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Novelist Jane Austen wrote about the moral philosophy of sensibility in 1811, at the peak of its popularity.

HISTORY

Science and sensibility

Mechanical world views were replaced by more sensory beliefs after the rise of the novel, finds **George Rousseau**.

Mechanical philosophies of nature flowered in the seventeenth and eighteenth centuries when Enlightenment beliefs, grounded in reason and empirical observation, came to the fore. The whole Universe, it was thought, could be explained in terms of matter undergoing motions that were governed by physical laws. Most scientists today are aware of the heritage of mechanism in Isaac Newton's theories about force and matter, motion and velocity, cause and effect. Less familiar is the philosophical phase that followed — sensibility, the view of humans as organic creatures, incapable of reduction to the sum of their mechanical parts, especially in the affective, moral and political realms.

In this weighty book, part of his multi-volume history of philosophy, Stephen Gaukroger explains how the philosophies of mechanism collapsed over eight decades, to be replaced by a more sensory view of nature. Gaukroger thoroughly comprehends the deep layers of science on which he pronounces. But by devoting the vast majority of the book to mechanism, he renders his treatment of sensibility too short to fully document the shift from one mind-set to another. Readers will have to wait for the next volume to make sense of this one.

The Collapse of Mechanism and the Rise of Sensibility: Science and the Shaping of Modernity 1680–1760
STEPHEN GAUKROGER
Oxford University Press: 2010. 505 pp. £35

Explaining this transition is a tall order because of its complexity. Mechanism was never a single set of principles about machine-like systems. It comprised an array of disparate beliefs, experiences and practices that were followed in far-flung places and presided over by its principal architects: René Descartes, Thomas Hobbes, John Locke and Newton.

Gaukroger, who has worked in this field since the late 1970s, deftly describes mechanism's variety. He accomplishes his goal brilliantly through a slow narrative pace that is used for all but the last part of his book. If only he had laboured as unhurriedly over sensibility. Gaukroger's riposte to this will be that sensibility, as a concept, did not infiltrate Western thought until the mid-eighteenth century; that is, at the end of his book's chronological span. He is right, but without the next (unpublished) volume in hand, few readers will understand the concept's hydra-headed complexities. Sensibility was as varied a set of beliefs and practices as mechanism.

Sensibility is a vague term. Is it a scientific concept, a state of mind or a description of the senses of particular individuals? Writing at the peak of such philosophy, Jane Austen teased out the strengths and weaknesses of the word in her novel *Sense and Sensibility* (1811). Two generations earlier, Denis Diderot gave it a bipartite definition in his *Encyclopédie*, assembled in the 1750s and 1760s, as "the soul's disposition" and "the sensitive principle of life". Gaukroger's description is far stronger: "Sensibility", he writes, "allows connections to be made between natural-philosophical and moral, political, and psychological theories in a new way, shaping a new field of the moral sciences".

Gaukroger argues rightly that neither science nor modernity can be understood without comprehending why mechanism collapsed and sensibility replaced it. But with his scant treatment, like others who have tried, he does not have the final say. His explanation centres around fracture and fragmentation: mechanism was not depleted but splintered, he argues; it unravelled and succumbed to new practices that placed greater emphasis on

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Gaukroger's *The Emergence of a Scientific Culture*:
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humans than on physical matter. In an age of increasing professionalization, especially among botanists, chemists, geologists and physicians, philosophical approaches diverged.

As mechanism was fracturing, Gaukroger notes, a new literary form was emerging that would develop into the novel. He writes, "It is internal psychological exploration, in the form of refined sensibility, rather than external events that have become the focus of the novel". It is true that sensibility needed these new forms of prose, and that it underlies our cognitive life far more than mechanism does. But such pronouncements are too few to explain why sensibility toppled centuries of mechanical thought.

Imaginative literature, later codified as 'Romantic', also drove nails into mechanism's coffin by postulating that matter was more complex than the mechanical natural philosophers thought. A human is not a mere machine; a fly is much harder to study than a pebble. By focusing on human nature rather than physical matter, the language of the new literature helped to alter the way scientists conceived their models, and enabled modernity to commence its work.

In this sense, the 1760s was a watershed decade — except that sensibility had already reared its head in French imaginative literature a century earlier. Just when you think Gaukroger has sent mechanism to its grave, he weaves in broader elements of history that further complicate the evolving drama of mechanism's failures. This is to be expected — intellectual history rarely evolves in orderly ways. Its fault lines are unkempt and its major paradigms overlap. It is to Gaukroger's credit that he avoids facile explanation.

Massive shifts in the history of knowledge are difficult to chart. The late historian of science Thomas Kuhn resorted to the intricate concepts of 'paradigm shifts', whereas philosopher Michel Foucault elaborated the acceptance of certain ideas at certain times in his 'epistemes'. But historians and scientists have different expectations of what constitutes adequate context. In my view, Gaukroger has soft-pedalled the socio-cultural aspects of sensibility. His approach sheds new light on mechanism's decline, but less on its organic replacement. I hope that a subsequent volume will rectify the imbalance. ■

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CHEMISTRY

Enigmatic elements

A Philadelphia exhibition is a playful celebration of the periodic table, reports **Katharine Sanderson**.

Elements, the fundamentals of chemistry, have an almost mystical symbolism. The astounding concept that all matter and all life comes from the coupling of energy with this ordered list of atoms unifies an exhibition to celebrate the International Year of Chemistry 2011. *Elemental Matters*, which opened this month at the Chemical Heritage Foundation in Philadelphia, Pennsylvania, and runs throughout 2011, features the work of seven artists known for tackling chemistry themes.

Canadian artist David Clark jokes that he was inspired to create pieces based on the periodic table because the symbols for the consecutive elements chlorine, argon and potassium spell out his surname. His work focuses on the structure of the table rather than its chemical contents. In *I Don't Think You Understand the Way I Feel About the Stove* (2000; pictured) — borrowing from the words of *Stove,* a song by Canadian indie rock band Eric's Trip — he replaces the chemical symbols with 118 identical rusty electric-stove heating elements. "By collecting objects that are all the same, it emphasizes the table's meaning as a sign," he says.

> ***"A series of 58 flasks holds a sample of an element scaled to the amount found in a person weighing 45 kilograms."***

In *Braille* (2000), Clark reorganizes the elemental symbols into another familiar chart, the eye test. The letters, also translated into Braille, shrink in size with each descending line. "The Braille fades into nothingness," says Clark. "They are like atoms, moving beyond our touch." His intent is to remind us that the shape of the periodic table, even without the information it usually holds, has become iconic.

Stove elements replace chemical ones in David Clark's artwork inspired by the periodic table.

C. ERB/CONRAD ERB PHOTOGRAPHY

Elemental Matters: Artists Imagine Chemistry
Chemical Heritage Foundation, Philadelphia, Pennsylvania. Until 16 December 2011.

The chemical ingredients of the human body are decoupled in New York artist Dove Bradshaw's *Self Interest* (1999), a series of 58 flasks mounted in a glass case. Each container holds a sample of an element scaled to the amount found in a person weighing 45 kilograms. The flasks containing trace elements such as yttrium, thorium or beryllium are only as big as three pinheads, notes Bradshaw. The piece explores whether our existence can be stripped down to material constituents.

The elemental forces of nature, and the chemical changes tied up with those forces, also find a place in this exhibition. In Bradshaw's *Waterstone* (1996), for example, a funnel drips water at a steady rate onto a limestone block. Running since the mid-1990s, the trickle of seven drops every minute has eroded a small dent in the carbonate.

The displayed works include more literal takes on the elements — in sound as well as vision. *Elements in Descending Order of Creation from Collapsing Stars*, by Oregon-based composer Susan Alexjander, transposes the vibrational frequencies of atoms down by 14 octaves into the audible range. Her musical 'scale' runs from hydrogen, helium, carbon, nitrogen and oxygen to silicon, phosphorus and sulphur.

The show also includes collaborative works, such as a giant printed collage of the 118 elements of the periodic table interpreted by 97 artists, with each print in its conventional place.

Chemists usually think of the periodic table in abstract terms, as a reference book or an aid to their research. These artworks remind us of the mystery that the elements can also evoke. ■

Katharine Sanderson *is a writer based in France.*