Fictions of science in Mary Shelley's *Frankenstein*

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In recent years, Mary Shelley's *Frankenstein* has often been described as the first science fiction novel.[1] Brian Aldiss, himself a writer of science fiction, amongst others identified *Frankenstein* as 'the Origin of the Species' of science fiction.[2] Such a description of course can only be true for a generation of readers who are comfortable with the expectations of science fiction, and Mary Shelley can have had no such expectations. However, in its representation of the creature's creation through the reanimation of disparate dead body parts, the novel is clearly about science. This essay, which focuses particularly on Shelley's representation of Victor's education as a man of science, and his subsequent experiment with the creature, demonstrates how the novel establishes distinct kinds of experimental investigation into the meaning of life, some associated with science, others with alchemy. Such concerns reflect Shelley's interest in the radical political culture of her time and the recent past. The novel negotiates the relations of dependence and disjunction between these concerns of science and politics in its language and plot. The form of the novel offers itself as a useful intellectual tool, allowing these disparate forms of thought to jostle up against each other, not in resolution but in colloquy. The novel form, and in particular the gothic mode adopted by Shelley, allows for the contradictions, confusions and errors of the science to be overlooked and underplayed, incorporated into the creative act of reading.

Over the last decade, *Frankenstein* criticism has been much interested in the status of Shelley's science. In 1990, for example, Maurice Hindle remarked that 'early-nineteenth century science had much more of an impact on the genesis and substance of *Frankenstein* than is normally noticed, or even allowed, by literary critics.'[3] Since that time some excellent work by scholars such as Marilyn Butler, Anne Mellor, and Samuel Vasbinder, has broadened our understanding of how

Shelley had an active interest in, and a sophisticated understanding of, some important scientific debates of her time on electricity and the origin of life, and how the novel might be said to take a part in those debates.[4] Other critics have determined that the novel's use of this scientific material is shallow or unconvincing. They notice that the creature is created by invoking both contemporary science and an older tradition of necromancy and alchemy.[5] This latter material is inimical to science (it will not conform to the rule of reason in that it has recourse to a supernatural world of spirits and essences). James Reiger argued that although 'Mary Shelley shared her husband's fascination with the natural sciences … it would be a mistake to call *Frankenstein* a pioneer work of science fiction', because her science is indistinctly represented and technologically improbable. 'In other words, she skips the science.'[6] There is reason to admit a more complex view here: firstly, the science itself is more coherent than many critics have allowed, and secondly, we might ask to what purpose Shelley invokes this central debate between science and magic. Without doubt, Shelley had taken a keen interest in her representation of the science in the composition and revision of the novel. Her diaries from 1816 record both her own reading of scientific work, and her enthusiastic commentary on the philosophical discussions at the Villa Diodati between herself and the poets Percy Bysshe Shelley (her husband-to-be) and Lord Byron, and Dr John Polidori, author of *The Vampyre* (1818). Subsequently, the substantial revisions to this material undertaken in the drafts of the novel, the first edition of 1818, and the heavily revised third edition of 1831, all point to her continued interest in getting the science right.[7]

Science as we know it today was in general not included in the common syllabus of education: or at least, English universities did not teach it. Instead it was taught largely by a process of emulation and repetition. In its philosophy, empirical science, with its practical experiments, was essentially autodidactic: each enquirer ought to be able to repeat each experiment, and so learn by eyewitness demonstration. The results and methods of these experiments, and the ideas they

generated, were disseminated through a culture of scientific enquiry: especially in print and in lecture demonstrations. Science did not only happen in scientific treatises and specialist journals, but also in general magazines and literary reviews, such as *The Edinburgh Review* and the *Quarterly Review*. Demonstrations were held not in academic environments, but in public locations, such as the upstairs rooms of coffee-houses or in specially constructed lecture halls. Humphry Davy, a man known to Mary Shelley in her childhood, oriented his public lectures to the Royal Institution in London to a fashionable audience: his demonstrations of his newly discovered gas, nitrous oxide or laughing gas, were particularly compelling.[8] The scientific was popular culture in a way that students of literature might now find surprising.

The education of a man of science

In the first chapter of his own narration, Victor Frankenstein regards his engagement with science as the 'genius that has regulated his fate'—although tellingly, he does not describe it as 'science', but 'Natural philosophy', the term used in the eighteenth century to describe both the physical sciences such as chemistry and physics and also the life sciences, biology and zoology. This distinction is not a slight one, for in the details of Victor Frankenstein's education as a 'man of science', and in his most famous experiment, the novel proposes a kind of argument about the nature of science. As a boy, untutored but enthusiastic, Victor is an alchemist, but as he is educated, he seems to leave off alchemy, as a childish delusion, and to take up enlightenment science—chemistry and anatomy especially. As we trace this move, we see the history of the scientific revolution, and the Enlightenment, being played out in miniature.[9]

The rejection of the supernatural and magic was central to contemporary claims that the period was an enlightened age, an age of Reason. The scientist and poet Erasmus Darwin, in his

Zoonomia; or, the laws of Organic Life (1801), was scathing in his rejection of the supernatural:

> In this age of reason, it is not the opinions of others, but the natural phænomena, on which those opinions are founded, which deserve to be canvassed. And with the supposed existence of ghosts or apparitions, witchcraft, vampyrism, astrology, animal magnetism, and American tractors, such theories as the above must vanish like the scenery of a dream; as they consist of such combinations of ideas, as have no prototype or correspondent combinations of material objects existing in nature.[10]

As Darwin suggests, Victor Frankenstein's creature exists only in the imagination: it is a work of fiction formed by a 'combination of ideas' that has no material object in nature.

Frankenstein's first engagement with natural philosophy is by chance: on a rainy day in a hotel near the mineral baths at Thonon, on the shores of Lake Geneva, in France, he idly picks up a book—a 'volume of the works of Cornelius Agrippa', a German alchemist of the sixteenth century. Although he opened this book with apathy, he reports that his feeling was soon changed into enthusiasm by the theory Agrippa attempts to demonstrate. Victor describes his engagement with Agrippa (Heinrich Cornelius Agrippa of Nettesheim (1486?-1535)) as a kind of enlightenment: 'A new light seemed to dawn upon my mind' (1818, I, i, p. 22). It is not clear which work is in question, but Agrippa was long out of print, and it might be best to think of little Victor reading a dusty old tome, as obscure in print as it is in thought. When Victor relates his exciting discovery to his instructor, his father, he replies 'Ah! Cornelius Agrippa! My dear Victor, do not waste your time upon this; it is sad trash.' (1818, I, i, p. 23) With hindsight, Victor the narrator (older and wiser) is able to contextualise this painful rebuff: remarking that Agrippa's views had been 'exploded' as chimerical, which is to say, fanciful and inaccurate. Instead they had been replaced by the 'real and practical' knowledge of 'a modern system of science'. Nonetheless, Victor remarks that Agrippa warmed his imagination (excited his passion and intellect), and as such, perhaps, 'the train of my ideas …

received the fatal impulse that led to my ruin'. Disobeying his father, Victor continued to read avidly in the works of alchemists when he returned home to Geneva, adding the works of Paracelsus and Albertus Magnus to those of Agrippa.

Victor's tuition in alchemical thought remains autodidactic: there is no-one to teach him but his own reading. 'I read and studied the wild fancies of these writers with delight; they appeared to me treasures known to few beside myself.' Indeed, despite recognising the power of 'these secret stores of knowledge', young Victor keeps his reading secret from his father, whose censure he fears, even as he 'disclosed his discoveries' to his cousin Elizabeth, 'under a promise of strict secresy'. The knowledge that Victor learns from the alchemists is secret, and must itself be kept secret. In this way, it is unlike the enlightenment knowledge of the modern system of science, which is publicly manifested in experiment and must be made public to become knowledge.

Victor declares that he has become a 'disciple' of Albertus Magnus (1026?-1280), a Dominican friar and master of alchemy. 'He was a famous *Magician*, and that he had formed a machine in the shape of a man, which served him as an oracle, and explained all the difficulties he proposed to it.'[11] Like Albertus, Victor 'entered with the greatest diligence into the search of the philosopher's stone and the elixir of life. But the latter obtained my most undivided attention: wealth was an inferior object; but what glory would attend the discovery, if I could banish disease from the human frame, and render man invulnerable to any but a violent death!' (1818, I, i, p. 23) In the period the novel was written, alchemy did not enjoy a high status amongst professional men of science, and neither did it enjoy a solid reputation amongst informed amateurs, although there were some apologists for alchemy. The antiquarian Francis Barrett published a compilation of Agrippa's thought in 1801 under the title *The Magus, or Celestial Intelligencer*; offering what he called 'a complete system of Occult Philosophy' by supplementing Agrippa's material with cabalistic speculation, numerology, and hermetic philosophy, as

well as more recent speculations on magnetism, and with biographies of the eminent alchemists (including Albertus Magnus, Paracelsus and Agrippa). Nonetheless, alchemy was more generally a fugitive discipline in the opening decades of the nineteenth century. The fourth edition of the *Encyclopaedia Britannica* of 1810 defined alchemy as

> that branch of chemistry which had for its principal objects the transmutation of metals into gold; the panacea, or universal remedy; an alkahest or universal menstruum; an universal ferment; and many other things equally ridiculous.[12]

The alchemist here is a kind of con-man or quack, perpetrating artifice and imposture on a gullible public. The alchemist was by 1810 only a short step from the showman conjurer, spinning wonders at the fair—a point of view that Victor's father appears to share. But the alchemists had a more reputable past too, as the fore-runners of modern chemistry.

Before the emergence of the new science in the seventeenth century, alchemy was one of the places where science, or natural philosophy, was carried out. Agrippa himself defended his 'natural magic' as a variety of natural philosophy:

> Natural Magick is taken to be nothing else, but the chief power of all the natural Sciences; which therefore they call the top and perfection of Natural Philosophy, and which is indeed the active part of the same; which by the assistance of natural force and faculties, through their mutual and opportune application, performs those things that are above Human Reason.[13]

As Agrippa says, both 'Alchymy, or Chymistry, is an Art.'[14] In Agrippa's work, there is material that appears to us obviously as magic: astrology, alchemy, mystical number symbolism, geomancy, incantations and rituals using pentangles. But there is also much of what the eighteenth century knew as natural philosophy, and which we recognise as the forebears of science: on physical properties of the elements (chemistry), on treatments for diseases (medicine), on the disposition of the stars (astronomy). This mixture, which appears to be

contradictory and therefore unstable, is presented as a unified theory of the world: indeed, defenders argued that it is its inclusiveness and comprehensiveness that gives it its power. But such theory was attacked in the works of materialist and mechanistic empiricists such as Newton and Copernicus, and gradually the magical elements of this philosophy were dissolved. The orthodoxy which replaced the natural magic was what later became known as the enlightenment: a materialist and pantheist philosophy of nature. Enlightenment science was clearly a refutation of the occult philosophy of the magicians, but it was also only possible because of their work. Francis Bacon (1561-1626) was well versed in the Hermetic tradition of the magicians, and yet he did important work in mathematics and mechanical philosophy. Furthermore as Margaret Jacobs has argued, there was a residual interest in magic throughout the so-called enlightenment, a 'blending of science and mysticism' sustained by the very same people who did so much to spread the innovations of the scientific revolution.[15]

Victor's turn to modern science

However, Victor relates that his own experience in 'the raising of ghosts and devils' (1818, I, i, p. 24) was always unsuccessful, despite his favourite authors' promise of such events. Indeed, it is this failure, and the alchemists' ignorance of certain physical processes (distillation and 'the wonderful effects of steam') that leads him to become disillusioned with alchemy. Instead, it is the new science—or the 'science of natural philosophy' as he himself calls it—that attracts his attention: first the demonstration of the vacuum by use of an air pump (an experiment which proved that air was matter), and secondly, the vivid lesson accorded by the effects of lightening on a tree outside the family house in Belrive. Victor's discovery of electricity—as explained to him by his father—was the 'last stroke which completed the overthrow of Cornelius Agrippa, Albertus Magnus, and Paracelsus'. However when Victor, at his father's urging, attends a series of lectures on natural philosophy, he finds them dull and incomprehensible: the

professor's account of 'potassium and boron, of sulphates and oxyds' is too abstract, and Victor loses interest (1818, I, i, p. 25). Modern scientific chemistry, then, having become a specialised discipline, offers no scope for the imagination, and young Victor forgoes its pleasures.

This indifference to the new science changes upon his entry to university. Aged seventeen, Victor becomes a student in the University of Ingolstadt, on the River Danube, near Munich. The death of his mother delays his departure for university, but also formed his course of study. Stricken by grief, Victor's thoughts return once more to the nature of life, or rather, to 'that most irreparable evil, the void that presents itself to the soul' occasioned by death (1818, I, ii, p. 27). Ingolstadt is an interesting choice of university. While science in England and France predominantly occurred outside the universities, in public lecture halls and private laboratories, in Germany and Italy, the universities were at the forefront of scientific endeavour. The university, founded in 1472, was purportedly the *alma mater* of Faustus, a wanderer and vagabond who practised necromancy and alchemy in the early sixteenth century in association with Agrippa. This legendary Faustus was the prototype for the magician depicted in works by Marlowe and Goethe, who sold his soul to the devil in exchange for knowledge and power. By 1816 when the novel was written, the University of Ingolstadt was an imaginary and even mythic place itself: it had relocated to Landshut in 1800, and to Munich in 1826. The myth with which it was often associated in these years was with a secret society known as the Illuminati, founded in 1776 by Adam Weishaupt, a professor of canon law at Ingolstadt. The Illuminati were dedicated to the liberal reform of their society, and to the rationalist ideals of the enlightenment. However, in the face of official repression by the conservative elector Karl Theodor, they adopted both the cloak of secrecy, and an institutional structure derived from the alchemists, by way of the Freemasons. Their name, the Illuminati, refers to their self-conception as the enlightened ones.

Victor's 'contempt' for 'the uses of modern natural philosophy' survives his tuition at Ingolstadt (1818, I, ii, p. 29). While he learns much about recent techniques, such as the voltaic pile and galvanism, he is scornful of these scientists' lack of ambition. His education in enlightenment science is undertaken by two quite different teachers. He has little respect for the first, Monsieur Krempe, who is disparagingly described as 'a little squat man, with a gruff voice, and repulsive countenance' (1818, I, ii, p. 29). At Victor's first interview with university science, Krempe pours scorn on his alchemical research, which he declares is 'nonsense'. 'Every instant that you have wasted on those books is utterly and entirely lost. You have burdened your memory with exploded systems, and useless names. […] I little expected in this enlightened age to find a disciple of Albertus Magnus and Paracelsus' (1818, I, ii, p. 29). It is interesting here that Victor, when called upon to declare what he has already learnt at home, offers his knowledge of the alchemists, even though his father's demonstration of electricity had supposedly caused him to reject their influence.

The bathetic and ridiculous portrait of the man of science offered by Monsieur Krempe—ugly, dull and dismissive—is juxtaposed to the alchemists, whom Victor calls 'the masters of science', and whom he commends for their visions of 'immortality and power', given to views that 'although futile, were grand' (1818, I, ii, p. 29). (Here the reader should not forget that the narrative, recounted in hindsight by Victor, is filtered through the beliefs he holds after his successful creation of the creature, when he sees the dangers, as well as glory, of his endeavour). But while Victor refuses to go to the lectures of 'that little conceited figure', Monsieur Krempe, he is drawn by curiosity and idleness to the lecturing room of Monsieur Waldman. He is an altogether more attractive figure:

> He appeared about fifty years of age, but with an aspect expressive of the greatest benevolence; a few grey hairs covered his temples, but those at the back of his head were nearly black. His person was short, but remarkably erect; and his voice the sweetest I had ever heard. (1818, I, ii, p. 30)

Waldman's insight and kindness mark him as a man of vision, the 'scientist-as-hero', to use Tess Cosslett's phrase, who appealed to those notions of genius favoured by the Romantic poets.[16] Waldman's attitude to Victor's alchemical heritage is more forgiving, as Waldman sees their work as a seamless continuum with modern practitioners of the discipline of chemistry.

> 'The ancient teachers of this science,' said he, 'promised impossibilities, and performed nothing. The modern masters promise very little; they know that metals cannot be transmuted, and that the elixir of life is a chimera. But these philosophers, whose hands seem only made to dabble in dirt, and their eyes to pore over the microscope or crucible, have indeed performed miracles. They penetrate into the recesses of nature, and show how she works in her hiding places. They ascend into the heavens: they have discovered how the blood circulates, and the nature of the air we breathe. 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.' (1818, I, ii, pp. 30-31)

Victor Frankenstein finds here an enquiry compatible with his own quest. Waldman's dignified treatment of the alchemists, delivered 'without presumption or affectation', excites Victor's admiration. Agrippa and Paracelsus, he says, 'were men to whose indefatigable zeal modern philosophers were indebted for most of the foundation of their knowledge' (1818, I, ii, p. 31). But when Victor becomes a disciple of Waldman's chemistry, an apprentice of his laboratory, he is also encouraged by Waldman to pursue 'every branch of natural philosophy' (1818, I, ii, p. 31).

Waldman is an important figure in Victor's science, then. Yet he is an unusual 'man of science', a generalist in a period of increasing specialisation, an historian of science in a period consumed by a desire for the new and the innovative. Indeed in the 1831 edition, Waldman's influence over Victor has something almost preternatural about it, as if Waldman

possessed the powers of the magus himself: his words appeared to Victor as 'the words of fate, enounced to destroy me', at whose sound, Victor says, 'I felt as if my soul were grappling with a palpable enemy; one by one the various keys were touched which formed the mechanism of my being: chord after chord was sounded, and soon my mind was filled with one thought, one conception, one purpose' (1831, iii, p. 48). Under Waldman's influence, Victor becomes a model student, applying himself with avidity to his studies, improving rapidly. 'My ardour was indeed the astonishment of the students; and my proficiency, that of the masters.' Victor's studies are still marked by passion and imagination (not the purposeful, systematic dullness of rationality), and indeed he relates that Professor Krempe often asked him, 'with a sly smile' how his studies of 'Cornelius Agrippa went on?' (1818, I, iii, p. 32)

It is clear, then, that Victor has not abandoned alchemy or magic, but has supplemented it. The 'elixir of life' is not forgotten, but is now pursued by another route, that of modern scientific chemistry and physiology. His studies, he comments, take him beyond the limits of agreed knowledge, and this thirst for discovery lures him on. 'None but those who have experienced them can conceive of the enticements of science. In other studies you go as far as others have gone before you, and there is nothing more to know; but in a scientific pursuit there is continual food for discovery and wonder' (1818, I, iii, p. 33). Indeed, it is at this stage, 'animated by an almost supernatural enthusiasm', that Victor's enquiry takes on a new dimension. His enquiry now expands to tackle the 'bold' question: 'Whence … did the principle of life proceed?', which he begins to approach through the 'science of anatomy'. 'To examine the causes of life, we must first have recourse to death. I became acquainted with the science of anatomy: but this was not sufficient; I must also observe the natural decay and corruption of the human body' (1818, I, iii, p. 33). Victor's study of life begins with what might seem a perverse step, an examination of death, corruption and putrefaction. Yet this was a rhetorical, and pedagogical, move made by many contemporary physiologists. The writings of John Hunter, John Abernethy and

William Lawrence, for example, all begin their analysis of the nature of life by comparing the properties of live matter to that which is dead. The distinguished surgeon and anatomist John Hunter, in his lectures in 1787, argued that the 'simple idea of life' is 'the principle of self-preservation, preventing matter from falling into dissolution', and 'preserving it from putrefaction'.[17] William Lawrence argued in his lecture 'On Life', delivered the Royal College of Surgeons in London in 1816 that 'The matter that surrounds us is divided into two great classes, living and dead.'[18]

In pursuing the origins of life amongst the manifestations of death, Victor has recourse to graveyards and charnel houses (repositories of bones). The scene of his science shifts from Waldman's university laboratory to the church yard, and from day to night. His father's education has taught him not to be afraid of these abodes of horror, and we may picture him as the grave-robbing anatomist, fearlessly fossicking amongst recently putrefying corpses of the recently buried.[19] 'I saw how the fine form of man was degraded and wasted; I beheld the corruption of death succeed to the blooming cheek of life; I saw how the worm inherited the wonders of the eye and brain' (1818, I, iii, pp. 33-34). In this way, Victor seems to be turning away from enlightenment science, which valued the kinds of open and public knowledge that could be demonstrated and verified by the lecture and experiment in public demonstrations. In Victor's graveyard laboratory, experiment is undertaken at night, out of sight and in secret. But although Victor walks on the dark side of science, he continues to experience enlightenment.

> I paused, examining and analysing all the minutia of causation, as exemplified in the change from life to death, and death to life, until from the midst of this darkness a sudden light broke in upon me—a light so brilliant and wondrous, yet so simple, that while I became dizzy with the immensity of the prospect which it illustrated, I was surprised, that among so many men of genius who had directed their inquiries towards the same science, that I alone should be reserved to discover so astonishing a secret. (1818, I, iii, p. 34)

The language of enlightenment here associates Victor's breakthrough with the discourse of modern science. It was, nonetheless, a work of labour and toil as it did not open 'upon me at once … like a magic scene' (a reference to the sudden appearance of an image in a magic lantern or slide show, rather than the work of a magician).

His discovery is, however, not scientific in its nature, as it remains a secret. Scientific knowledge, as had been the case from the seventeenth century, was knowledge that was verifiable in public. 'Free and open communication of research is regarded as … a major component of the ethos governing science.'[20] Knowledge that is not shared is not science. But Victor's discovery is secret, and is a secret. Indeed, in his later explanations, he celebrates how his discovery remains a secret even to him. The experiments which he has undertaken are shown only by their result, not in practical or technical demonstration, even though 'the stages of the discovery were distinct and probable'. The discovery is however, whole and indivisible. 'This discovery was so great and overwhelming that all the steps by which I had been progressively led to it were obliterated, and I beheld only the result' (1818, I, iii, p. 34). The balance of evidence here reveals that this discovery is alchemical.

The nature of Victor Frankenstein's discovery

The nature of Victor Frankenstein's discovery is such that those who understand it might be derided as mad. It might, he says, have been produced by 'some miracle.' Victor had, he says with some clarity, 'succeeded in discovering the cause of generation and life; nay, more, I became myself capable of bestowing animation upon lifeless matter' (1818, I, iii, p. 34). The clarity of this description is not supported by the rest of Victor's narration, which clothes the breakthrough in obscurity, as indeed it is necessary to do, because it is a secret.

Stepping out of the frame of the narration, Victor addresses his auditor, 'my friend', who is both Walton and the reader, to explain why it must remain a secret.

> I see by your eagerness, and the wonder and hope which your eyes express, my friend, that you expect to be informed of the secret with which I am acquainted; that cannot be: listen patiently until the end of my story, and you will easily perceive why I am reserved upon that subject. (1818, I, iii, p. 35)

The only public demonstration of the research will be the one experiment, the creation of the creature. No other researchers may follow Victor, he says, because his experience has shown that the power he now possessed was too great for the mere human scientist to bear. The public knowledge demonstrated by his discoveries is not scientific but moral and political. Victor commands: 'Learn from me, if not by my precepts, at least by my example, how dangerous is the acquirement of knowledge'.

The only way to establish the truth of his research according to the public standards of science is to behold the results. The rest of the novel, then, functions as a record of that experiment, through to its final conclusions. *Frankenstein* is the *Philosophical Transactions*, a scientific paper gone to seed. Armed with the 'astonishing … power' of 'bestowing animation' or life, Victor sets about 'the creation of a human being', the accomplishment of which would be the sublime expression of his sublime mastery. 'My imagination was too much exalted by my first success to permit me to doubt of my ability to give life to an animal as complex and wonderful as man.' So that the work might proceed more quickly, he settles upon one of 'gigantic stature, that is to say about eight feet in height, and proportionably large' (1818, I, iii, p. 36). The work is arduous, but the reward is great.

> No one can conceive the variety of feelings which bore me onwards, like a hurricane, in the first enthusiasm of success. 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. No father could claim

> the gratitude of his child so completely as I should deserve theirs. (1818, I, iii, p. 36)

Victor remains in search of the secret, and his search remains itself secret. He says that he 'pursued nature to her hiding places', and 'disturbed… the tremendous secrets of the human frame.' In addition, he complains of the 'horrors of my secret toil' and explains how he kept his laboratory, his 'workshop of filthy creation' hidden 'in a solitary chamber, or rather cell, at the top of the house' (1818, I, iii, p. 36). In the pursuit of this knowledge, he neglects the passing of time and the seasons, and even forgets his precious family.

The creation scene itself, at the beginning of chapter four in the 1818 edition, was the first section Shelley composed. The pathetic fallacy of the opening lines—'on a dreary night of November'—now seems banal and overdetermined. But the scene summarises this ambivalent encoding of alchemy and science. 'With an anxiety that almost amounted to agony, I collected the instruments of life around me, that I might infuse a spark of being into the lifeless thing that lay at my feet' (1818, I, iv, p. 38). Marilyn Butler has astutely suggested that this implies the presence of scientific apparatus. Referring to the research on electricity in the animal nervous system conducted by Luigi Galvani (1737-98), her suggestion is that the 'spark of life' that is here infused is electrical in nature. 'Frankenstein may have calculated he needed a gigantic Voltaic battery'.[21] The term 'instrument' is indeed used in a similar fashion earlier in the novel (1818, I, iii, p. 33), but Waldman also describes the alchemists as 'instruments' of research (1818, I, ii, p. 31). Victor's procedure also calls to mind the vitalist theories of contemporary physiologists such as the anatomist John Abernethy, who argued in 1814 that life was an effect of 'a subtile, active, vital principle, pervading all nature […], and denominated the *Anima Mundi*.'[22] But as well as this medical science, the scene continues to recall the alchemical. The theatrical location suggests the gothic, both in its midnight hour, the inclement weather and his isolated garret. That he is alone and without witnesses testifies that this is not a scientific

demonstration. Other aspects of the scene reflect an alchemical discourse too. Victor says that the 'spark of being' is infused into the 'lifeless' material. Infusion is a process known to modern chemistry, but it has an alchemical archaeology. The term 'infuse' here suggests that he pours in a liquid, or steeps the material in a soluble solution, suggesting the presence of the *alkahest*, or universal solvent, which could initiate alchemical transmutations.

Secrecy and subversion

Alchemical research was secret, not merely in response to official persecution, but because it was a kind of knowledge which could only be revealed to the initiated (a version of this is maintained to this day in the Hippocratic oath pledged by medical doctors). It is in this sense that we should pay attention to Victor Frankenstein's secret researches. Although much more pronounced in the third edition of 1831, where he talks of his desire to 'divine' the 'secrets of nature' (1831, ii, p. 37), Victor announces in the first edition that to him 'The world was … a secret, which I desired to discover' (1818, I, i, p. 21). Victor's notorious secrecy, and the secret knowledge to which he aspires (the two are not the same), recapitulate the characteristic esotericism of pre-modern natural philosophy. This secrecy is moreover pervasive in the novel: as many readers note, ambiguity and a lack of clarity about key points is the novel's signature tone. Victor's secret, the secrets of nature, is kept secret throughout the book. We don't know how he does it. In this way, the novel itself functions as an alchemical structure: it replicates the secretive form and content of alchemical researches.

Of course, in one sense, the novel does reveal its secret. The creature, the successful production of Victor's secret arts, is the practical demonstration of the success of his experiment. This is underlined when it becomes apparent later that he is capable of repeating it (the experiment succeeded because he understood the principle of the origin of life, not through serendipity or

chance). The second volume of the novel, narrated by the creature itself, demonstrates the extent of Victor's success, and also of course his failure. The creature's performance in these chapters suggests how Shelley argued one might debate this question of alchemy's secret knowledge through an example. The creature's account of his education, his attempts at socialisation, and his unwitting rebuff by the De Laceys (who are so blinded by petty social conditioning that they cannot see his natural humanity), make the creature (the Monster) an eloquent emblem for natural man, for the emancipated slave, for the working class.

This narrative, if we accept it, suggests that the novel does place some redemptive power in the forces of alchemy. If the new science of electrical chemistry represents the forces of modernity in the novel, and shows it to be only a partial (or indeed no) answer, the novel's curious faith in the redemptive force of deep history is not merely perverse gothicism. To answer this conundrum, we need to recognise the disruptive, transgressive and subversive appeal of the secret power of alchemical organisations in this period. Throughout the eighteenth century, in resistance to enlightenment and the tyranny of rationalism, the discourse of the alchemical was entertained by radical underground groups like the Rosicrucians, the Freemasons and the Illuminati. Georg Simmel suggests that reformist groups have a structural relation with secrecy: both reformers and secret societies propose an alternative version of the truth or of social conditions. 'Secrecy secures … the possibility of a second world alongside the obvious world, and the latter is most strenuously affected by the former.' As such, secret societies enter into combination with treason and subversion: 'the secret society, purely on the ground of its secrecy, appears dangerously related to conspiracy against existing powers'.[23] In the 1790s, conservative analysts identified the secret societies of the enlightenment as having a pivotal influence on the course of the French Revolution: according to conspiracy theorists such as John Robinson or the French emigré Augustin Barruel, their intellectual subversion had weakened the ancient regime to the extent that it fell prey to

their cabbalistic subversions.[24] The Illuminati were the paradigmatic example of the fertilisation of radical politics by the alchemical culture of secrecy. They were, in short, political magicians, necromancers of revolution. The Illuminati, of course, do not figure in the book, and in the period in which *Frankenstein* was written, the radicals had been reduced to a raggle-taggle rump of secret underground conspirators. Nonetheless, the novel's concern with the secret workings of underground figures like Victor, and the persecutions of his creation, suggest an enigmatic engagement with radical politics.

[1] Mary Shelley, *Frankenstein: or the Modern Prometheus. The 1818 Text*, ed. Marilyn Butler (Oxford: OUP World's Classics, 1994). This edition is used throughout, abbreviated in the text (1818, III, p. 43), referring to the first 1818 edition, followed by the volume, chapter and page number.

[2] Brian W. Aldiss, *Trillion Year Spree: the history of science fiction* (London: Victor Gollancz, 1986), pp. 36-52.

[3] Maurice Hindle, 'Vital matters: Mary Shelley's *Frankenstein* and Romantic science', *Critical Survey*, 2: 1 (1990), pp. 29-35, p. 29.

[4] Anne K. Mellor, 'A Feminist Critique of Science', in *Mary Shelley: her life, her fiction, her monsters* (London: Routledge, 1988), pp. 89-114; Marilyn Butler, 'Introduction', in Butler (ed.), *Frankenstein*, pp. [ix]-li.; and Samuel H. Vasbinder, *Scientific Attitudes in Mary Shelley's Frankenstein* (Ann Arbor, Mich.: UMI Research Press, 1976).

[5] Crosbie Smith, 'Frankenstein and natural magic' in *Frankenstein, Creation and Monstrosity*, ed. Stephen Bann (London: Reaktion Books, 1994), pp. 39-59.

[6] Mary Wollstonecraft Shelley, *Frankenstein, or the Modern Prometheus (The 1818 Text)*, ed. James Reiger (Indianapolis and New York: The Bobbs-Merrill Company, 1974), p. xxvii.

[7] The 1831 edition is widely reprinted. The edition preferred here is Mary Shelley, *Frankenstein, or the Modern Prometheus*, ed. M.K. Joseph (Oxford: Oxford University Press, 1969), hereafter abbreviated in the text as (1831, ii, p. 40), referring to chapter and page number.

[8] Jan Golinski, 'Humphry Davy: the public face of genius', in *Science as Public Culture: Chemistry and Enlightenment in Britain,*

1760-1820 (Cambridge: Cambridge University Press, 1992), pp. 188-235.

[9] See Dorinda Outram, *The Enlightenment* (Cambridge: Cambridge University Press, 1995).

[10] Erasmus Darwin, *Zoonomia; or, the laws of Organic Life*, 3rd ed., 4 vols. (London: J. Johnson, 1801), II, p. 63.

[11] Francis Barrett, *The Magus, or Celestial Intelligencer; being a complete system of Occult Philosophy* (London: Lackington, Allen and Co., 1801), p. 180.

[12] *Encyclopaedia Britannica; or, a Dictionary of Arts, Sciences, and Miscellaneous Literature*, 4th ed., 20 vols. (Edinburgh: Archibald Constable and Company; London: Vernor, Hood and Sharpe, 1810), vol. 1, p. 570.

[13] Henry Cornelius Agrippa, *The Vanity of the Arts and Sciences*, (London: R. Everingham for R. Bentley, and D. Brown, 1694), p. 110.

[14] Agrippa, *Vanity*, p. 312.

[15] Margaret Jacob, *The Radical Enlightenment: Pantheists, Freemasons and Republicans* (London: George Allen & Unwin, 1981), p. 35.

[16] Tess Cosslett, *The 'Scientific Movement' and Victorian Literature* (Brighton: Harvester, 1982), pp. 6-7.

[17] John Hunter, *Lectures on the Principles of Surgery*, in *The Works of John Hunter, F.R.S., with notes*, ed. James F. Palmer, 4 vols bound as two (London: Longman, Rees, Orme, Brown, Green, and Longman, 1835), I, pp. 199-643, p. 223, 225.

[18] William Lawrence, *An Introduction to Comparative Anatomy and Physiology* (London: J. Callow, 1816), p. 121.

[19] See Tim Marshall, *Murdering to Dissect: Grave-robbing, Frankenstein and the anatomy literature* (Manchester: Manchester University Press, 1995).

[20] William Eamon, 'From the secrets of nature to public knowledge', in David C. Lindberg and Robert S. Westman, eds, *Reappraisals of the Scientific Revolution* (Cambridge: Cambridge University Press, 1990), pp. 333-65, p. 333.

[21] Butler (ed.), *Frankenstein*, p. 255n.

[22] John Abernethy, *An Enquiry into the Probability and Rationality of Mr. Hunter's Theory of Life* (London: Longman, Hurst, Rees, Orme and Brown, 1814), p. 52.

[23] Georg Simmel, 'The Sociology of Secrecy and of Secret Societies', trans. Albion Small, *The American Journal of Sociology*, XI, 4, (1906), pp. 441-98, p. 462, 498.

[24] John Robison, *Proofs of a Conspiracy Against all the religions and governments of Europe, carried on in the secret meetings of Free Masons, Illuminati, and Reading Societies* (London: T. Cadell and W. Davies, 1797); Abbé Augustin Barruel, *Memoirs, illustrating the history of Jacobinism*, trans. Robert Clifford, 4 vols. (London: for the author by T. Burton, 1797-98).

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