ORIGINAL ARTICLE

Can Mary Shelley's *Frankenstein* be read as an early research ethics text?

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The current, popular view of the novel *Frankenstein* is that it describes the horrors consequent upon scientific experimentation; the pursuit of science leading inevitably to tragedy. In reality the importance of the book is far from this. Although the evil and tragedy resulting from one medical experiment are its theme, a critical and fair reading finds a more balanced view that includes science's potential to improve the human condition and reasons why such an experiment went awry. The author argues that *Frankenstein* is an early and balanced text on the ethics of research upon human subjects and that it provides insights that are as valid today as when the novel was written. As a narrative it provides a gripping story that merits careful analysis by those involved in medical research and its ethical review, and it is more enjoyable than many current textbooks! To support this thesis, the author will place the book in historical, scientific context, analyse it for lessons relevant to those involved in research ethics today, and then draw conclusions.

Mary Shelley conceived the idea for and started writing *Frankenstein* in 1816 and it was first published in 1818.[1] In its historical context, the earlier 17th and 18th centuries had seen the early signs of the rise of science and experimentation. Francis Bacon (1561–1626) had laid the theoretical foundations in his "Great Insauration"[2] and scientists such as Boyle, Newton, and Hooke developed the experimental methods. Sir Robert Talbor, a 17th century apothecary and one of the key figures in developing the use of quinine to treat fevers, underlined this: "the most plausible reasons unless backed by some demonstrable experiments seem but suppositions or conjectures".[3]

The 18th century saw the continued construction of foundations upon which all subsequent medical experimentation has been built. Lady Mary Montagu promoted smallpox vaccination; its proponents experimented on prisoners to study its efficacy, and James Jurin, the secretary of the Royal Society, developed mathematical proof of this in the face of ecclesiastical opposition.[4] Many of the modern concepts of therapeutic trials were described although not widely accepted. Empirical observation through experimentation was starting to be recognised as the tool that allowed ascertainment of fact and truth. An account of Dr Bianchini's experiments on "Le Medicin Electrique", reported to the Royal Society explains that "The experiments were made by Dr Bianchini assisted by several curious and learned men … who not being able to separate what was true … determined to be guided by their own experiments and it was by this most troublesome though of all the others the most sure way, that they have learned to reject a great number of what have been published as facts."[5]

Similarly, Henry Baker's report to the Royal Society, describing Abbe Nollet's experiments, outlined the need for comparative studies and that "treatment should not be condemned without a fair trial"[6] and a Belgian doctor, Professor Lambergen, describing the use of deadly nightshade for the treatment of breast cancer wrote "Administration of this plant certainly merits the attention of the medical profession; and surely one may add entitles the medicine to future trials … nevertheless the most efficacious medicines are such if its efficacy by repeated trials be approved."[7]

In the mid 18th century James Lind conducted the first controlled trial to establish a cure for scurvy and his *Treatise on the Scurvy* contains what could be seen in modern terminology as the first "review of the current literature" prior to a clinical trial.[8]

Mary Shelley certainly knew of experiments with electricity ("galvanism"), probably through her parents, whose acquaintances included many experimentalists and her husband who had himself conducted his own experiments.[9] Her introduction to the 1831 edition gives support: "perhaps a corpse would be re-animated; galvanism had given token of such things … perhaps the components parts of a creature might be manufactured … and endued with vital warmth" (p 8).

Her motives for writing *Frankenstein* are more difficult to define. In her introduction to the 1831 edition she writes that she wanted her work to

> … speak to the mysterious fears of our nature and awaken thrilling horror—one to make the reader dread to look round. If I did not

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Abbreviations: GAfREC, Governance Arrangements for Research Ethics Committees; IRB, institutional review board; REC, research ethics committee.

Page numbers after quotations in the novel are those in the Penguin Classic edition.

> accomplish these things, my ghost story would be unworthy of its name … (p 7, 8)

This is supported by the events around the creation of the story in Geneva.[10] During their stay, Lord Byron had, one evening, challenged his companions Percy Shelley, James Polito, and Mary Shelley to create and relate a ghost story.

In addition to this desire to instil fear, she also seemed to want to write a cautionary tale, warning of the consequences of creating human life:

> … frightful would be the effect of any human endeavour to mock the stupendous mechanism of the creator … (p 9)

The 1818 preface, written by Percy Bysshe Shelley, indicates a deeper purpose. He wrote that the story recommends itself as it ''…affords a point of view on the imagination for the delineating of human passions more comprehensive and commanding than any which the ordinary relations of existing events can yield…'' (p 11) and that ''…I am by no means indifferent to the manner in which ... moral tendencies (that) exist in the sentiments of characters shall affect the reader…''(p 12).

Such a work must inevitably explore the moral issues consequent upon its creation. What is interesting is that despite Mary Shelley's expressed abhorrence of assuming divine powers and creating human life, the novel is far from an outright condemnation of Frankenstein, the creator of the monster, or of his actions. We find a surprisingly balanced judgement. The possibilities and dangers of science are recognised as are the strengths and frailties of human beings.

If, therefore, this evidence indicates that the novel *Frankenstein* is based in the science of its day, what can be learnt of relevance to those undertaking ethical review of such research today?

ISSUES RAISED IN *FRANKENSTEIN* AND MODERN RESONANCES

Scientific endeavour has potential for benefit

Frankenstein's story as told to Walton is a cautionary tale, but within this there is a clear appreciation of the power of scientific experimentation.

The principal human characters, Robert Walton and Viktor Frankenstein recognise the potential of knowledge derived from experiment. The novel starts with letters from the explorer Robert Walton to his sister Margaret in which he describes how he himself had used science ''I often worked harder … and devoted my nights to the study of mathematics, the theory of medicine, and those branches of physical science from which a naval adventure might derive the greatest practical advantage'' (p 17).

Later Frankenstein expresses a similar view, ''… that a modern system of science had been introduced, which possessed much greater powers, real and practical …'', and praises the ''wonderful discoveries of the modern philosophers'' (p 40, 41).

Others reiterate this view. Waldeman, one of Frankenstein's professors, describes science's potential:

> Modern masters … have performed miracles. They penetrate into the recesses of nature and show how she works … they have acquired new and almost unlimited powers. (p 49)

Few would dispute this view now and this idea has wide support. It is self evident that medical treatments have improved in recent centuries and that these developments are founded upon experimentation.[11–14] Supporting this view, the introduction to the Governance Arrangements for Research Ethics Committees (GAfREC) in the United Kingdom contains the statement ''Research is essential to the successful promotion and protection of health and social care'' (GAfREC 1.1).[15]

Any body undertaking review of medical research now must take this into consideration but in Mary Shelley's time this thesis was more speculative. There was little practical evidence to support the argument. It was not evident that medicine or science had improved any aspect of life at the start of the 18th century. Crude measurements such as life expectancy had not improved[16] and few therapeutic advances had been made (table 1). The views expressed by Shelley's characters were ahead of their time and prophetic.

Scientific experimentation can harm

To counterbalance this potential benefit, Frankenstein also recognises the seductive excitement of scientific discovery. He describes his feelings as the ''secrets of nature were revealed'' to him: ''Gladness akin to rapture, as they were unfolded to me'' (p 38) and his later discovery ''From the midst this darkness a sudden light broke upon me—a light so brilliant and wondrous'' (p 53) and ''The astonishment soon gave place to delight and rapture'' (p 53).

The book continues to develop how this can lead to a darker side of science. Frankenstein warned Walton to ''Learn from me how dangerous is the acquirement of knowledge'' (p 54) and explained its seductive power: ''None but those who have experienced them can conceive the enticements of science'' (p 51).

In modern times, we have learnt that in the quest for knowledge, experiments can seriously harm subjects. Some of the women recruited by Neisser into his experiments to develop an antisyphilis serum contracted the disease themselves. Many in the concentration camps were brutally killed in Nazi experiments. Poor African Americans were observed and treatment withheld as they developed syphilis in the Tuskegee experiment and children admitted to the Willowbrook unit in New York State were deliberately infected with hepatitis A. The novel *Frankenstein* provides insight as to how and why some scientists, enticed by scientific endeavours and their successes, can lose their moral perspective.

Scientists are not a species apart

The description of Viktor Frankenstein is far from his being evil, indeed the very opposite: we read of a compassionate and learned man. Walton's portrait stands as testament:

> Sometimes I have endeavoured to discover what quality he possesses that elevates him so immeasurably above any other person I ever knew … intuitive discernment … never failing power of judgement. (p 30)

Table 1 Some therapeutic advances, 17th–20th centuries

Therapeutic advance	Scientist, year
Treatment of fever	Robert Talbor, 1682
Small pox variolation	James Jurin, 1722
Treatment of scurvy	James Lind, 1753
The ''dropsy''	William Withering, 1785
Vaccination	Edward Jenner, 1796
Anaesthesia	James Simpson, 1853
The establishment of antiseptic techniques	Joseph Lister, 1867
The discovery of antibiotics	Alexander Fleming, 1928

We also find evidence of Frankenstein's moral values. He admits to doubts about his purpose: ''I doubted at first whether I should attempt the creation …'' (p 54); and he also demonstrates personal insight into his character: ''My imagination was too much exalted by my first success'' (p 54).

When he met the monster again, he first agreed to create a companion but finally stood firm and refused. He understood the conflicting moral duties to his family and the being he created, but saw that those to his family were greater. It was only with great anguish after wrestling with his conscience that he denied the monster a companion.

The danger of separating scientist and society

Pursuing his experiments, Frankenstein worked alone and was ultimately seduced by science and his early experimental successes. Yet this weakness is far from the marker of an evil personality, a view attested to by Walton. We see a scientist working alone, divorced from family and society. His only contact seemed to be with other scientists. These self imposed privations at university ultimately led to illness and breakdown. ''Natural philosophy … became nearly my sole occupation'' (p 51).

His progress and single minded dedication were reinforced by the approbation of the only people he met: ''I had made some discoveries, which procured me great esteem and admiration at the university'' (p 52); and ultimately he lost moral perspective, was seduced and finally captured by science: ''The professors' words enounced to destroy me … my soul was gripped by a palpable enemy'' (p 49)

> During my first experiment a kind of frenzy had blinded me to the horror of my employment; my mind was intently fixed on the consummation of my labour and my eyes shut to the horror of my proceedings. (p 169)

The potential of science and his own early success first motivated and then seduced Frankenstein. The choice of words is deliberate. The *Oxford English Dictionary* defines motivation as ''that which moves a person to act'' in contrast to seduction as ''that which persuades to leave duty or allegiance to beguile to do something wrong.'' Frankenstein was clearly ''seduced''. Clearly he ultimately neglected his duties and forgot his allegiances to his family and society.

There are resonances with William Godwin's (Mary Shelley's father) views and with views current in the community of research reviewers, that scientist and society must work together. Those who met the monster did not appreciate his initial benevolence; they obviously knew nothing of the experiments or the monster's personal tragedy. ''I am malicious because I am miserable. Am I not shunned and hated by all mankind'' (p 147). Godwin wrote:

> Knowledge, and the enlargement of intellect are poor, when unmixed with sentiments of benevolence and sympathy … and science and abstraction will soon become cold, unless they derive new attractions from ideas of society.[17]

In modern guidance to institutional review boards (IRBs) and research ethics committees (RECs), Food and Drug Administration regulations, International Commission on Harmonisation—Good Clinical Practice, and GAfREC require researchers and IRBs/RECs, as one of society's representatives in the debate on medical research, to collaborate with researchers in the protection of research subjects.

> The protection of research participants is best served by close co-operation and efficient communication amongst all who share responsibility … participants, research funders, sponsors and employers. (GAfREC 1.10)[15]

Mary Shelley's novel gives us a hideous insight into the consequences of separation of scientist and society. In our current model the IRB/REC is one of the key representatives of society. There is further support for this collaboration in the UK. GAfREC proposes that the REC role must include the facilitation of ethical research, a task impossible without close collaboration between researcher and reviewer (GAfREC 2.3 and 2.4).

The central issue of the character of the researcher

Tragedy rests upon a susceptible but not evil personality, with common human frailties. I believe we can find early clues in the description of Frankenstein's conversations with his ''cousin'', Elizabeth. She seemed to delight in nature while he earnestly sought the causes: ''I was capable of a more intense application'' (p 38), suggesting that he could more easily lose human perspective when applying himself to study. We also read of his intense ambitions developing from his reading of science: ''So much has been done, far more will I achieve: treading in the steps already marked, I will pioneer a new way, explore unknown powers, and unfold to the world the deepest mysteries of creation'' (p 49) which interestingly he recognised: ''From my infancy I was imbued with high hopes and a lofty ambition'' (p 214).

Frankenstein, himself, attributes events to ''enthusiastic madness'' (p 219) and maintains he was not to be blamed: ''During these last days I have been occupied in examining my past conduct: nor do I find it blameable. In a fit of enthusiastic madness I created a rational creature'' (p 219).

There seems to be no reason to believe these arguments are invalid today. Indeed they are ever more important. In modern times two commentators on research ethics, Beecher and Pappworth, have both recognised that the researcher's ethical standards are probably the research subject's most important protection against harm. Beecher, when considering protection of research subjects, concluded that ''There is the more reliable safeguard provided by the presence of an intelligent, informed, conscientious, compassionate and responsible investigator''.[18] Pappworth took this further: ''undoubtedly no code [ethical] can ever be a substitute for the moral integrity of any individual investigator''.[19]

If Saunders' and Wainwright's analysis [20] of the relationship today between clinician/researcher and participant is correct and the knowledge and authority of the researcher puts any potential subject at a disadvantage, the only protection against exploitation of this can be the integrity of the clinician/researcher.

From a different perspective, experience of research fraud provides support for these views. Wells, drawing on his own experience of the British pharmaceutical industry, found examples of recurrent fraud by the same researcher[21] and Peter Jay draws a similar conclusion from his experience as an investigator for the UK's General Medical Council. In the course of his investigations, he had experience of ''doctors who had been up to no good for so long that their total disregard for the possibility of detection indicated arrogance in the extreme''.[22]

More recently O'Neill (in her 2002 Reith lectures) has added philosophical support to this argument:

> Reasonably placed trust requires not only information about the proposals or undertakings that others put forward but also information about those who put them

> forward … If we are to place trust with assurance we need to know what we are asked to believe or accept and who is soliciting our trust … Well placed trust grows out of active enquiry rather than blind acceptance.[23]

Interestingly there is still little support for this in guidance to IRBs or RECs—only brief mention is made: ''The IRB/REC should consider the qualifications of the investigator for the proposed trial'' ICH 3.1.3,[24] guidance echoed in GAfREC[25] (GAfREC 9.15).

''The devil is in the detail'': scientific protocols require close scrutiny and adherence

One further contribution is referred to only briefly, yet is of vital importance. For ease of experimental progress, Frankenstein changed his research design and made the monster eight feet tall: ''As the minuteness of the parts formed a great hindrance to my speed I resolved contrary to my first attention to make the being of gigantic stature''. (p 54)

Tragic consequences would seem unlikely had the monster been only one metre tall! Unchecked, he took the catastrophic decision to change his experimental design and make the monster larger than life. Review of a protocol and subsequent adherence is one of the key roles of an IRB or REC. Would such a change have been approved? Again Mary Shelley's novel raises a key and topical point for IRBs/RECs: the importance of continuing review of research.

CONCLUSIONS

Whatever her ultimate reasons and personal beliefs, Mary Shelley provides us with a novel that explores the problems consequent upon medical experimentation. The question she addresses could be succinctly framed: ''What would happen if a scientist undertook an experiment to create human life?''

Nowadays IRBs and RECs undertake their work with a similar question. We are asked to consider, ''What would happen if the scientist before us undertook this research proposal? Would the consequences be morally and ethically acceptable?''

The novel captures some of the ethical dilemmas that are still at the heart of our review of medical research. As cloning rediscovers the secret that Viktor Frankenstein sought to take to his grave, her book is as relevant today as it was when first published. It may lack a modern ethical framework (this the reader must provide) and it does not address all issues, but it makes up for this as an illuminating and provocative narrative with purpose and direction—features that are often absent in the more formal, modern ethical analyses. As such I would propose that IRB or REC members could profitably read it to develop their understanding of, and interest in, this subject.

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