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ORIGINAL PAPER

Explanatory models for homeopathy: from the vital force to the current paradigm

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Facing claims for and against the scientific status of homeopathy, one is entitled to ask: is there a scientific model for homeopathy? In this study we reconstructed the model put forward by Hahnemann. The results showed that it was essentially based on the assumption of a 'vital force' exclusive to living beings. While the vital force was a basic element of 18th-century science, the existence of such a *sui generis* force of nature was refuted with the formulation of the law of the conservation of energy by mid-19th century. As a function of that fact for homeopathic theory, we discuss the history of the rise and demise of the theory of the vital force from the last quarter of the 18th century to 1830. Finally, we call the attention to the paradigm shift biology underwent starting at the end of the 19th century as the framework for contemporary views on the functioning of living beings and consequently, of the effects of pharmacological agents on them. *Homeopathy* (2016) **105**, 280–285.

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Introduction: scientific models and homeopathy

The notion of 'scientific models' and their difference vis-à-vis 'scientific theories' are a subject of much discussion. As a generic working definition, one might agree on that: they are logical systems, i.e., their components are articulated through the laws of logic, the 'pieces' being observations, axioms or postulates, which allow asserting under which conditions some assumptions occur, and thus allow inferring/postulating other possible facts by applying a given set of rules.

Models must necessarily be consistent (i.e., not contain contradictions) and complete (account for the full universe of objects and phenomena within their scope). In addition, experiments and data should meet two intimately intertwined properties: repeatability/reproducibility (repeatability: same method on identical test material, under the same conditions; reproducibility: same method on identical test material but under different conditions – different operators, different apparatus, different laboratories and/or after different intervals of time)[1] and predictability.

Facing the countless claims for and against the scientific status of homeopathy, one is entitled to ask: is there a scientific model for homeopathy?

In this study we reconstructed the model put forward by Hahnemann. The results showed that it was essentially based on the assumption of a 'vital force' exclusive to living beings. While the vital force was, indeed, a basic element of 18th-century science, the existence of such a *sui generis* force of nature was refuted together with the formulation of the law of the conservation of energy by mid-19th century. As a function of the relevance of that fact for homeopathic theory, we discuss the history of the rise and demise of the theory of the vital force from the last quarter of the 18th century to the 1830.

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Finally, we call the attention to the paradigm shift biology began to undergo starting at the end of the 19th century as the direct framework for the contemporary views on the functioning of living beings and consequently, of the effects of pharmacological agents on them.

Hahnemann's model: the vital force as cornerstone

To have a clear understanding of the assumptions underlying Hahnemann's explanatory model for homeopathy, the most appropriate source is *Spirit of the homeopathic doctrine of medicine*, first published in 1813 (revised in 1833), which Hahnemann wrote to give the theoretical grounds underpinning his more practical-minded *Organon of medicine* (1st edition, 1810).[a]

The first and foremost assumption in science concerns the ultimate nature of being, and within our context of interest it corresponds to the theory of matter. As it was almost the rule in the 18th and first decades of the 19th century, also Hahnemann adopted the vitalist perspective[2]:

> "*The material substances of which the human organism is composed no longer follow in their living combination the laws to which the material substances in lifeless state are subjected, but follow the laws of vitality alone; […] here a nameless, all-powerful fundamental force (**Grundkraft**) rules […]*".[3]

Consistently, he defined health/disease/cure as the normal/abnormal/recovered functioning of the vital force:

> "*[…] it is evident that human diseases are caused by the dynamic and virtual influence of pathological harmful agencies; in essence, they cannot be but purely dynamic (can only operate in a spirit-like [**geistig**] manner) affections of the vital character of our organism*".[4]

As it was common among 18th and early 19th century physiologists (see below), also Hahnemann admitted that 'forces', understood as the ***causes*** of motion, could not be investigated as such, but only through their effects: "*Whatever life might be, it can only be empirically discernible through its manifestations and phenomena […]*".[3] Being that the causes could only be inferred from their perceptible effects, the only method valid in natural science and medicine was the one based on observation and experimentation and the inferences directly resulting from them. This was a basic assumption of the 'new science' that had emerged in the 17th century, as we discuss below in more detail.

In short, these are the assumptions that underlie Hahnemann's model for health/disease/cure/therapeutics, as follows:

- ***Disease***: abnormal working of the vital force; it is caused by anything able to disarrange the normal operation of the vital force; therefore, the nature of any cause of disease must be the same as the nature of the vital force: 'dynamic', spirit-like (*geistig*).
- ***Cure***: real cures can only be achieved through the use drugs necessarily able to act on the vital force and reinstate its normal functioning.
- ***Actions and effects of drugs***: a medicine is thus any substance able to act on and modify the functioning of the vital force; therefore, their nature must be the same as the one of the vital force ('dynamic', spirit-like). When such a substance is administered to a healthy individual, it elicits a specific series of manifestations ('symptoms'); this procedure became known as 'proving' or 'pathogenesy' (and more recently, 'homeopathic pathogenetic trial' – HPT).[5] Reciprocally, when that substance is administered to an ill person exhibiting a similar set of symptoms, it is able to cure him/her. Therefore, concludes Hahnemann:

> "*Both the [ability] to heal diseases and to pathologically affect the healthy are inseparably found in all the remedies, and both operations patently originate from one and the same source, namely, from their power to alter the human health in a dynamic manner, therefore, it is impossible that they might act according to different immanent natural laws in the sick than in the healthy; then, it follows that **it is the same force in the remedies that which heals diseases in the sick and induces pathological symptoms in the healthy***".[6]

The abovementioned assumptions led Hahnemann to formulate an *experimental hypothesis*, which might be phrased as follows: if substance X heals disease Y, then it elicits the symptoms of disease Y in healthy provers; and reciprocally, if substance X elicits symptoms Y in healthy provers, then it heals cases of disease that exhibit symptoms Y.[7] Hahnemann tells us that he then set himself to demonstrate empirically this hypothesis. Unfortunately, his experimental notebooks did not survive, and we thus have to take his word as authoritative.

To summarize, according to Hahnemann the mode of action of the cause of disease and of its healing remedy is the same, the only difference being that the state induced by the former is 'natural', while the one elicited by the latter is 'artificial' (to notice, term 'artificial' had no pejorative connotation at that time, but merely meant 'made through art').[8] Here, Hahnemann introduced the only *ad hoc*

[a] Hahnemann C Geist der neuen Heillehre (1813), Geist der homöopatischen Heillehre (1833), in Schmidt JM, Kaiser D, ed. Gesammelte kleine Schriften. Heidelberg: Karl F Haug Verlag, 2001, p. 639–648 and p. 842–852, respectively; here the 1833 version was quoted, as representing Hahnemann's more mature views; only the 1813 version is available in English translation, Spirit of the homoeopathic doctrine of medicine, in Dudgeon RE, The lesser writings of Samuel Hahnemann, London: W Headland, 1851, 696–711. All translations from German are ours, we translated in a way that makes sense to a present-day readership, see Schmidt JM, Vorwort der Herausgebers, in Hahnemann C Organon der Heilkunst (6th ed.). Neufassung mit Systematik und Glossar. 2nd ed. München/Jena: Elsevier/Urban & Fischer, 2006.

hypothesis we were able to locate, and that moreover, he described as an 'axiom' (self-evident truth requiring no demonstration): living beings are conditionally susceptible to the action of pathological agencies, but unconditionally susceptible to the actions of remedies.[9]

Hahnemann found the final element he needed to explain the effect of remedies ('artificial diseases') on ('natural') diseases in the hypotheses put forward by Christopher Nugent (1698−1775) and John Hunter (1728−1793) to account for the action of preventive/therapeutic means against infectious diseases, including vaccination. According to Nugent, the basic feature of rabies was fiber spasm, and its occurrence could be prevented through the application of a different type of spasm, stronger but benign in nature, which overpowered and destroyed the one caused by disease.[10] The reason was provided by Hunter: two different diseases cannot coexist at once in the body, but 'a non-specific one might prevent the occurrence of a specific disease'.[11]

The model thus elaborated allowed Hahnemann to infer explanations for other empirical findings, like the need to use small doses (the minimum needed to overcome the naturally induced 'irritation') and the so-called 'homeopathic aggravation' (result of the addition of the symptoms of the natural disease and the ones resulting from the own action of the remedy, when the dose was too large, and thus the 'irritation' it elicited exceeded by much the one induced by the natural disease).[12]

In time, all those aspects came to be described by homeopathic practitioners as the 'pillars' and 'philosophy' of genuine homeopathy: law of similars, proving of remedies on healthy subjects, use of one single medicine at a time, small doses and vitalism. The possible reason might be that Hahnemann's model is consistent (lacks internal contradiction), complete (includes all the cases within its scope), allows predicting phenomena, provides an explanation for all the phenomena within its scope with a minimum of *ad hoc* hypotheses, is translatable into logical terms and is based on adequate methods. Finally, Hahnemann's model was fully coherent with 18th-century science, the theory of matter in particular − vitalism, or theory of the vital force, which is the topic of the next section.

Rise of the theory of the vital force…

As shown in the previous section, the core of Hahnemann's model was the idea that a 'vital force' unique to living beings existed side by side with other forces of nature. Therefore, a proper understanding of the homeopathic model as formulated by Hahnemann naturally demands an accurate comprehension of what the 'vital force(s)' meant to men of science and doctors at the turn of the 19th century.

A tradition arose in the early 1700s, which based on Isaac Newton's (1643−1727) prestige and the universal validity of the law of gravity, also legitimated the suggestions Newton made in the *Queries* appended to his *Opticks* as 'proved science', while they were nothing but proposals for future research in the best of cases.[13] As a fact, Newton's work gave rise to two traditions in the 1700s,[14] which are worth of reviewing here summarily, as they define the exact 18th-century meanings of terms found all across Hahnemann's writings, which should be understood within the very temporal context of their production (and not in, e.g., Aristotelian, 3rd century BC, or present-day terms, an inadmissible anachronism one only too often finds in the homeopathic literature).

The so-called ***mechanistic*** tradition was grounded on Newton's theories on the ether, having recourse to 'imponderable fluids' and collisions of atoms to account for the occurrence of the natural phenomena; the source text for this tradition was Newton's *Principia Mathematica*. The second tradition was described as ***dynamic***, inasmuch as it was grounded on the notion of '***force***' and as of consequence, sought to explain the natural phenomena in the terms of the (Newtonian) fundamental forces, i.e., attraction and repulsion. The source text for this tradition was Newton's *Queries*, in *Opticks*, Quest # 31 in particular, which was quoted *ad nauseam* in the 18th-century physiological literature. Thus being, it is worth to look at the relevant parts of it:

> "*Have not the small Particles of Bodies certain Powers, Virtues, or Forces, by which they act at a distance […] but also upon one another for producing a great Part of the Phænomena of Nature? For it's well known, that Bodies act one upon another by the Attractions of Gravity, Magnetism and Electricity; and these Instances shew the Tenor and Course of nature, and* ***make it not improbable*** *that there may be more attractive Powers than these […] How these Attractions may be perform'd, I do not here consider […]*".[15]

Newton did not consider which such 'attractions' could be, but this was the cue for chemists all along the 18th and early 19th century to seek 'laws of chemical attraction' or affinity, from Étienne Geoffroy Saint-Hilaire (1772−1844) to Justus von Liebig (1803−1873).[14]

While Hahnemann had explicit recourse to Newton's concept of 'force',[16] more interestingly he emphatically asserted that.

> "*Everything a doctor can know about his object, the vital organism, and all he needs to know in this regard, is restricted to that which the wisest among us […] understood and taught as physiology, and that one might designate as the empirical knowledge of vitality […]*".[17]

And he actually mentioned those sages by name: the Newtonian doctors Albrecht von Haller (1708−1777) and Johann F Blumenbach (1752−1840), two of the most influential physicians and men of science in the second half of the 18th and early 19th century. It is worth to observe that the third member of this elite group is Heinrich A Wrisberg (1739−1808), whose work mostly dealt with anatomy, gynecology, obstetrics and embryology, for which reason we did not consider him in the discussion below.

As a thorough Newtonian,[18] Haller focused his attention on the forces that put the living matter into action; his program was taken up by virtually all physiologists in the 1700s. Having defined physiology as 'the science of motion in living bodies', and considering that motion depended on mechanical forces, according to Haller, the task of physiology was to account for the forces active in living processes. Painstaking experimentation led him to identify two properties exclusive to living beings, namely, irritability and sensitivity, which being inherent to the 'animal fiber', did away with the need to provide any other, and more fundamental cause for motion in living beings, "*[…] as it is neither possible to indicate the cause of attraction or gravity. The physical cause is hidden within the internal structure, but it is sufficiently manifested to experience […]*".[19]

Haller asserted that forces peculiar to living beings (mainly irritability and sensitivity) were similar to the other forces of matter, i.e., they were a property of matter, in this case, of a unique type of matter, which was susceptible to equally unique stimuli. This paved the road for the 18th-century physiologists to postulate a *sui generis* force exclusive to the living matter, to wit, the vital force (*Lebenskraft*; this term was minted by Haller himself).[20,21]

Following in Haller's steps, Blumenbach called the attention to three specific features that ought to be considered relative to the singular organization exhibited by the human body: 1) the materials needed for its subsistence (the bodily vital fluids); 2) the structure of the solid parts that contained the fluids; and 3) the vital powers through which the solids were influenced by and propelled the fluids for the performance of movements, and which he qualified as 'the essence of the living machine'.[22] Blumenbach warned that such 'vital powers' were more easily recognized than defined; the very opposite of the purely physical, chemical or mechanical properties of matter ('lifeless powers'), they were the actual basis of physiology, no matter what their name, concept or definition could be:

> "*[such names], as also attraction, gravity, etc., only serve to designate a force, whose constant effect is recognized in experience, while its causes […] are a hidden quality for us. Ovid's saying applies to all such forces:* ***causa latet, vis est notissima*** *[cause is hidden, force is highly evident]. The application of the study of such forces merely consists in accurately establishing their effects and subsume them under more general laws*".[23]

This tradition had enormous and long-lasting influence. So, for instance, Johannes Müller (1801−1858), the so-called 'reformer of modern physiology',[24] devoted the 100 pages of the *Prolegomena* to his bestseller *Handbook of Physiology*, 1833−40, to the following two questions: 1) Does the material composition of the bodies that manifest phenomena of life differ from the one of the inorganic bodies studied by physics and chemistry?; 2) Are the phenomena occurring in both types of bodies as different as to require different fundamental forces? Müller's answer to both questions was an unqualified yes![25]

To summarize the ideas discussed up to this point: the 18th-century physiologists extended Newton's fundamental (or central atomic) forces to the living beings, in agreement with the latter's proposal to extrapolate the forces active in infinitely large distances to the infinitely small ones (i.e., between the particles, or atoms, composing bodies). As a consequence, the ideas of (chemical) affinity, including a force unique to living matter, entered the mainstream of physiological and medical thought and remained until well into the 19th century.

By 1842, Liebig, considered the founder of organic chemistry, suggested a common origin for the mechanical forces and the animal heat. However, discrepancies were found between his theoretical predictions and the experimental results reported by the French chemists Pierre L Dulong (1785−1838) and César M Despretz (1798−1863). Liebig admitted that such discrepancies could be attributed to the vital force and consequently he wrote that forces exclusively active in living nature existed side by side with the other causes known in physics and chemistry (chemical force, affinity, gravity, electricity, magnetism, etc.).[26] However, the very arguments used to proclaim the legitimacy of the vital force also brought its doom with them.

… and its demise

One of the main concerns in the 19th century was the interconversion and equivalence of mechanical work and heat. As a result, it was almost natural that the law of conservation of force would be simultaneously and independently discovered, in 1847, by at least three researchers, including James P Joule (1818−1889), J Robert Mayer (1814−1878) and Hermann von Helmholtz, (1821−1894) as shown in the groundbreaking study by T.S. Kuhn.[27] The principle of conservation of energy (then 'force') is the first law of thermodynamics and states that the energy of an isolated system remains constant, i.e., energy is neither created nor destroyed, but merely transformed.

This law is particularly relevant for the present discussion, because in the case of Helmholtz, its discovery was the result of his ***explicit attempts to disprove the very existence of a vital force***. To make a long story short,[28−33] Helmholtz's point of departure was Liebig's work: based on the notion of the mechanical equivalent of work/heat, the German chemist had demonstrated the correlation of the forces active in living beings, except for the aforementioned gap in the measurements, which he attributed to the action of the vital force. The latter was inadmissible for Helmholtz, as he utterly rejected the possibility of perpetual motion, and vital force an exemplary case of self-perpetuation. Mathematical reasoning and a painstaking series of experiments led him to demonstrate that no force was 'lost' in the interconversion of mechanical and chemical forces and animal heat. To raise the stakes, Helmholtz made a daring modification in the experimental circuit: instead of a frog muscle-

nerve preparation, he had a living human being perform the initial muscle contraction, who was required to first concentrate and think about the experiment, so that any 'vital force' could make itself evident through its effects. That was not the case.

Therefore, as understood by the 18th and 19th century men of science and doctors, including Hahnemann, the vital force was one of the many Newtonian forces operating on matter. Together with the formulation of the law of the conservation of energy, no theoretical or practical room was left in the map of science for any form of energy exclusive to living beings to this day. As it was shown above, the entire theoretical building of Hahnemann's homeopathy was supported by the notion of the vital force. Following its demise, homeopathy became a theoretical orphan. Hahnemann missed these developments, since he had died four years earlier.

Biology as autonomous discipline and recent paradigm shift

Since the end of the 19th century, scientists universally agree that the fundamental natural sciences are three: physics, chemistry and biology, being that none can be reduced to any other. During the 19th century there was an explicit attempt to reduce the phenomena of life to the known laws of physics and chemistry, but it thoroughly failed. No biologist from the beginning of the 20th century onwards has asserted that life can be fully reduced to the phenomena proper to lifeless matter. It is worth thus to pay attention to the authoritative opinion of the community of biologists. So, for instance, Ernst Mayr (1904−2005), one of the leading 20th-century evolutionary biologists emphatically asserted:

> "*[…] most biologists realized that organisms are different from inanimate matter […] there is nothing in the processes, functions and activities of living organisms that is in conflict with or outside any of the laws of physics and chemistry […] organisms have many characteristics that are without parallel in the world of inanimate objects. The explanatory equipment of the physical sciences is insufficient to explain complex living systems […] The phenomena of life have a much broader scope than the relatively simple phenomena dealt with by physics and chemistry [...]*".[34]

According to Mayr, the following are properties exclusive to living beings: complexity and organization; chemical singularity; quality; uniqueness and variability; presence of a genetic program; historical nature; natural selection; and indeterminacy (randomness, non-predictability). To these, we might add, normal and pathological functioning,[35] and information processing.[36]

A radical paradigm shift, has indeed taken place in biology along the past 60 years, starting with the discovery of the structure of DNA. Matter-based explanations were increasingly replaced by informational/semiotic views, as we have discussed elsewhere.[37] From this point onwards, the language of biology became thoroughly impregnated with the lexicon of information/communication theory, and hardly one will read a piece on molecular biology (!) appealing to the physical and/or chemical interactions of matter.

Contrariwise, the scope of informational/semiotic biology has not ceased to increase from the macro-ecological to the minutest intracellular events, where sometimes it seems as if phenomena would be restricted to up/down-regulation of gene/protein transcription/expression. The publicity given to the discovery of the structure of the human genome, as well as the development of the 'omics' field (genomics, proteomics, transcriptomics, and so forth) demonstrates this point. To illustrate the common understanding held by present-day scientists about the phenomena of life, rather than quoting from the specialized literature (which is enormous and thus unquotable), let us show how molecular biology is represented for the lay in a blog published by graduate students to make medical concepts and news understandable to a general audience:

> "*Molecular biology is a branch of science concerning biological activity at the molecular level. The field of molecular biology overlaps with biology and chemistry and in particular, genetics and biochemistry. […] The specific techniques used in molecular biology are native to the field but may also be combined with methods and concepts concerning genetics and biochemistry, so there is no big distinction made between these disciplines. Molecular biology looks at the molecular mechanisms behind processes such as replication, transcription, translation and cell function. One way to describe the basis of molecular biology is to say it concerns understanding how genes are* ***transcribed*** *into RNA and how RNA is then* ***translated*** *into protein.*"[38]

Although it falls outside of the scope of the present study, it is worth noting that this paradigm shift has also modified fundamental research on the biological action of homeopathic medicines, as the latest reviews on this subject show.[39,40] In any case, we are definitely very far from the matter-force view of the world that prevailed in Hahnemann's time, and which many homeopathic practitioners and theoreticians still believe to be the one that prevails in modern biology.

Conflict of interest

None.

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