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"A Spark of Life". Emotions and Nervous Fluids in Mary Shelley's *Frankenstein*

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Since Marilyn Butler's pivotal edition (1993) of the 1818 text of Mary Shelley's *Frankenstein*, new and unexpected interpretations have emerged and Shelley's extensive knowledge of natural philosophy has been widely analysed. Butler has connected the reactions to the first version of the novel to a paper published in 1819 in the *Quarterly Review*. *Frankenstein* was not mentioned, but the author discussed the broad issue of "vitalism, or the principle of life", alluding to a number of both scientific and literary authors, such as the German phrenologists Franz Joseph Gall and Johann Gaspar Spurzheim, the British materialist physician William Lawrence, and the irreverent author of *Don Juan*, Lord Byron. The bitter attack on "vitalism", Butler affirms, was clearly related to *Frankenstein*, since

> [its] naturalist vocabulary [had been] so firmly demonized as irreligious, anti-social, and immoral, the pro-religious, anti-scientific interpretation of the novel was in effect in place.[1]

Early readers recognised *Frankenstein*'s origins in the coeval scientific debate and thought of it as a result of bold and non-religious views of nature. In this essay, I wish to point out why the novel was so easily associated with the irreligious scientific milieu and why it was interpreted as unequivocally supporting "radical science". This term could include several different unorthodox attitudes, especially non-Christian views of man and the natural world. In particular, *Frankenstein* may be considered as the expression of two branches of "radical science"– chemistry and physiology–that will be analysed here.

Rational chemistry

> It was a dreary night of November that I beheld the accomplishments of my toils. With an anxiety that almost amounted to agony, I collected the instruments of life around me, that I may infuse a spark of being into the lifeless thing that lay at my feet. It was already one in the morning; the rain pattered dismally against the panes, and my candle was nearly burnt out, when, by the glimmer of the half-extinguished light, I saw the dull yellow eye of the creature open; it breathed hard, and a convulsive motion agitated its limbs (58).

According to the 1831 *Author's Introduction*, these were the very first words Mary Shelley wrote about Victor Frankenstein and his scary creature (F, 10). They were written in 1816, during a journey to Switzerland and a few days after reading some German ghost stories. In the 1818 text, Shelley preceded this passage with some letters sent by the young Englishman Robert Walton to his sister and by the description of Frankenstein's family and education. The long introduction to the "birth" of the monster has often been interpreted as a means by which the author expands the distance between the reader and the facts, to make the story a little less scary and in order to shock the readers less. Moreover, the detailed preamble also suggests that the information about Victor's scientific knowledge and aspirations had not originally been part of the plan of the novel, even though in this "beginning" Frankenstein announces his "sole purpose of infusing life into an inanimate body" (58). In the pages preceding the creation we are told that the young Victor is initially impressed by Cornelius Agrippa, Paracelsus, and Albertus Magnus, writers he associates with the alchemic tradition. He praised "their greatest diligence into the search of the philosopher's stone and the elixir of life; but the latter soon obtained my undivided attention" (42).

While Victor is not attracted by the promising transmutation of metals (the supposed effect of the philosopher's stone), he is more interested in those physical powers of matter that can "banish disease from the human frame and render man invulnerable to any but a violent death" (42). This was not an old-fashioned interpretation of the goals of human science: in 1802, in illustrating the progress of a new-born science, chemistry, Humphry Davy affirmed that medicine and physiology "will be found to have derived from chemistry most of their practical applications", since "a new influence has been discovered, which has enabled man to produce from combinations of dead matter effects which were formerly occasioned only by animal organs"[2].

While Paracelsus recommended the study of the curative effects of minerals, Davy thought that modern chemistry could fully explain physical powers and allow complete knowledge of their action on living bodies. Davy insisted on the *power* which man could gain from the intimate knowledge of nature: while chemistry had been successfully applied to agriculture and textile manufacturing, Davy wished to expand its use to medicine, in order to make men healthier and help them live longer. Davy's aims may appear akin to those of the Renaissance alchemists, but he was no doubt modern in pointing out the instruments of this progress. He set ancient alchemy against the "systematic arrangement of facts"[3] which chemistry was made up of and exalted the invaluable results it had achieved.

Modern chemistry had been recently popularised by the *Traité élémentaire de chimie*, in which Antoine Lavoisier set out a controversial account of chemical elements, but also established a common nomenclature. Victor Frankenstein was familiar with the new chemical language, as his father sent him to a Geneva professor of natural philosophy, who "discoursed with the greatest fluency of potassium and boron, of sulphates and oxyds" (232). In order to address his son to reliable scientific theories, Victor's father suggested that he apply "the more rational theory of chemistry that has resulted from modern discoveries" (231).

Victor aimed at the alchemists' bold goal of discovering the hidden secrets of nature, but he borrowed his method from modern chemistry: this somewhat bizarre plan had also been announced by Davy. He accepted modern nomenclature, but revised Lavoisier's theory, reintroduced the history of chemistry (a topic Lavoisier had excluded) and encouraged man to bestow

> upon him powers which may be called creative; which have enabled him to modify and change the beings surrounding him, and by experiments to interrogate nature with power, not simply as a scholar, passive and seeking only to understand her operations, but rather as a master, active with its own instruments.[4]

Even though the control and the violation of nature were encouraged by as authoritative book as Francis Bacon's *The Advancement of Learning* (1605), passive scholars were an influential and well-established group in British universities. Seeking to observe and describe natural phenomena, they perpetuated a distinctive Newtonian theme but also derived from the investigation of nature religious sentiments: natural philosophers

became acquainted with the most sophisticated natural laws and their increasing knowledge reinforced their religious faith. According to Samuel Clarke, the Anglican Bishop who collaborated with Newton, natural philosophy was the new *ancilla theologiae*, since it fuelled a devout and respectful religious consciousness. Accordingly, the main task of science was to describe the material world God had created as precisely as possible; no active transformation was required, but only the full explanation of Divine creation. The Newtonian version of the design argument – as it was called, emphasising the Divine intelligence that the investigation of nature revealed – was defended by William Paley, whose *Natural Theology* (1802) was based on the image of the natural world as a watch:

> [whose] mechanism being observed (it requires indeed an examination of the instrument, and perhaps some previous knowledge of the subject, to perceive and understand it; but being once, as we have said, observed and understood), the inference, we think, is inevitable; that the watch must have a maker; that there must have existed, at some time and at some place or other, an artificer or artificers who formed it for the purpose which we find it actually to answer; who comprehended its construction, and designed its use.[5]

According to Paley, the aim of scientific examination was to define the functions assigned by God to each body; the natural philosophers' discovery of natural laws hence shed new light on, and confirmed, Divine benevolence and providence. Therefore, good scientists were not to be asked to apply their knowledge, as any change in the natural laws would have appeared impious and disrespectful. Davy was not an atheist, but he consciously proposed an unorthodox view of nature when he suggested that scientists should use their knowledge as masters and not as observers.

Victor's attitude to modern science appears much indebted to Davy. Even though he admitted that modern science "possessed much greater powers than the ancient, because the power of the latter were chimerical, while those of the former were real and practical" (41), he was dissatisfied with a science which could only "dissect, anatomise, and give names", aiming only to observe and classify nature. Moreover, he first gave up reading natural philosophy after having being taught about electricity:

> It seemed to me as if nothing would or could ever be known […] [I] set down natural history and all its progeny as a deformed and abortive creation, and entertained the greatest disdain for a would-be science which could never even step within the threshold of real knowledge. In this mood of mind I betook myself to the mathematics (43).

The entire natural philosophy, both ancient and modern theories, appears to Victor as ill-grounded and deceitful; this "mood of mind" changes only after he hears Waldman's lecture in Ingolstadt. Victor's sentiments are invigorated by Waldman's "panegyric of the new science", a declaration sounding akin to Davy's *Discourse*:

> [Modern philosophers] penetrate into the recesses of nature, and show how she works in her hiding-places. […] 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.[6]

Like Davy, Waldman is assigning to modern natural philosophers the tasks which alchemists wished to attain; moreover, he would later tell Victor that Paracelsus and Cornelius Agrippa were important sources for modern natural philosophers. Like Davy, Victor is attracted to natural powers (instead of natural laws) and he wishes to reach the hidden secrets instead of limiting himself to what is immediately visible. While Waldman's words sound remarkably similar to Davy's, they urge Victor "to return to [his] ancient study" (49), that is, alchemy: modern science becomes attractive and reliable only when associated with ancient and pre-scientific goals.

"Darwinism"

Even though Victor is a learned natural philosopher and his education reveals Shelley's extensive knowledge of contemporary science, very few explicit references to scientists can be found in *Frankenstein*. It is worth noting, then, that Erasmus Darwin (1731-1802) is mentioned in the introduction to both the first and the second edition, as the Doctor "who preserved a piece of vermicelli in a glass case, till, by some extraordinary means, it began to move with voluntary motion" (8). Darwin was an influential physician, a famous poet, and a notorious radical philosopher. His name on the first pages of the novel confirmed *Frankenstein*'s derivation from the radical milieu, but these allusions may also shed light on Shelley's notion of the body.

In fact, the creature's early life might seem quite problematical, as it behaves like any normal human child: it is scared of storms, of its own image reflected in water, and by its first emotions. Moreover, it learns a "native" language and it begins to read and write by observing the education imparted to a girl. The creature's reactions to, and progressive acquaintance with, the world are remarkably similar to the coeval accounts (especially A. Smith and J.-J. Rousseau's) of savages or untamed children living outside human society.

While they were mostly used to point out the reality of human nature, prior to any influence of society and education, they apply problematically to Victor's creature. In fact, it has no soul, whereas feeling, thinking, and learning are supposed to be at least partly due to an immaterial and immortal substance. Instead, the creature is created by giving life to organs collected from dead bodies; the "principle of life" is derived from a close study of alchemy and chemistry, that is, from the properties and powers of matter.

As Victor's creature thinks and feels, these "intellectual" faculties can derive only from its body: thinking and feeling are therefore assumed to be corporeal functions and powers of the material animal frame. This point was largely illustrated and eagerly defended by Erasmus Darwin. He performed a number of experiments in order to study the "principle of life": he analysed animal reproduction and the appearance of germs and micro-organisms (Shelley could have been alluding to one of these observations) to demonstrate that life is a material phenomenon in which the soul or any other immaterial substance has no role. He was familiar with Galvanism (mentioned twice in the 1831 edition of *Frankenstein*) and the discovery of electrical animal fluids in muscles and nerves, as Galvani's theory was popularised in Great Britain by Giovanni Aldini's public lectures. According to these, electricity is the most important animal function, as it provides the energy supporting vital functions, such as respiration, muscular motion or blood circulation.

While Darwin was no doubt acquainted with Galvanism, he enthusiastically supported John Brown's controversial medical theory. Both Brown and Darwin were former students of the University of Edinburgh and they both accepted the assumption that animal life depends on the soundness of nervous fluid, the soft matter that fills the nerves and through which the brain coordinates animal functions. Even though its existence had not been confirmed by anatomical observations, nervous fluid became the central point of eighteenth-century physiology, as it directed a number of different animal functions. It was supposed to be a matter with a continuous tendency to move; an insufficient quantity of it determined a state of weakness, while an excessive amount produced most mental diseases. As a matter of fact, the nature of nervous fluid and the forms of its motion were not clear and its definition could have included many physical phenomena, such as voluntary motion, nervous vibrations, chemical reactions as well as electricity. However, the nervous system was unequivocally thought of as the source of

animal life: rapid or slow motions of nervous fluid were supposed to produce vital functions, such as digestion, respiration, circulation of blood and lymph, muscular motion and, of course, perception and passions.

Brown and Darwin radicalised the functions of the nervous fluid and stressed the fact that it needed continuous stimulation in order to remain healthy: life was said to be a forced state, as it is a specific reaction of the nervous system to stimuli and requires the constant action of external bodies. While Brown described the effects of stimulants, in particular opium, on the nervous system, Darwin used nervous sensitiveness to explain superior functions, such as imitation and association of ideas. Like David Hartley (1705-1757) and Joseph Priestley (1733-1804) before him, he often referred to comparative anatomy to affirm that feeling and thinking grow more sophisticated as the nervous system becomes more complex. Moreover, animals are capable of simple forms of "thinking" – in fact they can be made to obey orders and can acquire habits – as these derive exclusively from nervous activity. From sensations and volitions, that is, motions stimulated by external objects or by the nervous fluid itself,

> all our emotions and passions seem to arise […] Pride, hope, joy, are the names of particular pleasures: shame, despair, sorrow, are the names of peculiar pains: and love, ambition, avarice, of particular desires: hatred, disgust, fear, anxiety, of particular aversions.[7]

Darwin was aware that he was giving a physical explanation of the operations of the mind and firmly excluded that intellectual operations could depend on an immaterial soul. All animal actions, including judging and reasoning, were described as a particular form of instinct, in which the reader should "not only include the natural desires of love and hunger, and the natural sensations of pain or pleasure, but the figure and contexture of the body, and the faculty of reason itself".[8]

Reason thus results from a combination of sensations and volition and does not imply any thinking power, but nervous activity only. This physiological account may explain why Victor says he has created "a sensitive and rational animal" (214), and he has given it the organs which enable thinking – nerves, brain and sensorial organs. Its early knowledge of the world consists in acquiring sensations and analysing them attentively. Attention is thus considered as the voluntary effort to direct the mind towards selected objects: "A strange multiplicity of sensations seized me, and I saw, felt, heard, and smelt at

the same time; and it was, indeed, a long time, before I learned to distinguish between the operations of my various senses" (105).

In these initial steps, the creature is not alone and therefore is not taught or assisted in its knowledge of the world; its faculties increasingly improve according to a natural and spontaneous tendency. Perhaps influenced by Condillac's notorious account of attention, Darwin himself spoke of ideas originally perceived in tribes, then separated and recognised as distinct.[9] While most authors affirmed that this was a common tendency of the mind, Darwin insisted that it derived from the laws of nervous activity, as a chain of impressions initially excites a general sensation of pain and pleasure, but distinct ideas can be gained when each of them is recognised as pleasant or painful.

The creature's acquaintance with the world is quite quick: by the end of winter, it has learned to distinguish "the insect from the herb, and by degrees, one herb from another" (106), to harness fire and to use it to cook food. Almost entirely self-taught, the creature begins to speak and write French and becomes so clever as to read important literary works such as *Paradise Lost* or *The Sorrows of Werther*. Walter Scott thought of the creature's *Bildung* as one of the less verisimilar parts of the novel. While the creature's easiness appears somewhat exaggerated, it may however be grounded in Darwin's physiology. In fact, Darwin emphasised the "plasticity" of the human mind, the fact that a few basic faculties of the nervous system can produce a number of "intellectual" activities:

> Hence the activity of this power of volition produces the great difference between the human and the brute creation. The ideas and the actions of brutes are almost perpetually employed about their present pleasures, or their present pains; and […] they seldom busy themselves about the means of procuring future bliss, or of avoiding future misery; so that the acquiring of languages, the making of tools, and labouring for money, which are all only the means to procure pleasures; and the praying to the Deity, as another means to procure happiness, are characteristic of human nature.[10]

The search for future happiness is far more common in humans than in animals, but it is performed through the ordinary sensations of pleasure, pain and ideas associated with them. Therefore it results from nervous activity and implies no additional faculty, such as truly mental powers. The creature is not interested in money and hardly prays to God, but its first ideas concern future comforts: it struggles to keep the fire burning, moves when it no longer finds food, asks Victor for a female mate in order to have a companion for its life. These are normal human reflections and deliberations but, according to

Darwin, they derive from the body and its power to associate nervous stimuli; therefore, even a creature made up of dead organs may develop intellectual faculties.

Conclusion

Although she was not a physician and received no formal education, Mary Shelley used the most recent scientific theories and assigned them a role in her novel. *Frankenstein*'s scientific connections have recently been discussed and *Frankenstein*'s scientific grounding has been variously explained and controversially interpreted: David Knight has affirmed that Victor Frankenstein was the most successful of Davy's pupils, while according to Desmond King-Hele, Shelley's novel was the most powerful popularisation of Darwin's medicine. But Davy and Darwin were very different characters and their positions usually diverge: Darwin was an atheist, supported radical ideas, and proposed a new medical theory; Davy had authentic religious sentiments, he had no role in radical politics, and devoted his efforts to chemistry. References to both of them may be explained by Shelley's general attitude: she was not interested in scientific controversy and did not aim at supporting or criticising either of them. On the contrary, she was describing the expectations that Darwin's and Davy's diverging theories had raised. Davy urged natural philosophers to *apply* their knowledge in order to improve human life and warmly encouraged them to modify the current human condition. Darwin was also concerned about the marvellous applications of science, but he based his hopes on an updated materialistic account of human life, according to which human health and happiness derive from a sound and well-managed body. Shelley blended these different issues in Victor Frankenstein's character: he is a bold young man, more eager to apply his knowledge than to discover and record unknown natural laws. Moreover, moulding a living, feeling, and thinking being out of dead matter, Victor followed a materialistic explanation, akin to Darwin's.

In 1840, William Whewell, Master of Trinity College, Cambridge, complained that medicine had sometimes been misapplied and interpreted as a proof of materialism:

> [Speculations] respecting the nervous fluid, proceeding from some of the greatest philosophers who ever lived, prove only that hitherto the endeavours to comprehend the mistery [sic] of perception and will, of life and thought, have been fruitless and vain. Many anatomical truths have been discovered, but, so far as our survey has yet gone, no genuine physiological principle. All the trains of physiological research which we have followed have begun in

> exact examination of organisation and function, and have ended in wide conjectures and arbitrary hypotheses.[11]

Whewell did not directly accuse (some) modern physiologists of materialism, but he was clear about any effort to physically explain mental functions such as perception, will and thought. Medicine, he thought, is the careful collection and description of facts relating to animal life; any other interpretation should produce unreliable and conjectural explanations. This was exactly the result achieved by physicians who focused on the "nervous fluids", and Erasmus Darwin was obviously one of them. They were guilty of misunderstanding science, as they extended a medical (unobserved) fact to mental phenomena. In these examples of "bad science" Victor Frankenstein could also be included: he was not only so bold as to create a living being, but he was also confident in producing feeling and thinking out of matter. This was a real example of *hubris*, as scientists should always keep in mind a sober dualistic view of man. While they enlarge human knowledge, they should be aware that mind and body are distinct and have no common properties or laws of behaviour. According to Whewell, any monistic interpretation of man is both fruitless for scientists and misleading for men.

For all these reasons, Frankenstein should have appeared to be a novel largely indebted to "radical science", even though Shelley can hardly be considered among its supporters. In fact, her position was mostly critical: Victor Frankenstein is successful in creating a living being, but his aspirations are frustrated and he is the cause of the destruction of his family. Shelley's critical approach to "radical science" appears to be remarkably different from Whewell's: for Shelley, it was sound and well-grounded knowledge, but she was suspicious about its impact on human behaviour and society. She perceived its challenges, which should not depend on a materialistic view of life, but on ethical issues, and was sensitive to the consequences of the new science for human relationships. While Shelley adopted an updated scientific vocabulary, she applied it to describe a case of failure of scientific ambitions and she warned about *human* reactions to unexpected situations. But these additional problems, arising from *Frankenstein*'s origins in "radical science", will no doubt require further work by future scholars.

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NOTES

[1] Mary Wollstonecraft Shelley, *Frankenstein or the Modern Prometheus,* ed. Mar ilyn Butler, Oxford: OUP, 1994, 230. Noted after simply as a page reference in brackets.

[2] Humphry Davy, "A Discourse introductory to a Course of Chemistry", in *The Collected Works of Sir Humphry Davy*, London: Smith, 1839, vol. II (313, 321).

[3] Ibid., 311.
[4] Ibid., 319.
[5] William Paley, Natural *Theology*, London: Faulder, 1802 (3-4).
[6] Humphry Davy, "A Discourse" (49).
[7] Erasmus Darwin, *Zoonomia, or The Laws of Organic Life*, Boston: Thomas and Andrews, 1809 (39).
[8] Ibid., 102.
[9] See ibid., 34-35.
[10] Ibid., 41.
[11] William Whewell, *History of Inductive Sciences,* New York: Appleton, 1875 (3rd edition), II, 467.