

# Vitalism and Vital Force in Life Sciences – The Demise and Life of a Scientific Conception

Gunnar Stollberg, Bielefeld Institute for Global Society Studies<sup>1</sup>

There is no clear shape of vitalism. The term itself has not been used before the 19<sup>th</sup> century. At that time, its history was traced back to Aristotle, and older and newer forms became differentiated. Looking from a today's perspective, vitalism can be defined as a theory of life in the life sciences (natural philosophy, natural sciences, and medicine) that debates life in relation – not necessarily in opposition – to physics and physicalism, which reduces all life activities to physical phenomena. Vitalism developed in three phases:<sup>2</sup> The first one is covered by Georg Ernst Stahl's (1660 – 1734) *animism*. The second one is the conception of a vital force (life force), dating from the 1770s to the 1840s. In the third one life was conceptualised as an organising power. Though the protagonist of this last phase, the German biologist and philosopher Hans Driesch (1867 – 1941) traced his conception back to Immanuel Kant (1724 - 1804), he discussed his vitalism as a new one, opposing the conception of a vital force as well as physicalist conceptions. Vitalism demised in the first decade of the 20<sup>th</sup> century, when physicalism gained its victory in biology, medicine and other life sciences during the course of the 19<sup>th</sup> century. Meanwhile the latter forms the basic conception even in the philosophy of mind.<sup>3</sup> Thus, vitalism is a knowledge rejected by mainstream life sciences. Nevertheless we can still find it today. This is literally true for homoeopathy, where Hahnemann's (1755 – 1843) conception of a vital force has been modified just slightly. But also the conception of self-organisation (*autopoiesis*), which is prominent in biological and sociological systems theory, got theoretical connections to vitalism. There is a life of vitalism after its demise one century ago.

Many vitalist conceptions used Aristotelian categories of development and life. Thus I am going to outline these categories, before sketching the phases of vitalism. In his *Metaphysics* Aristotle (384 - 322) made a difference between *dynamis* (Latin *potentia*) and *energeia* (or *entelecheia*; Latin *actus*). *Dynamis* meant a matter that was prone to be formed, *entelecheia* the moulding principle. This dichotomy could be adapted to many natural and social phenomena. In *On the Origin of Animals* Aristotle treated the question, how the parts of the

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<sup>1</sup> Most of the research work for this article I could do during my fellowship at the Hanse Institute for Advanced Study at Delmenhorst.

<sup>2</sup> I am following Mocek (1998), who differentiated three varieties of vitalism: Aristotle saw *entelecheia* as a forming power. For the German physician Georg Ernst Stahl the *anima* brought matter to life, while Hans Driesch, the last vitalist biologist and philosopher, saw *entelecheia* as an organising power.

<sup>3</sup> Cf. Newen/ Vogeley 2000.

embryo come into being. The heart is the first visible part; the liver develops later on. But does the latter develop from the first? Here the difference of *dynamis* and *entelecheia* becomes important: The heart and the liver develop from the female semen or matter, but are shaped by the male semen. The latter is the *entelecheia*, which moulds the matter according to its *dynamis*. Regarding the human beings, Aristotle wrote in *On the Soul* that the soul is the first *entelecheia* of a natural body, which is a living body by its *dynamis*. Aristotle called life and its principle soul (*psyche*). He differentiated it into a soul of plant and nourishment (*psyche threptike*), a soul of animal and perception (*psyche aisthetike*), and a soul of man and reason (*psyche noetike*).

By the end of 19<sup>th</sup> century, Hans Driesch used the term *entelecheia* to construct a theory, which opposed the explanation of life by physics and chemistry. Driesch called this theory teleological or – since 1899 – vitalist (cf. Mocek 1998: 36). He named Aristotle's conception of life a 'mere vitalism' (1905: 19).

In this paper, I will firstly sketch vitalism in life sciences during the 18<sup>th</sup> (I) and 19<sup>th</sup> centuries (II). Then I will outline the transformations of vitalism in 20<sup>th</sup> century (III), and finally give an outlook to the heirs of vitalist thought today (IV).

I. Georg Ernst Stahl performed a Pietist medical *instauratio scientiae*. His reunion of faith and (natural) science was directed against the Cartesian tradition. Descartes (1596 – 1650) had aimed at proving that he could exist without his body. He used to differentiate between a bodily and a merely mental or spiritual ego. But when radicalising his argumentation, he drew a clear distinction between his mind, the *res cogitans*, and his body, the *res extensa* (cf. Kemmerling 2003). Many authors followed Descartes in his radical position, though he himself admitted that his bodily existence might belong to his essence:

'But may it happen that the thing, which I suppose to be nothing, because I do not know it, in reality do not differ that which I know? I do not know, but I do not discuss about that in the moment (...)' (Oeuvres, vol. VII: 27)<sup>4</sup>

But the Cartesian tradition made a clear difference between body and soul. Stahl discussed with Leibniz (1646 – 1716), Boerhaave (1668 – 1738) and others. Leibniz allocated the connection between material and non-material spheres in his monads (cf. Geyer-Kordesch 2000: 209). Boerhaave clearly divided body and soul. He nevertheless admitted a connection

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<sup>4</sup> Original text: 'Fortassis vero contingit, ut haec ipsa, quae suppono nihil esse, quia mihi sunt ignota, tamen in rei veritate non differant ab eo me quem novi? Nescio, de hac re jam non disputo(...).'

between both of them, which he could not explain (cf. Toellner 1991: 229). Stahl for his part called the living body ‘ an organism, and not a mechanism’ .

‘Every movement in the human body follows a certain purpose. All vital, animalist and rational processes are caused by their finest harmony and their unsolvable connection with a special force. You rightly conclude that it is the soul, which all produces these movements (processes) directly. They may be well ordered or not, have vital or animalist characters, they may preserve the body or destroy it, be correctly guided or not’ (translated from Rothschuh 1978: 294).

This quotation remembers to the Aristotelic tradition of the three souls. But Stahl’s conception was a Christian one, nevertheless:

‘(...) When speaking about the creation of the things, that man was made from the living soul, is it possible not to see in this passage of the *Genesis* that the human soul was really infused into the body, and can we give it another meaning when we keep the literal sense of these words?’ (translated from Geyer-Kordesch 2000 : 172)<sup>5</sup>

This is Stahl’ s famous animism: God realises himself as an active principle, as life. He gave man a vivid soul, which lives in the body. This soul may be regarded as threefold, like Aristotle did; it makes the body alive. From this base Stahl develops a conception of an organised dynamic of matter in living bodies. He criticises Aristotle’ s atomism. From the thesis that the body is assembled from very small parts, results the conclusion that the body consists of these small parts, only. In *De mixti et vivi corporis vera diversitate* (1707) Stahl differentiates between the material structure of the body – which consists of small corpuscles, indeed -, and its ‘ aggregated state’ , which can only be understood in its living order. The bodily matter is heterogeneous. It remains functional only in its vivid aggregation. When the body dies, the matter dissolves into its chemical parts and decomposes. The mixture of matter in the body does not directly result from its environment, but emerges primarily in its own context. The living things reproduce themselves in their own forms. They take food from their environment, but change it into matter naturally belonging to the body. These processes are guided by the soul. Stahl writes in his *Theoria medica vera* (1712):

‘ Man has been made for the living soul (...), namely for that, that it lives: certainly this expression fits to this acceptance, that the soul, which gives life, has been created as a whole, namely which makes the act of life, and conserves the body, and produces in the body and by the body bodily affections and affections of the divine wisdom (...). (quoted from Geyer-Kordesch 2000: 172)<sup>6</sup>

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<sup>5</sup> Original text: ‘ (...) *en parlant de la création des êtres, que l’homme fut fait en âme vivante, est-il possible de ne pas voir dans ce passage de Genèse que l’âme humaine fut réellement infusée dans le corps, et pourrait-on lui donner une autre signification en se tenant au sens littéral de ces mots ?*’

<sup>6</sup> Original text: *Factus est homo in animam viventem (...) nempe in id, propterea, ut viva sit: certe non abludit expressio a tali acceptione, quod holo factus sit Anima Vivifica, nempe quae actum vitae, corporis*

Thus, man is equated to the vivid soul. The soul gives him life, it is life itself, and it develops a vivid activity in the body. In opposition to the Descartes – Boerhaave – tradition, which stresses the mechanical base of body and life, Stahl's position may be called vitalism, because he opposes the thesis that the living body can be reduced to physical corpuscles and their relations or functions. For Stahl, life cannot be explained by the physical parts forming the body, but a living principle is supposed to add life to the matter, to make organisms alive. So Stahl's animism may rightly be called a form of vitalism, after this term had emerged.

II. The conception of a vital force (or a life force, a vital spirit) developed from the contrast between Stahl and Boerhaave. François Sauvages de Lacroix (1706 – 1767) brought Stahl's animism to Montpellier. One of his successors, Paul-Joseph Barthez (1734 – 1806), introduced a *principium vitale* into medical theory in 1772. Christoph Wilhelm Hufeland (1762 – 1836), then a physician to the Weimar court, wrote about a vital force in the 1790s.

These developments started on the background of Brownianism. The Scottish physician John Brown (1735 – 1788) defined life as excitability in 1780. In his *Elementa medicinae* he differentiated life from non-life by its excitability: environmental or internal excitants produced activity and excitement in the body. Every living being got a certain amount of excitement. Brown postulated a normality of excitement in the middle between asthenia and sthenia.<sup>7</sup> The character of the excitability was neither defined as material nor as vital; like Newton's (1643 – 1727) gravity it could be described, but not be defined. The same is true for Johann Friedrich Blumenbach's (1752 – 1840) *vires vitales* (vital forces). The physiologist Blumenbach later became well known for his division of mankind into five races. In the 1780s, he propagated contractibility, irritability and sensibility together with the *vita propria* (the life of the parts of the body) as vital forces, whose character could not be defined. A further vital force is the *nisus formativus*, a natural effort to build forms.

The conception of a life force was introduced into medicine in the 1770s. Before resuming the well-known works of Barthez, Hufeland, and Reil I will sketch that of Friedrich Casimir Medicus (1736 – 1808), who was the first (or one of the first) to use the term. Medicus was trained as physician and became a botanist, who created a botanical garden at Mannheim in 1766. In 1774, he gave a lecture *Von der Lebenskraft* (On the vital force) at the Mannheim

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*conservatorium exercent, et in corpore, per corpus, affectiones corporeas, actiones divinae sapientiae circa affectiones corporeas, agat, agitet, sectetur, recolat, aestimet, et inter haec versetur*'.

<sup>7</sup> Sthenic diseases result from an excessive amount of stimuli, asthenic ones from an amount too small. Brown aimed at measuring the excitability on a scale between 80 and 0.

Academy of Sciences. He started from the question, how the soul could influence the human body, how voluntary movements could come into being (1774: 7). Medicus outlined two main views on this question: Stahl, Sauvages et al. took the soul to cause all movements, while Boerhaave, Albrecht von Haller (1708 - 1777), Friedrich Hoffmann (1660 – 1742) et al. clearly differentiated between the nature of the soul and the body. All bodily movements resulted from physical causes. Medicus went over to non-voluntary movements, and raised the objection against Stahl that the main properties of the soul were thinking and wanting, while things which had not been wanted or which the soul had no conscience of, could not be its actions. This was true for digestion, secretion, for producing blood, for heartbeats, the circulation of blood etc. These performances of animal life could not be actions of the human soul. Medicus looked for opinions common to the Boerhaave and the Stahl currents. For Boerhaave, the liquid of the nerves was a secretion of the marrow cortex of the brain. He called it spirit of life, and the actions of the soul were performed by it. Haller introduced the irritability and declared it to be an innate force. Stahl and his followers postulated a non-material matter to move the matter and bring life into it. A secret force (*vis occulta*) performed the non-voluntary movements of the body. Now Medicus outlined his own thesis:

‘These causes made me to follow up my own opinion, and to suppose a simple substance in addition to the organised matter and the soul; a substance that the creator gave to all organic bodies as a force bringing life into them. This force is in the vegetable and in the animal kingdoms the only force giving life to the organised matter. It is present in the man, too, where it causes all animal, or as other authors express it, all mechanic life. But man has a reasonable soul in addition to this organised matter and to this simple substance, the vital force; a soul that thinks and wants within him. Thus I think the man to consist of two simple substances, a soul and a vital force, and of a third one, of the organised matter.’ (Medicus 1774: 13)<sup>8</sup>

Medicus finally offers three differences between the vital force and the soul: the vital force performs its adequate actions ‘1) without any fatigue, 2) without further development of its forces, and 3) without any conscience of its actions’ (1774: 20)<sup>9</sup>. And where is the vital force situated? In plants, its place is the marrow; in animals and men, it is the brain and the spinal cord (ibid. 24).

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<sup>8</sup> Original text: ‚Diese Gründe haben mich bewogen, einer eigenen Meinung zu folgen, und außer der organisierten Materie und der Seele noch eine einfache Substanz anzunehmen, die der Schöpfer allen organischen Körpern als die belebende Kraft mitgetheilet hat. Diese belebende Kraft ist in dem Pflanzenreiche und in dem Thierreiche das einzige, was die organisirte Materie belebet; in dem Menschen ist sie ebenfalls gegenwärtig, und die Triebfeder des thierischen, oder wie andere wollen, des mechanischen Lebens. Aber außer dieser organisirten Materie und außer der einfachen Substanz, der Lebenskraft (sic!), hat der Mensch noch eine vernünftige Seele, die in ihm denket und will: folglich würde der Mensch, nach meiner Meinung, aus zweien einfachen Substanzen, einer Seele und einer Lebenskraft, und aus der drittern, aus der organisirten Materie bestehen.’

What does this overview of Medicus' s book add to our findings about vitalism? Firstly, Medicus aims at mediating between Boerhaave's physicalism and Stahl' s animism. He does not want to simply further Stahl's theses. Secondly, his differentiation between the soul and the vital force reminds of Aristotle' s threefold differentiation of the soul.<sup>10</sup> Thirdly, Medicus reduced the soul to spiritual effects, while the Aristotelian tradition and Stahl had treated corporeal effects as outcomes of the soul.

Medicus wrote in an intellectual environment, which produced similar conceptions in many ways. Gravitation, magnetism, and electricity were invisible forces much debated at that time, in medicine and in other sciences. Barthez<sup>11</sup> postulated a third *principium agens* besides the soul and the body, the *principium vitale hominis* or the *principe de vie*.<sup>12</sup> He left open, whether it existed independently from the single body, but there was a *harmonie préétablie* between this principle and the bodily organisation. The principle got a system of forces: the *forces radicales* determinate the degree of vitality. *Forces agissantes* activate the single organs. They can be divided into:

1. motor forces, e.g. muscular and tonic forces;
2. sensitive forces, which respond to irritations;
3. forces of the blood, which produce the blood or make it coagulate;
4. forces of heat, which heat the body and keep its temperature;
5. forces of pulsation, which drive the blood from the heart to the ends of the vessels etc.

Barthez' conception of the vital principle as a third entity besides body and soul resembles to Medicus' s. His differentiation of its forces looks for connection to the dynamics of irritation, which was propagated by Haller, Brown and others, but also to Stahl (Barthez' s tonic forces and Stahl' s *motus tonicus*). Today, some of these phenomena are explained in mechanical, others in cybernetic terms. But at about 1800 the vital force became established in medicine as a term of its own, which got many varieties. For Hufeland it was a basic cause of life.<sup>13</sup> He abstained from defining it as a matter of its own or as a property of matter. It produces life, maintains and renews it, cures diseases, and even inflames the forces of mind and soul. It got active and resting forms (e.g. the seed). Death is the loss of vital force, which can be divided into:

1. a force maintaining life;

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<sup>9</sup> Original text: '1) daß sie ohne Ermüdung; 2) ohne fernere Entwicklung ihrer Kräfte; und 3) ohne alles Bewußtsein die ihr angemessenen Handlungen verrichte'.

<sup>10</sup> But Aristotle just shortly reflected about respiration, the movement and the soul (*On the Soul* I, 2).

<sup>11</sup> I follow Rothsuh 1978: 323ff.

<sup>12</sup> *De principio vitali hominis* (1772). *Nouveaux éléments des la science de l'homme* (1778).

<sup>13</sup> I follow Rothsuh 1978: 332ff..

2. a plastic force, which produces the organism and regenerates it in diseases like inflammation;
3. a force of the blood, which produces the foetus and maintains the life of the parts of the body;
4. by the vital force the organism can perceive irritations in all its parts;
5. the force of the nerves enables the function of the nerves and of the brain;
6. by the affection of the nervous force the soul can have effects on the body;
7. the senses got a special irritability for light or sound, the heart for the blood, the liver for the bile etc.

Hufeland defines life as the freely effective state of the vital force. ‘Vital force is just potency; life itself is action’:<sup>14</sup> here the Aristotelian tradition becomes obvious. The other differentiations resemble to Barthez’ s ones. Both of them abstain from fixing the character of the vital force respectively the vital principle, which forms a third entity besides body and soul. Both the authors look for connections with conceptions of irritability, and they define several forms of the vital force.

Unlike Barthez and Hufeland, Johann Christian Reil (1758 – 1813), a professor of medicine at Halle/ Saale, debated the character of the vital force.<sup>15</sup> Reil firstly denied the existence of a life force independent from matter:

‘We seek the ground of animal appearances in a suprasensible substrat, in a soul, in a universal world spirit, in a life force, which we think of as something incorporeal, and in that way we are restricted in our investigations or else are led into error’ (Reil 1796: 4, quoted from Le Roy 1985: 113).

Reil secondly stressed the role of organisation in the animate realm: ‘To the formation of the substance of animate beings we have given a specific name *organization* on account of its excellent perfectness. *Organ and organization is thus formation and structure of animate bodies ...*’ Now Reil defines force in general, and lists five types of force:

‘The relation of the phenomena to the properties of matter through which they are generated I name force (...). The word

1. *Physical force* indicates: the most general manifestations of matter and its relation to more general properties that we meet both in inanimate and animate nature.
2. *Vital force* indicates the relation of more individualized phenomena to a special kind of matter which we encounter only in living nature (...) Besides we cannot offer any genetic definition of this force as long as chemistry has not made known to us more exactly the elements of organic matter (...) we never meet in nature a simple matter which has life, but find it always only in the known combination with visible substances, because life expresses itself through so very different phenomena (...) through alteration of the visible matter, or by addition of different substances, electricity, heat, oxygen, opium, etc. we can now raise, now lower the vital force.
3. *Vegetative force* and its product *plant life* (...)

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<sup>14</sup> *Die Kunst, das menschliche Leben zu verlängern*, Wien/ Prag 1797, translated from Neumann (in: Engelhardt/ Hartmann 1991) I: 353.

<sup>15</sup> *Von der Lebenskraft* (On the vital force), 1796.

4. *Animal force* (...)

5. Finally remains the *faculty of reasoning* which is peculiar only to man.

(...) *The forces of the human body are thus properties of its matter, and its special forces are results of its specific matter* (quoted from Teich 1992: 441 f.)

Reil 'sought to define the place of the organic body in the physical world through chemistry' (cf. Le Roy 1985: 131). Thus he conceptualised the vital force as emerging from the matter. He did not oppose it to physicalism. What is the difference between Barthez's and Hufeland's forms of vital force on the one side, and Reil's on the other? The former two aimed at different manifestations of this force, while Reil aimed at its character common to other 'forces'. While all three of them differ between vegetative and spiritual forces, Reil does not come back to Aristotle's relation of potency and actuality of life, but differentiates between various natural forces. Life he defines as an organisation of animate bodies, and thus takes some steps into the direction vitalism should take since the 1860s.

Hufeland held many controversies with contemporary physicians, but his conception of a vital force was not a subject of them. This is the case also for Hufeland's dispute with Samuel Hahnemann, who conceptualised homoeopathy. His *Organon der Heilkunst* was first published in 1810.<sup>16</sup> With Hufeland he argued since the 1790s. Does his conception of a vital force differ from Hufeland's? Hahnemann wrote:

§ 9 In the state of health the spirit-like vital force (*dynamis*) animating the material human organism reigns in supreme sovereignty. It maintains the sensations and activities of all the parts of the living organism in a harmony that obliges wonderment. The reasoning spirit who inhabits the organism can thus freely use this health living instrument to reach the lofty goal of human existence.

§ 10 Without the vital force the material organism is unable to feel, or act, or maintain itself (...) Without the vital force the body dies; and then, delivered exclusively to the forces of the outer material world, it decomposes, reverting to its chemical constituents.

§ 11 When man falls ill it is at first only this self-sustaining spirit-like vital force (vital principle) everywhere present in the organism which is untuned by the dynamic influence of the hostile disease agent.' (Hahnemann 1989: 14ff.)

So Hahnemann contents himself with one side of Aristotle's contrast of *dynamis* and *entelecheia*. And he is clearly engaged with one side in the controversy between physicalism and vitalism. Hahnemann's vital force differentiates the living body from the dead one, which just consists of its chemical components.

§ 11a ' (...) the dynamic force with which pathogenetic influences act on healthy individuals and the *dynamic* force with which medicines act upon the vital principle to restore health are nothing but a contagion devoid of any material or mechanical aspect. A magnet powerfully

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<sup>16</sup> As *Organon der rationellen Heilkunst*. Hahnemann published five editions and made further corrections up to 1842.

attracts a piece of iron or steel near it in a similar way (...). The invisible force of the magnet does not need any mechanical (...) means (...). We have here a *dynamic* phenomenon (...). The influence of medicines upon our organism is exerted *dynamically* (...), without the transmission of the slightest particle of the material medicinal substance.’ (Hahnemann 1989: 16-18)

Unlike Hufeland, Hahnemann does not aim at a description of the vital force in different regions of the body etc. Unlike Reil, he characterises it as a spirit-like, non-material force. Unlike Medicus, Hahnemann does not want to reconcile physicalism and vitalism or animism. His point of view is clearly that of anti-physicalism, and he stresses the non-material aspects of homoeopathic drugs. The comparison with the forces of magnetism was modern in his times, when Franz Anton Mesmer’s (1734 – 1815) curing by ‘animal magnetism’ was a popular way of curing. But in contrast to Mesmer, Hahnemann stresses the non-material character of magnetism.<sup>17</sup> Hahnemann’s vitalism is firmly anti-materialist.

In 19<sup>th</sup> century, the quarrel between physicalism and vitalism was continued in the field of morphology. Some paragraphs of the *Critique of Judgement* (1989/ 1790) by Immanuel Kant regulated much of the debate. Here I cannot give a detailed overview (cf. Driesch 1905: 62-81; Lenoir 1982: 17ff.; Mocek 1998: 52ff.; Krohn/ Küppers 1990; 1992). Kant aimed - in contrast to Aristotle - at differentiating teleology between natural sciences and ethics. The last part of his *Critique of Judgement* is dedicated to the *Critique of Teleological Judgement*. Kant propagated a difference between nature and freedom. Judgement he defined as the ability to acknowledge the particular being included in the general. The experience of nature required a principle of expediency, which was attached to human experience, and not to nature. But Kant’s reflections on natural expedience reached beyond the original question. Descartes had assumed god to be the general cause of movement, and Newton had presumed a supernatural force to extend gravitation all over the world (cf. Krohn/ Küppers 1992: 33, 36). In contrast, Kant took nature to be run by a dynamic equilibrium, while life was governed by three forces on three levels: the biogenesis by a vital force, the ontogenesis by a drive to formation, and the phylogenesis by a developmental force. Sentences like ‘(...) a thing exists as a physical end if it is (...) both cause and effect of itself’ (Kant 1989/ 1790: II, 18) firstly can be taken as an early and almost complete argument of self-organisation (cf. Krohn/ Küppers 1992: 45); secondly they kept their influence on morphological discussions for several decades to come (cf. Mocek 1998: 74ff). Many natural philosophers like Isidore Geoffroy St. Hilaire (1805 – 1861), Johann Wolfgang von Goethe (1749 – 1832), and Richard Owen (1804 – 1892) tried to

find one basic plan of animal morphology, which went through many metamorphoses.<sup>18</sup> New conceptions of morphology, represented by Wilhelm His (1831 – 1903), Wilhelm Roux (1850 – 1924), and Hans Driesch (1867 – 1941) emerged since the 1860s. I will return to this point later on.

The conception of a vital force was part of the morphological discussions of the early 19<sup>th</sup> century. I already mentioned Blumenbach's *nisus formativus* (1789). In his embryology, the zoologist and anatomist Karl-Ernst von Baer (1792 – 1876) regarded the vital force 'as expressed in a certain order and relationship among materially related parts'. (...) On the other hand, in his discussion of the mammalian ovum von Baer on occasion employed a notion of *Lebenskraft* that was constitutive and directive' (Lenoir 1982: 159f.). In contrast, the romantic philosopher Friedrich Wilhelm Schelling (1775 – 1854) in 1799 declared the vital force to be a product of a bad reason (cf. Rothschuh 1978: 392):

'The essence of life does not at all consist in a force, but in a free interplay of forces, which is continued by some external influence' (translated from Mocek 1998: 57).<sup>19</sup>

The Leipzig physiologist and philosopher Hermann Lotze (1817 – 1882) strongly criticised the conception of a vital force in 1842. He opposed the physical conception of a force to the physiologist one of a vital force:

'In physics, every force is considered to imply certain masses (...). It is considered to be the cause of the phenomenon by dint of which a thing causes something. But the definition of force as a cause at once produces the error that either force becomes identified with a matter (...) or that causes are perceived as strange existing beings (...) (1842: XIXf.). Rather we conceive the body as a system of (...) physical masses. The course of living phenomena comes from the proportionate single physical forces (...). Vital force we do not assign to this system as the cause of its existence, (...) but as the capability to produce a certain amount of outward achievement, which has to be explained by the relative counteraction in the body. (...) If we follow teleological inductions (...), we shall be able to have a clear look into the complete organisation of this organic mechanism' (XLVIII f.).<sup>20</sup>

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<sup>17</sup> Mesmer talked about a magnetic fluidum, and even the Prussian commission, which should evaluate his activities in 1816, explained the phenomena by a physical agent (cf. Juette 1996: 108). By the way, Hufeland took part in this commission.

<sup>18</sup> Mocek (1998) called this morphological paradigm comparative.

<sup>19</sup> Original text: *„Das Wesen des Lebens besteht überhaupt nicht in einer Kraft, sondern in einem freien Spiel von Kräften, das durch irgend einen äußeren Einfluß kontinuierlich unterhalten wird.“*

<sup>20</sup> Original text: *„In der Physik wird jede Kraft bestimmten Massen inhärent gedacht (...) Daher ist sie dort überall als der Grund der Erscheinung behandelt, vermöge dessen ein Ding etwas wirkt. Diese Definition aber, welche die Kraft als Ursache bezeichnet, bringt sogleich den Irrthum herbei, dass entweder die Kraft mit irgend einem Stoffe identifiziert wird, (...) oder dass Kräfte als eigenthümliche seiende Wesen betrachtet werden. (...) Wir sehen vielmehr den Körper an als ein System (...) physikalischer Massen, aus deren proportionalen physikalischen Einzelkräften (...). Lebenskraft theilen wir diesem System nicht als den Grund (...) seiner Existenz zu, (...) sondern nur als eine Fähigkeit zu einer bestimmten Größe der Leistung nach außen, welche selbst aus den Verhältnissen der Gegenwirkungen im Körper erklärt werden muß. (...) folgen wir jedoch teleologischen*

In the same year, the chemist Justus von Liebig (1803 – 1873) offered a physicalist explanation of the vital force:

‘In the ovum, in the seed of plants, we recognize a remarkable activity, a cause of the increase in mass (...), a force in the condition of the rest. By the means of external conditions, through fertilization, (...) the condition of static equilibrium of this force is removed. In going over into motion it expresses itself in a series of structures, which are quite different from geometrical forms of the sort we find in crystallizing minerals even though they are sometimes enclosed by straight lines. This force is called *Lebenskraft* (vital force).’<sup>21</sup>

Liebig did not oppose the existence of a vital force. But he conceived it as depending from quantitative relations:

‘The quantity of oxygen that has been assimilated by the organ is equivalent to the quantity of *Lebenskraft* lost, and in the same measure an equal portion of the matter is expelled from the organ in the form of an oxygen compound.’ (quoted from Lenoir 1982: 166)

Lenoir (1982: 166) comments upon this quotation:

‘For Liebig the *Lebenskraft* was a kind of potential energy connected with the organization and arrangement of material parts but capable of assuming certain concrete material forms of expression in the structure of the organism itself.’

So in the very same year of 1842 we can observe two different physicalist positions towards the concept of a vital force. The philosopher Lotze strongly opposed it, while the chemist Liebig used it in a physicalist manner. In 1848, the physicist Emil Heinrich du Bois-Reymond (1818 – 1896) pointed to the existence of expediency also in inanimate nature. He expressed his hope to have expelled thereby the vital force from one of its entrenchments (cf. Botsch 1997: 299). New conceptions of physical force, the general physicalist victory in sciences, and Darwin’s evolution theory led to the demise of the vital force. In 1890, *Meyers Konversations-Lexikon* stated that this conception had lost its vitality in favour of mechanist explanations of life (4<sup>th</sup> ed., vol. 10).

In 1904, the natural philosopher J. Reinke differentiated between an old and a new vitalism.<sup>22</sup> The old one he characterised by the conception of a vital force; the new one, which he also called *finalism*, was about ‘the immanent forces, which build the organism itself’ (translated from Reinke 1904: 589).<sup>23</sup>

Morphology became a new field of vitalist thought, and this way led to conceptions of self-organisation, indeed. Wilhelm His, professor of anatomy at Leipzig university, researched

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*Inductionen (...), so werden wir allerdings einen deutlichen Blick in die Gesamteinrichtung dieses organischen Mechanismus thun können.*

<sup>21</sup> Liebig 1842: *Die organische Chemie in ihrer Anwendung auf Physiologie and Pathologie*. Quoted from Lenoir 1982: 163.

<sup>22</sup> See Driesch 1905 for the same division.

about ‘the self-shaping of organic form from the conditions of development and from the movements of growing of the germ’.<sup>24</sup> His results were: ‘The shaping of the form follows the growth shaping the embryological material’ (cf. Mocek 1998: 120). Roux, professor at Halle/Saale, called his research ‘mechanics of development’ (*Entwicklungsmechanik*). It was about self-differentiation, e.g. of the egg,<sup>25</sup> about functional adaptation as a self-organisational action etc. Hans Driesch, a biologist who changed over to philosophy, discussed the fact that damaged parts of animals (e.g. the intestinal of marine animals) could reconstruct the full part by themselves. He reformulated the problem in philosophical terms: ‘that and how order can reconstruct itself from disturbed order’ (Driesch 1895, translated from Mocek 1998: 315).<sup>26</sup> This ability called Driesch ‘prospective potency’, and regarding this potency he spoke of self-regulation and of vitalism:

‘If we look at the kinds of formative stimuli we know, we cannot find a sufficient cause for the reconstruction of the intestine of the larvae cut up, which consists of three members, in its correct proportions. This reconstruction in its correct proportions rather refers to an event that it not mechanical by principle, but rather specifically vital’ (Driesch 1899; translated from Mocek 315).<sup>27</sup>

Driesch looked for terms describing his thoughts.<sup>28</sup> The prospective potency to produce the whole parts he also named after the Aristotelian term *entelecheia*. He talked about four forms of causality: the *mechanical* causality, which is directed towards the sequence of singular states; the causality forming things, that one forming changes, and finally the causality forming whole entities by entelechy. Looking from a today’s perspective, Mocek (1998: 403ff.) stresses that Driesch has reached a state of the argument, which could be continued by systems theory. Ludwig von Bertalanffy (1901 - 1972) and today Gerhard Roth produced partly new views, but certainly a new terminology for the problems Driesch had discussed before. Driesch’s holistic causality could be replaced by systems causality.

What can I resume about vitalism at the end of 19<sup>th</sup> century? In the first decade of the 18<sup>th</sup> century the physician Stahl had developed a conception of the *anima vivifica*, the life-

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<sup>23</sup> Original text: ‚die immanenten Kräfte der Selbstbildung des Organismus’ .

<sup>24</sup> His: *Untersuchungen über die erste Anlage des Wirbelthierleibes. Die erste Entwicklung des Hühnchens im Ei* (Studies about the first structure of the body of vertebrates. The first development of the chicken in the egg). Leipzig 1868; cf. Mocek 1998: 109f.

<sup>25</sup> In 1892; cf. Mocek 1998: 235.

<sup>26</sup> Original text: ‚dass und wie sich aus gestörter Ordnung Ordnung wiederherzustellen vermag’.

<sup>27</sup> Original text: ‚In dem hier geschilderten Geschehen lässt sich für die proportional-richtige Dreigliederung des Darmes der zerschnittenen Larven ein zureichender Grund unter den von uns gekannten formativen Reizarten nicht ausfindig machen; jene proportional-richtige Gliederung weist vielmehr auf eine Geschehensartprinzipiell-nicht-maschineller spezifisch-vitaler Art hin.’

<sup>28</sup> Weber (1999) discusses Driesch’s argumentation from a logical perspective. He criticizes Driesch for a ‘metaphysical postulate’ that cannot be proven by empirical facts. – Dix (1968) had argued in favour of a ‘vitalistic principle’ explaining the ‘drive toward the maximum benefit’ in theoretical thoughts.

producing soul. In the 1770s, Barthez and Medicus split Stahl's soul into the (modern mental) soul and a principle of organic life. This triangle of body, soul, and life force resembled to Aristotle's three souls. The conception of a life force became prominent. In medicine, Hufeland at about 1800 reshaped the vital force using Aristotle's dyad of a potency (the life force) and an act (the life). Reil defined life as the organisation of animate bodies. Hahnemann stressed the non-material character of the vital force. In philosophy, Kant differentiated between a self-organised equilibrium in inorganic nature, and a triad of forces producing life. Schelling saw life as resulting from a free play of various forces. By the 1840s, the physiologist and philosopher Lotze criticised the biodynamical conceptions propagating physicalist explanations of life. He opposed any vital force. But the chemist Liebig, a leader of the physicalists, used this term in a physicalist sense. Nevertheless, the manifold and vague term vanished at that time, and a new stage of vitalist thought started since the 1860s. Morphologists like His, Roux, and Driesch did research work in the field of self-organising causality forming whole biological entities. For this causality Driesch used Aristotle's term *entelecheia*, and for his morphological theory he took up the term vitalism.

III. The conception of a vital force had been developed in Germany and in France by the last quarter of the 18<sup>th</sup> century. In Germany, it demised by the second half of the 19<sup>th</sup>. In France, the catholic philosopher Henri Bergson (1859 – 1941) revitalised the vital force as *élan vital* in 1907.

The German philosopher Arthur Schopenhauer (1788 – 1860) had radicalised Kant's individual approach to cognition. He took the universe as a result of personal imagination. Intention was an experience of personal identity; a blind impulse to exist, which could never be satisfied.<sup>29</sup> Bergson adopted this conception in his evolution theory.<sup>30</sup> He interpreted reality from the unity of life. The basic power of this life, the *élan vital*, wrestled with matter, and thus always produced new creatures. This perpetual *évolution créatrice* resisted against the tendency towards solidification or petrification, which would finally result in matter. The character of this movement as a whole could not be analysed like nature, but be perceived by philosophical intuition, by the spiritual energy of man, because it had got spiritual qualities.<sup>31</sup> Bergson grasped evolution in its tension between virtuality and actuality. In this he resembles to Aristotle's conception of *dynamis* and *entelecheia*. On the other hand he resembles to

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<sup>29</sup> *Die Welt als Wille und Vorstellung* (The world as intention and imagination), 1819.

<sup>30</sup> Cf. *L'évolution créatrice*, 1907.

<sup>31</sup> In 1866 the astronomer and popular scientist Camille Flammarion (1842 – 1925) had argued in a similar way regarding the human *intelligence créatrice*: In *Dieu dans la nature* (God in nature). Cf. Reinke 1904 : 600.

Hegel's *Phenomenology of Mind*, because man is the cause of all this development. The *élan vital* only succeeds in the descendance of man (cf. Deleuze 1989: 133). The matter forms part of its creation. It is a tool of imagination, of freedom; a mechanism, which triumphs over determinism of nature (cf. Deleuze 1989: 135). The *élan vital* is the moving principle of evolution (cf. Meyer 1964: 49f.). Evolution is neither a prestabilised harmony (Leibniz), nor is it blind (cf. Jankélévitch 1959: 138).

In the paragraph especially dedicated to the *élan vital*, which he also calls *élan original de la vie* (Bergson 1962: 88), Bergson discussed the limitations of both the mechanist and the finalist approach.<sup>32</sup> He stressed upon the organisation as a fabrication. For an example he took the eye as an organ of seeing. From this example he concluded that

- life is a tendency to act or raw matter,
- life is contingent, it got more than only one possible actions (1962: 97).

Thus, we return to a point we had left with Reil: what is life? Roux had named his research 'mechanics of development'. The physicist Erwin Schrödinger (1887 – 1961) was engaged in quantum mechanics, before he asked about life. In 1925/26 he had published a new theory of matter, the wave mechanics, which competed the matrix mechanics developed by Werner Heisenberg (1901 – 1976) at the same time.<sup>33</sup> Ten years later Schrödinger propagated (together with the geneticist Timoféev-Ressovsky and the physicist Zimmer, 1935) the theory that every gene was to be looked at as a macromolecule. Another ten years later (1944/46), in 'What is life?' he reflected about the contrast between physics and biology. The first one sees order to be created from disorder (statistical mechanism). The second one sees order to be created from order (dynamic mechanism). But Schrödinger reconciled the contrasting devices by a theory of Max Planck: dynamic laws, which pertain to physical phenomena, can explain statistical laws, which pertain to biological phenomena. Thus for the physicist Schrödinger life was shaped by an indirect form of physical laws. This position resembles to the Lotze – Liebig – line I have sketched above.

IV. But Driesch's morphology, which he had called vitalism, did not simply demise in the first half of the 20<sup>th</sup> century. It was indirectly taken up the theory of self-construction

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<sup>32</sup> For finalism, see my remarks on Reinke, above.

<sup>33</sup> Later on, Schrödinger offered mathematical evidence for the equivalence of his approach and Heisenberg's. For the observer exists the phenomenon, that microphysical objects (they consist of one or several elementary parts) can be described as waves *or* as corpuscles.

(*autopoiesis*) in the 1980s. The Chilean biologists Humberto Maturana and Francisco Varela looked at the development of living systems trying to bring together mechanicism and the Darwinian perspective on biological diversity. I am sorry for the long quotation following; but here Maturana and Varela construct a historical genesis of their efforts, which is important for our historical overview:

‘In the search for an understanding of autonomy classic thought, dominated by Aristotle, created vitalism by endowing living systems with a non-material purposeful driving component that attained expression through the realization of their forms. After Aristotle (...) the history of biology records many theories, which attempt (...) to encompass all the phenomenology of living systems under some peculiar organizing force. However, the more biologists looked for the explicit formulation of one or other of these special organizing forces, the more they were disappointed. (...) mechanicism gradually gained the biological world (...). Darwinian thought (...) has shifted (...) the emphasis in the evaluation of the biological phenomenology from the individual to the species (...). Today the two streams of thought represented by the physicochemical and the evolutionary explanations, are braided together (...). The ever present question is: ‘What is common to all living systems that we qualify them as living’ ; if not a vital force, it not an organizing principle of some kind, what then?’ (Maturana & Varela 1980: 74f.)

For our context it is important to realise that Maturana and Varela identify vitalism with the conception of a vital force. In biology, this conception had demised by mid 19<sup>th</sup> century, indeed. They are also correct in stressing the paradigm shift from the individual to the species. But they ignore the tradition in morphological thought I sketched above, a tradition reaching from Blumenbach, Reil, and Kant at about 1800 to His, Roux and Driesch towards the end of 19<sup>th</sup> century; these authors had conceptualised nature and life as organisation and self-organisation. Their tradition becomes evident when we look at Maturana’s and Varela’s conception of living machines:

‘An autopoietic machine is a machine organized (defined as a unity) as a network of processes of production (transformation and destruction) of components that produces the components which: (i) through their interactions and transformations continuously regenerate and realize the network of processes (relations) that produced them; and (ii) constitute it (the machine) as a concrete unity in the space in which they (the components) exist by specifying the topological domain of its realization as such a network’ (Maturana & Varela 1980: 78f.).

Driesch’s question about the echinus cut up I quoted above is similar to this modern conception of a living machine. Here I cannot go into details like the difference between Bertalanffy’s open and Maturana’s closed systems. Maturana’s autopoietic conception has widely been accepted not only in modern biology, but also in social sciences. Basing on Talcott Parsons’s (1901 – 1979) theory of a society being composed not by action or by men, but by a number of subsystems controlled by logics of their own, Niklas Luhmann (1927 – 1998) introduced the autopoiesis of these social systems (1984). He clearly divided the non-

autopoietic physical systems from biological, psychological and social systems. The latter ones, like economy, politics, families, sports etc. and the society as a whole consist of communications (or of mutual expectations) and operate in a principally autonomous manner.<sup>34</sup> They emerge by evolution, and they reproduce themselves in an autopoietic way.

Systems theory looks at evolution, organisation and autopoiesis. In these points it comes close to the morphological conception, which Driesch had called vitalist. There are at least two other modern philosophical conceptions, which take up other aspects of vitalist tradition: Hans Jonas's living body as the centre of ontology, and Robert Spaemann's and Reinhard Löw's renaissance of teleology.<sup>35</sup>

Hans Jonas (1903 – 1993) became well known for his *Imperative of Responsibility* (1979). Modern technology has challenged the survival of mankind. Thus the new categorical imperative will be: 'Act so that the effects of your action are compatible with the permanence of genuine human life' (Engl. version 1984, foreword). These theses made a deep impact on the German Green party. In *Organism and Freedom* (1973), Jonas, who had been a pupil of Martin Heidegger, put the living body into the centre of a new ontology. The history of human thought may be conceptualised as a panvitalism in early stages of mankind. The Renaissance put panmechanism in its place. But his living body refers man to a third position: 'The body lives and can die, has a world and forms part of it, can be felt and feel itself. Its outward form is organism and causality, its inner form is being a self and finality – This body is the memento of the still unsolved question of ontology: what is being? And it must be the canon of future attempts to solve this question, which go beyond particular abstractions, and get closer to the hidden cause of their unity by striving for an integral monism on a higher stage.' (translated from Jonas 1973: 33)<sup>36</sup>

This position takes up German philosophical thought in anthropology.<sup>37</sup> Because it debates mechanicism and vitalism, and puts life into a crucial point of ontological thought, it can be regarded as a form of vitalism.

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<sup>34</sup> Luhmann (1984: 298 fn.13) criticized Maturana for not differentiating social from living systems.

<sup>35</sup> Some dictionaries claim also Jacob von Uexküll (1864 – 1944) and Viktor von Weizsäcker for vitalist positions. But Uexküll stresses upon the subjective cognition of the world; he does not comment on vitalism. And Weizsäcker called Driesch's vitalism 'a naïve false solution': 'I did not aim at overwhelming mechanicism, but to frame it by a higher conception of nature' (cf. Henkelmann 1986: 46).

<sup>36</sup> Original text: 'Der lebendige und sterbenkönnende, welt-habende und selber als Stück zur Welt gehörige, fühlbare und fühlende Körper, dessen äußere Form Organismus und Kausalität, und dessen innere Form Selbstsein und Finalität ist – er ist das Memento der immer noch ungelösten Frage der Ontologie, was das Sein ist, und muß der Kanon kommender Lösungsversuche sein, die sich über die partikularen Abstraktionen hinaus dem verborgenen Grunde ihrer Eigenheit annähern und also jenseits der Alternativen einen integralen Monismus auf höherer Stufe wieder anstreben müssen.'

<sup>37</sup> Scheler's 'The position of man in cosmos' and Plessner's (1892 – 1985) 'The states of the organic and the man' have both been published in 1928. In 'Philosophical Anthropology' (1970) Plessner meditated about the difference of the living body (in German *Leib*) and the dead one (in German *Körper*). Man has and is a *Leib*.

In 1981, the German philosophers Robert Spaemann and Reinhard Löw pled for a renaissance of teleology. Their history of teleological and anti-teleological thought from Platon and Aristotle via Descartes, Leibniz, Kant and the German idealism to its destruction by Nietzsche and Darwin leads into an anti-criticism: causal explanation, system and information, matter etc., and especially consciousness, morality and just life cannot be conceptualised without teleological terms.

‘(...) the great, complete program of evolution, which should put an end to teleology forever and on all levels, is surrounded by a teleological horizon, which also covers its physicist terminology’ (translated from Spaemann & Löw 1991: 260)

This is especially true for life:

‘Understanding of life can just go the other way round: the only certain criterion for life is our own performance of life (...)’ (1991: 255)<sup>38</sup>

In this point Spaemann and Löw meet Jonas’ s thinking about the living body.

Besides systems theory and philosophical anthropology there is a third modern form of vitalism. This is the homoeopathic holding to Hahnemann’s conception of a vital force. I have characterised Hahnemann’s conception as differing from most of his contemporaries (Medicus, Reil, Mesmer) by stressing the non-material essence of the vital force. While Hahnemann was an anti-physicalist theorist, modern homoeopathic theory tries to become compatible with natural sciences.

George Vithoulkas (born in 1932), a Greek homoeopath, prominently has shaped modern homoeopathic theory. He took up the conception of a vital force, but he modernised the Hahnemann tradition. The vital force he took as a mechanism of defence against illness. From Hahnemann’s conception Vithoulkas quoted rather shortly (1986: 71ff.), going over to a long quotation from James Tyler Kent (1849 – 1916), a famous American homoeopath. In his *Lectures on Homoeopathic Philosophy* (1900) Kent called energy a strong substance talented with intelligence. He differentiated between a realm of thoughts and a realm of material substance. The latter is governed by clearness and harmony. But we are ‘able to understand the intimate and deep nature of existence’ (74). The principles of homoeopathy belong to this realm of thoughts, of causes. Men exists on three levels, on the bodily, the emotional, and the spiritual level. Vithoulkas now changes over from Kent to the modern theory of

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<sup>38</sup> Original text: ‘(...) daß das große, vollständige Evolutionsprogramm, welches der Teleologie für immer und auf jeder Ebene den Garaus machen sollte, bis in seine physikalische Begrifflichkeit von einem teleologischen Horizont umschlossen ist (...)’ – , Verständnis des Lebens kann nur den umgekehrten Weg gehen: das einzig sichere Kriterium für Leben ist unser Selbstvollzug des Lebens (...)’

electromechanical fields.<sup>39</sup> The field of an organism is connected with changes on the bodily level. This true for both the other levels, too.<sup>40</sup> Vithoulkas summarises:

‘There is a spirit-like vital force, which enlivens and penetrates all levels of human organism. It expresses itself (...) as a mechanism of defence. As its primary instrument appears the biological - electro dynamical field, as discovered by modern biology.’ (translated from p. 80)

Vithoulkas developed a vitalist conception of his own. Every body got a frequency of its own. Homoeopathic drugs operate by the interaction (resonance) of their electromagnetic field with that of the body. This process can be strengthened by potentialising the drugs (114).

### *Conclusion*

Vitalism is not a homogenous concept. Its unity was constructed as late as by the end of 19<sup>th</sup> century. In the 1710s, Stahl conceptualised life as the realisation of God in the human soul. He reshaped Aristotle’s term by making the soul the principle of life. In the 1770s, Stahl’s animism and partly Boerhaave’s physicalism were transformed into a medical conception, which divided Aristotle’s threefold principle of life/ soul into a bodily vital force and a mental soul. Some authors opposed this vital force to matter (Hahnemann); others saw the first to emerge from the latter (Reil). A third group (Blumenbach, Hufeland) rejected to define the character of the life force.

The vital force became part of morphological discussions in physiology. Though it was compatible with physicalism (Liebig), it vanished from the stage since the 1840s. Physicalism and evolution theory administered its euthanasia. Morphology took up the term vitalism by the end of 19<sup>th</sup> century. The conception of biological self-organisation had been formulated at about 1800. By 1900 it was re-formulated and called a new stage of vitalism (Driesch).

The first decades of the 20<sup>th</sup> century saw conceptions of life (Bergson), which followed on Kant, Hegel and Schopenhauer. Others took up the contrast between physical and biological explanations (Schrödinger). In the 1980s, an autopoietic conception of life emerged, which claimed physicalism and Darwinism as its ancestors (Maturana/ Varela). Opposing the tradition of a vital force, it ignores similarities to morphological vitalism (Kant; Driesch).

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<sup>39</sup> The theory of an electromechanical field has first been described by James Clerk Maxwell in the 1860s. Hertz proofed the existence of such waves experimentally in 1887. Fields became a prominent metaphor in physics. The conception was transferred to psychology by Max Wertheimer in his explanation of selective viewing. W. Köhler took it up when developing the thesis of an isomorphy of the fields of perception and physical nature. Though Vithoulkas’s thesis comes close to this isomorphy, he does not mention the psychological field theory. Rather he refers to biological fields, quoting from S. Burr, *The Fields of Life*, New York 1972. Field theory had been prominent in molecular biology in the 1930s (cf. Haraway 1976: 154ff.). But Burr’s conception seems to be allocated in the margins of modern biology.

<sup>40</sup> Vithoulkas indicates the changed strength of fields from persons suffering from schizophrenia and alcoholism.

Besides this autopoietic concept, today we got two other resumptions of vitalism: the (German) philosophical anthropology (Plessner, Merleau-Ponty, Jonas) and the homoeopathic tradition (Vithoukas).

The conception of a life force demised by the 1840s, though it was partly compatible with physicalism. The latter became the dominant paradigm, and it constructed a myth of victory by refutation. In 1890, *Meyers Konversations-Lexikon* (4th ed., vol. 10) praised Lotze to have refuted life force, which had been the core of vitalism, in 1842 (vol. 17). In 1990, *Brockhaus' Enzyklopädie* (19<sup>th</sup> ed., vol. 13) dated back the first refutation of life force to 1828, when the chemist Friedrich Wöhler (1800 – 1882) produced the organic urea by a combination of the inorganic cyanic acid with ammonia. This myth has been unmasked since 1944 (cf. Teich 1992: 451f.): Wöhler and his contemporaries had not seen the preparation of urea as a refutation of vitalism.

Vitalism has not been refuted by empirical research. Has it been repressed by powerful coalitions of science and politics? I do not think so. The conception of a vital force was abandoned by scientists in the 1840s or later. At that time the perspective changed from individual life to that of the species, and mechanics became the leading discipline governing industry. The morphological 'new' vitalism did not take up the doctrine of a vital force. On its part, it became ignored by modern autopoietic theory. This ignorance may be due to the splitting of knowledge according to nations and disciplines. But this forms a problem of its own.

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Prof. Dr. Gunnar Stollberg, Faculty of Sociology, University of Bielefeld, Postbox 100 310, D – 33501 Bielefeld.  
 Phone (0521) 106 4618, fax (0521) 106 6020.  
 gunnar.stollberg@uni-bielefeld.de