Literary reactions

Chemistry makes occasional appearances in fiction but rarely takes centre stage. Philip Ball unearths chemistry’s fictional roles
Discussions of chemistry in fiction invariably begin with Johann Wolfgang von Goethe’s 1809 novel *Elective affinities*, and with good reason: seldom has a chemical metaphor been made more explicit. The story centres on four characters. Eduard and Charlotte languish in an affluent but stultifying marriage of convenience on a country estate, and Eduard falls in love with Ottilie, whose approaching presence must be provided with a D, and this D is unquestionably the charming little lady Ottilie, whose approaching presence you may no longer resist.

The ‘affinities’ of the title refer to the pre-eminent theory of the time for chemical reactivity, which was ascribed to precise but differing degrees of affinity between the elements. Eighteenth century chemists drew up ‘affinity tables’ summarising what was known about the laws of chemical composition. Affinity was often imagined as a kind of chemical force akin to Newtonian gravitation, giving chemistry the appearance of a unified and exact science. Goethe, whose own scientific interests are widely known, made laborious use of this metaphor: ‘The affinities become interesting only when they bring about divorces,’ says Eduard.

It has been debated whether Goethe in fact intended all this as mere metaphor, or whether he thought there really were fateful forces that governed the relationships between people. Certainly the sociologist Max Weber, who read Goethe’s work, used the term ‘affinity’ in the early twentieth century to describe specific attractions that he perceived in social phenomena, for example between Protestantism and capitalism.

But Goethe’s use of chemical analogies in literature wasn’t as new as is sometimes implied, since alchemy had long been a source of inspiration to artists, writers and poets. It’s been suggested that alchemical imagery lies at the core of several of Shakespeare’s works, most notably *King Lear*, where the tribulations of the king can be seen as symbolising the transformations in alchemy that were supposed to produce the ‘Red King’, a substance en route to the Philosopher’s Stone. Alchemical metaphors for romance were particularly common in the Elizabethan age – two of Shakespeare’s sonnets are based on imagery connected to the Aristotelian quartet of elements – and in some ways Goethe’s tale could be regarded as updating, to the science of his day, the old notion of the chemical marriage – the union that was supposed to take place in the alchemical crucible between ‘male’ and ‘female’ principles to create the fictitious Stone. John Donne wrote of ‘love’s alchemie’, and he draws on the sexual union of the chemical marriage in his poem *The comparison*, written in the 1590s:

> Then like the Chymicks masculine equall fire, Which in the Lymbecks warm wombe doth inspire Into th’ears worthlesse dart a soule of gold, Such cherishing heat her best lov’d part doth hold.

*Lymbeck* here is the alchemist’s...
A Faustian legacy

Elective affinities was not the beginning of any trend; it remains an oddity, a more or less unique attempt to create modern fiction from chemical themes. If we seek chemistry in literature between then and now, we generally tend to find it used much more straightforwardly, as a bit of science that somehow serves the plot – as in, to take a random example, the art forger’s chemical art in Robertson Davies’ What’s bred in the bone (1985). One could even say this is true of Mary Shelley’s Frankenstein, published just a few years after Goethe’s novel, where it’s easy to forget that it is chemistry that brings the monster to life. ‘Chemistry,’ says Victor Frankenstein’s mentor Dr Waldmann of the University of Ingolstadt, ‘is that branch of natural philosophy in which the greatest improvements have been and may be made.’ It is clearly implied that a form of galvanic electrochemistry, a hot topic when Mary Shelley wrote the book around 1816, is what infuses a ‘spark of being into the lifeless thing’.

But there is more to the chemistry in Frankenstein than a bit of vogueish science. The story is basically a retelling of the Faust myth, in which a hubristic knowledge seeker unleashes powers he can’t control. It was Goethe himself who gave this myth a modern face, making Faust a tragic figure rather than, in the earlier medieval tradition, a bungling charlatan. And Faust always uses what is perceived as the most powerful science of his time, which is why Christopher Marlowe’s Faust, in his 1594 play which was again a product of the chemical philosophies, is interested in alchemy, while Shelley’s is a chemist. The twentieth-century retellings of hubristic scientists, meanwhile, such as Dr Strangelove and the faceless labcoats whose botches create B-movie monsters, make them nuclear scientists today’s Fausts and Frankensteins are biotechnologists and geneticists (think of Jurassic park). For better or worse, chemistry soon disappears as the central plot device in this particular strand of science in fiction.

But there is one notable exception. Thomas Pynchon’s Gravity’s rainbow (1973) is almost without parallel in the way it engages with the place of chemistry in the modern world. Admittedly, it’s no mean feat to discover this, because Pynchon’s huge novel is one of the densest, most labyrinthine and peculiar works of the late twentieth century. If you’re used to a coherent plot with a beginning, middle and end, and to literary staples such as character development, you’re in for a shock. The story, such as it is, is almost impossible to summarise, but revolves around the journeys of US army lieutenant Tyrone Slothrop through Europe at the end and in the aftermath of the second world war, as he stumbles over the genesis and the intended future of the German V2 technology. A more conventional and less informed writer would doubtless have bound all this up with nuclear physics and the start of the Cold War. But Pynchon instead makes the architect of rocket technology a shady, trans-national industrial–military complex centred on the German chemical cartel IG Farben, manufacturer of the notorious poison gas Zyklon B. Its ominous schemes were set in motion by a chemist named Laszlo Jamf, an intellectual descendant of August Wilhelm Hofmann, who seems to have been a specialist in organic and polymer chemistry.

Jamf is the mad scientist in his icy Dr Strangelove guise. He is said to have invented a mysterious polymer called Imipolex G, a material that seems to change its properties in response to electrical stimuli and become, wickedly, erectile:

Under suitable stimuli, the chains grow cross-links, which stiffen the molecule and increase intermolecular attraction so that this Peculiar Polymer runs far outside the known phase diagrams, from limp rubbery amorphous to amazing perfect tessellation, hardness, brilliant transparency, high resistance to temperature, weather, vacuum, shock of any kind.

This was to be the smart skin of a new type of rocket bomb that is almost creepily intelligent.

In Gravity’s Rainbow, Pynchon feels no need to ensure that his readers will follow all the science. Indeed, it is arguably part of the point that they won’t, making it all the more apparent that IG Farben possesses occult knowledge that gives it the power to manipulate history. Pynchon pulls this off (in my view) because he himself knows what he is talking about; he studied engineering physics at Cornell in the 1950s, and later worked at Boeing.
**Chemistry for better living?**

All this might dismay the chemist who is sick and tired of being cast as the callous enemy of public health and safety. But I don’t believe that Pynchon intended any such simplistic diatribe. His target was the military–industrial complex, not the science per se. And he had the insight to see that chemistry was central here, precisely because it is such an applied science.

A rather similar picture is presented by American author Don DeLillo in his 1984 novel *White noise*, where the life of the Gladney family in middle-class Middle America is permeated and dominated by the textures and products of modern chemistry, from pills for every imagined ailment to synthetic fabrics with cryptic names like Mylex. The story pivots around a chemical accident, an ‘airborne toxic event’ involving a carcinogen called Nyodene D.

Again, this is no anti-chemistry diatribe, but a study of the almost mythic dimension that the products of modern chemistry have acquired. That too is a theme of Richard Powers’ 1998 novel *Gain*, which has dual narrative strands. One tells of the origins and evolution of a chemical company called Clare, from its beginnings as a candle- and soap-making business of two Irish immigrants in Boston to a multinational rival of Lever and Procter & Gamble. The other describes the decline and death of a real-estate agent in Illinois called Laura Bodey, whose ovarian cancer may or may not be linked to the proximity of Clare’s chemical works.

Even more than Pynchon, Powers embellishes his account with chemical details, to the extent of showing the reactions of the Leblanc process for converting sodium chloride into soda, and a diagram depicting the various uses of Glauber’s salt (sodium sulfate). And again the message is complex, for chemistry is shown as a saviour as well as a potential killer – Laura is prescribed semi-synthetic taxol, and her son becomes an expert on protein folding for drug development. The message is not about the evils of chemistry, but about the double-edged sword of a consumer society: ‘People want everything,’ whispers the terminally ill Laura. ‘That’s their problem.’

**Chemistry’s poet**

Set against all of this is the writer who, along with Goethe, is bound to crop up in discussions of chemistry in fiction: Primo Levi. He is now virtually the patron saint of chemistry writing, whose 1975 book *The periodic table* is credited with making chemistry accessible to countless readers who would otherwise have run a mile from the subject. *The periodic table* is not a novel as such, but a series of vignettes and sketches, many of them autobiographical, that are somehow based around a chemical element. The last of these is explicitly pedagogical, but poetic enough never to feel that way: in *Carbon*, Levi traces the progress of that element through its natural biogeochemical cycle.

To my mind, Levi’s novel *The monkey’s wrench* (1978) contains a considerably more explicit and elegant depiction of what chemists do: ‘we rig and dismantle very tiny constructions’. His chemist narrator relates how difficult it is to get all the parts in the right place, and how crude many of the shake ‘n’ bake methods are. He fantasises about having delicate ‘tweezers’ that now sound remarkably like the atomic-probe microscopes, invented only a few years after the book was written, which can pick up atoms and push bits of molecules into shape.

The book is rather less compelling as fiction, however, perhaps because its autobiographical elements are more filtered and disguised. Nothing can equal the narrative and moral power that Levi brings to his accounts as a survivor of the concentration camps, glancingly in *The periodic table* but in detail in *Uncle Tungsten*.

*Uncle Tungsten* is a science writer based in London, UK

---

**How nice it would be to find the ideas of chemistry take centre stage**

If this is a man. It was his training as a chemist that saved his life when he was selected to work as an assistant in IG Farben’s Buna-Werke laboratory at Auschwitz, making synthetic rubber in an eerie resonance with Pynchon’s fable.

Levi’s stories in *The periodic table* delight in the materiality of chemistry: sodium, he explains ‘is neither rigid nor elastic; rather it is soft like wax; it is not shiny or, better, it is shiny only if preserved with maniacal care’. The book is unique in actually explaining some chemistry, which should ordinarily never be the reason for putting science into fiction. Oliver Sacks achieves a similar interweaving of chemistry and humanity in his autobiographical *Uncle Tungsten* (2001).

**Not just a villain?**

An optimistic reading of these diverse examples of chemistry in fiction would suggest that they offer a more nuanced vision of chemistry than that perpetuated in media scare stories about the terrible things ‘chemicals’ in our environment threaten to do to us. To my mind, linking chemistry to modern culture, with all its consumerist excesses, is potentially a good rather than a bad thing: it allows a writer like Richard Powers to show that the problems stem from the way applications are chosen and implemented, and moreover that ‘evils’ such as toxic spills and contamination of remote ecosystems are the flipside of the immense benefits that chemistry has conferred on society. Fiction offers opportunities for exploring these complex issues without resort to the polarities and simplifications typical of journalism.

But science in fiction can surely do more than provide a vehicle for debating its applications. Physics and biology appear to offer rich sources of literary metaphor, poetic imagery and allusion. Goethe and Levi have made the case that chemistry can do so too, yet they are unusual in that, if not perhaps unique. No doubt readers of *Chemistry World* would welcome books in which chemists are the heroes and not the villains. But how much nicer it would be to find the ideas of chemistry take centre stage, as alchemy did in some Elizabethan poetry. Who will take up the challenge?

**Philip Ball is a science writer based in London, UK**

---

Oliver Sacks interweaves chemistry and humanity in his autobiographical *Uncle Tungsten*