

# Life Force and Chemistry

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Formerly, most scientists believed that life depended on a specific 'force of life'. Only very few argued that science and the laws of nature could explain everything. However, the question remains unanswered.

**T**he idea of a specific life force, essential for explaining how the human body operates and how bodily chemical reactions are maintained, has existed for as long as chemistry itself. Actually, probably longer, as the difference between what is living and what is dead seems so obvious to the majority of people.

**Throughout history**, some scientists, although nowhere near as many as one might think, have also wished to reject such a special life force, arguing instead that bodily functions can be explained purely scientifically and by the laws of nature. The ancient atomists believed that everything, including life, was simply made up of atoms moving in an empty space. In the 15th century, mechanists maintained that the body was a gigantic machine readily understood using the laws of physics. During the mid-1800s, major arguments around materialism meant that a leading physician and physiologist such as Ludwig Büchner, referring to chemistry, was able to proclaim that: "The brain generates thoughts in the same manner as the kidneys produce urine".

These opponents to the belief in a life force are often highlighted as predecessors (pioneers) of a scientific approach towards life, although they were in a clear minority among scientists. The idea of a specific life force has always been very much

alive and dominant. Among its proponents were many of chemistry's greatest, such as Justus Liebig and Louis Pasteur.

**Often quoted as** an important part of the argument against the existence of a life force is Friedrich Wöhler's preparation of an organic product, urea, from inorganic starting materials. In the 1820s, he found that urea was produced when ammonium cyanate was drying. Many have argued that this removed the boundary between what is living and what is dead. There was no longer any need for a mysterious life force.

This is hardly how it was interpreted at the time. Instead, the experiment was considered to show that there is no clear distinction between organic and inorganic chemistry (after all, urea is not a particularly complicated organic compound), but also that the same chemical laws apply in both disciplines. Above all, it supported the rule about ratios, i.e. that the ratio between the components of a chemical compound is constant. Wöhler's study confirmed that organic and inorganic chemistry were two aspects of the same discipline.


However, the more complicated questions: "What is life?" or "Is there a specific life force?" were not answered. At the time, no one thought so as it would be unreasonable to suggest that one simple experiment in a German laboratory in the 1820s would lead to such complex issues being laid to rest.

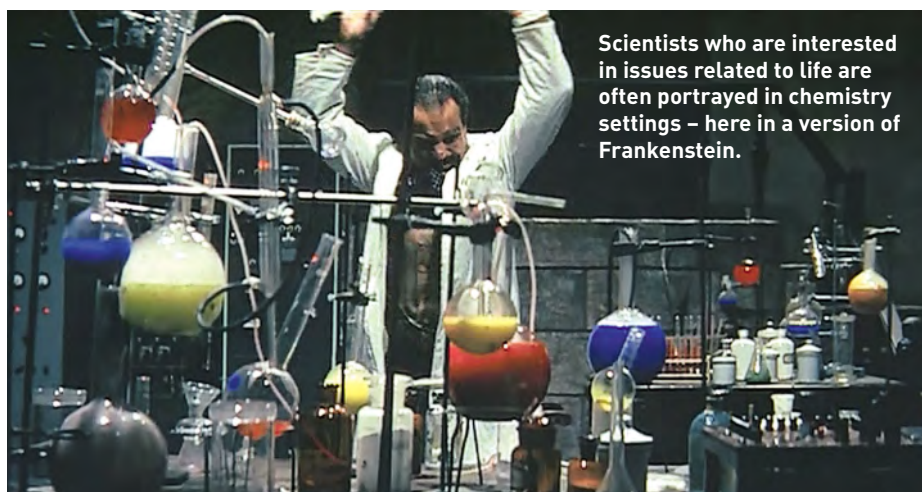


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Neither Wöhler nor his colleagues or the world around them viewed his experiment from such an angle. There were no cries of joy over the demise of the life force. It disappeared from science simply because chemists continued to make no comments on the matter. When dealing with chemical processes in the body, educational text books would consistently avoid questions regarding what life is, merely explaining that this issue lies outside what chemists should occupy themselves with.

**Hence, to state that** the boundary between organic and inorganic chemistry had been crossed was one thing. There was no doubt about that. However, to argue that this also settled the riddles of life, was a completely different matter. Virtually no one maintained that this was the case. The question is whether on reflection any chemist ever has argued that. This is not to say that it is not worth discussing or seriously consider what explanations chemistry can offer for human actions, especially since in recent decades our knowledge about the chemical processes that form necessary parts of our lives has increased dramatically.

However, are there really any chemists today who can offer an interesting answer to the question "What is life", and is this a question exclusively for chemists? Isn't life more than simply chemistry? Or... 



**Scientists who are interested in issues related to life are often portrayed in chemistry settings – here in a version of Frankenstein.**