favourite employment. Every night I was oppressed by a slow fever, and I became nervous to a most painful degree" (*F*, p. 51). Victor continues to be tormented by anxiety attacks, bouts of delirium, periods of distraction and madness. As soon as he determines to blaspheme against nature a second time, by creating a female human being, nature torments him with a return of his mental illness: "Every thought that was devoted to it was an extreme anguish, and every word that I spoke in allusion to it caused my lips to quiver and my heart to palpitate" (*F*, p. 156); "my spirits became unequal -- I grew restless and nervous" (*F*, p. 162). In the end, Frankenstein's obsession with destroying his creature exposes him to such mental and physical distress that he dies before his twenty-fifth birthday.

The novel thus calls into question the gendered metaphor on which much Western scientific theory and practice are founded. The attempt of science to penetrate, possess, and control Mother Nature entails both a violation of the sacred rights of nature and a false belief in the "objectivity" or "rationality" of scientific research. When it construes nature as a passive and possessable female, Western science encodes a sexist metaphor that has profoundly troubling implications, not only for women but for human survival. As Frankenstein's monster tells him, "Remember that I have power; . . . I can make you so wretched that the light of day will be hateful to you" (*F*, p. 165). Like Victor Frankenstein, modern scientists have too often treated nature as the "other," to be exploited rather than understood and served through detailed, loving, and noninterventionist description. In their search for the truth about the workings of the physical universe, they have ignored the possibility that their manipulations of nature might harm her. Too often, they have failed to take responsibility for the predictable consequences of their research, failed to care for their own technological progeny. As Mary Shelley first perceived, a scientific method founded on the gendered construction of nature as the female other, as the passive object of desire, hence possessable and exploitable, can produce monsters, even monsters of biological, chemical, and nuclear warfare capable of destroying civilization as we know it.

Notes

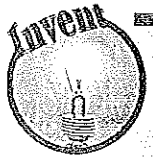
1. Quoted in Benjamin Farrington, "Temporis Partus Masculus: An Untranslated Writing of Francis Bacon," *Centaurus* 1 (1951), p. 197.

2. Luigi Galvani, *De Viribus Electricitatis in Motui Musculari: Commentarius* (Bologna, 1791); *Commentary on the Effects of Electricity on Muscular Motion*, trans. M. G. Foley, with notes and introduction by I. Bernard Cohen (Norwalk, Conn.: Burndy Library, 1953).

3. John Aldini, *An Account of the Late Improvements in Galvanism, with a series of Curious and Interesting Experiments performed before the Commissioners of the French National Institute and repeated lately ill the Anatomical Theatres of London; to which is added, An Appendix, containing the author's Experiments on the Body of a Malefactor executed at New Gate* (London: Cuthell and Martin, 1803), p. 54. (This book is an English translation of the original French text, *Essai théorique et expérimentale sur le galvanisme* published in Paris in 1802 and translated into German by F. H. Martens and published at Leipzig in 1804.)

4. Brian Easlea, *Science and Sexual Oppression, Patriarchy's Confrontation with Woman and Nature* (London: Weidenfeld and Nicolson, 1981), pp. 83–86.

5. This phrase was deleted by Percy Shelley from Mary Shelley's manuscript of *Frankenstein* (now in the Bodleian Library, Abinger Dep. c. 477/1). Her original version of the passage at F, 50, lines 31-33 reads thus: "I wished, as it were, to procrastinate my feelings of affection, until the great object of my affection was compleated."



According to Mellor, Shelley disapproves of "'bad' science, the hubristic manipulation of the forces of nature to serve man's private ends" including "scientific researches ... which attempt to control or change that universe through human intervention." How could this sort of science be considered "monstrous"? With a partner, brainstorm a list of scientific advances that try to "*control* or *change*" nature. In front of the class, make an argument for why these advances are or are not monstrous. Be aware that your argument could be controversial.

Research Erasmus Darwin or Luigi Galvani, and answer the following questions: How was he received in his own time? What were common opinions of him and his theories? In what way might his theories have been considered "monstrous"? How might Mary Shelley's feelings about him reflect or differ from the common opinions of her time?

Mellor claims that Shelley takes a feminist stance, condemning Frankenstein not only for his "bad science" but also for his usurpation of female roles and for his attack against Nature, which she claims is the embodiment of femininity. In a small group, discuss your definitions of feminism. How do definitions differ within your group? How do your group's definitions differ from Mellor's? What assumptions come across in your discussion? Find a definition online of a feminist literary approach, and compare it with your ideas about feminism. Then look back at the selection from *Frankenstein* in this book, and discuss how Mellor's position fits the various definitions of feminism you have examined. Be prepared to discuss your discoveries in class.

How might a monster be used as a metaphor for science or scientific advances, and how could such a metaphor be considered social commentary about science? According to Mellor's essay, Frankenstein's creature comments on the science of Shelley's day. In *The Strange Case of Dr. Jekyll and Mr. Hyde*, how might Hyde accomplish a similar goal? In contemporary texts, zombies often provide similar metaphors for science. Choose either *Dr. Jekyll and Mr. Hyde* or a modern zombie story, and write a research paper with a thesis about how the monster provides a metaphor for scientific advances. Your essay should compare Jekyll/Hyde or zombies with Frankenstein and his creature—how is the monster you've chosen similar to this pair?