Part 4

Nineteenth-Century Philosophy

Abstract: In this chapter I examine different sides of the controversies over materialism in Germany, from the *Materialismusstreit* in the 1840s to more epistemologically oriented debates of the 1870s. In the first section, I introduce the metaphysical, religious and political background of the controversy. In the second section, I analyze the connection between materialism and natural science, focusing on Karl Vogt's arguments and the replies by Rudolph Wagner, Hermann Lotze and others, arguing that the latter were inspired by Kantian arguments. In the third section, I show how physiologists of the school of Johannes Müller, namely Rudolph Virchow, Ernst Haeckel and Emil du Bois-Reymond, denied the possible materialistic implications of their science with different arguments. In the fourth section, I examine Friedrich Albert Lange's monumental attempt to deal with the philosophical legacy and meaning of materialism in a framework that was mostly (but not solely) based on Kantian ideas and arguments. I conclude that the "materialism controversy", although loaded with religious and political issues, eventually elicited a fruitful investigation of the epistemological meaning and scope of materialism, which was carried out in connection to the debate on Darwinian biology.

18

Materialism Between Science and Metaphysics

Controversies in Germany (1840s–1870s)

Paolo Pecere

18.1 Introduction

The "materialism controversy" (*Materialismusstreit*) that started in the late 1840s is considered as one of the most important intellectual debates in 19th-century Germany.[1] The discussion was sparked by the thesis, defended in popular writings by Karl Vogt, Jakob Moleschott, Ludwig Büchner and others, that materialism was an implication of contemporary natural sciences, notably chemistry and physiology. This view was described as a materialism of scientists (e.g., Schleiden, 1863: 5) and the phrase "scientific materialism" is still used to characterize it. Nevertheless philosophers, theologians and physicians immediately entered the controversy and the discussion was focused on soul, brain and the domain of different disciplines. Friedrich Albert Lange's monumental *History of Materialism and Critique of its Present Importance*, first published in 1866 and largely reworked for the second edition of 1873–1875, is standardly considered as a break of the controversy. Meanwhile, the development of cell theory, the reception of Darwinism and the controversy started by Emil du Bois-Reymond's 1872 address "On the Limits of Natural Science" added new elements to the discussion.

These German debates are better understood in a broader historical perspective. Since the very notion of "materialism" was introduced by Leibniz in German philosophy, this doctrine was conceived as a revival of the ancient philosophy of Democritus, which denied the existence of

God and the immortal soul, and therefore it was a target of metaphysical and theological attacks. In mid-19th-century intellectual circles, dualism was still considered as the necessary condition for the coexistence of science and Christian religion. Post-Kantian idealists – such as Immanuel Hermann Fichte (1834), who participated the materialism controversy – continued to publish books on the immortality of the soul. Against these views, Karl Vogt (1847: 206) considered the distinction of the soul from the "instrument" of the brain as "nonsense". Jakob Moleschott (1852: 18) claimed that scientific research "rules out the Revelation". Heinrich Czolbe (1856: 8) concluded: "Man is nothing more than a mosaic picture ofdifferent kinds of atoms".

The connection of these theses with contemporary political events was a crucial side issue. Ludwig Feuerbach (1850: 1074) considered Moleschott's 1850 *Theory of Food* (*Lehre der Nahrungsmittel*) as a proof of the "universal revolutionary meaning of natural science" and even connected the failure of the 1848 March Revolution to the lack of phosphor in the diet of the German people (1083). Although these political reflections were not logical implications of scientific materialism, the heated context of the 1848–1849 revolutions and the rise of socialism and communism in Europe exacerbated the philosophical and scientific discussion. In reply to Vogt, the physiologist Rudolph Wagner provokingly connected the latter's thesis of the material origin of "spiritual products" to the "political nonsense that individual hotheads promoted in these recent years", described as a "ferment" for the "disintegration of social order and national education" (Wagner 1852: 314). Wagner (1854: v–vi) talked of a "battle [*Kampf*]" against materialism as a matter of defense of State and religion. The use of a harsh language against materialists became common among academics for decades.[2] This produced a worrying context for those who wanted to defend some version of materialism and arguably encouraged the resort to less politically suspect positions.[3] In this regard, it was an irony that "scientific" materialists were also blamed as "vulgar materialists" by Marxists, because they lacked the materialist conception of history.

A further characteristic element of the German context was Goethean pantheism. In *Poetry and Truth*, Goethe reported his disappointment with Holbach's *Système de la nature*,

described as an "empty" and "sad atheist" picture of nature that failed to "build the world with moving matter before our eyes" as it promised to do (Goethe 1977: 10: 537ff.). When Goethe published this intellectual autobiography in 1811–1833, he was already a cultural hero. Against this background, we can understand the popularity of Gustav Fechner's "identity theory", which merged Christian theology, Goethean vitalism and idealism into a view of matter as universally animated, thereby providing both a foundation of psychophysics and a defense of the afterlife. The Goethean criticism of materialism as a theory of dead matter was also typical of Ernst Haeckel, who contrasted materialism with his "monism".

Besides the metaphysical and religious issues, the epistemological problems raised by the controversy led to original results. Vogt was attacked for his allegedly simplistic pretense that science explained mental phenomena as functions of the brain. Even those who sympathized with materialist ideas and rejected the legacy of post-Kantian idealism, such as Friedrich Albert Lange and Emil du Bois-Reymond, designed different arguments against materialist explanations of mental activity, considering this view as metaphysical rather than scientific. Eventually, Lange's Neo-Kantianism and du Bois-Reymond's scientific agnosticism disposed of the theological and political language of earlier critics of materialism and left a considerable legacy for 20th-century investigations on the foundations of natural science.

18.2 Natural Science and the *Materialismus-Streit* (1840s–1850s)

Karl Vogt's *Physiological Letters* (1847) – a popular exposition of recent investigations in chemistry and physiology – are usually considered as the starting point of the materialism controversy. Critical comments especially targeted Vogt's statement that "all those abilities that we understand under the name of activities of the soul are only functions of the brain substance; or, to put it in a certain way here, thoughts stand approximately in the same relation to the brain as bile to the liver or urine to the kidneys" (Vogt 1847: 206). The thesis that thought is a

physiological product was not original, and the metaphor of thought as "secretion" of the brain had been coined in 1802 by Pierre-Jean-Georges Cabanis (1980: 137–138). However, Vogt reported this view with caution. The context of his famous statement needs to be taken into account. In the 12th letter, titled "Nervous force and mental activity", Vogt examined the functions of nerve fluids. He mentioned recent research concerning galvanism, arguing that the latter was different from electricity (Vogt 1847: 204). Then he focused on the function of nerve fluids for the "specialization of stimuli" (e.g., visual or acoustic) and claimed that experiments were on the way of discovering the laws of this process. On the contrary, he added, "it is much more difficult to prove the relationship between this function of the peripheral nerves and those of the central parts which are called the mental operations". To be sure, Vogt claimed that there is a "seat of consciousness, of the will, of thought in the brain", but the operations of its mechanism lay "beyond the range of our actual cognitions" (205). In other words, we know "that" those functions belong to the brain, but we don't know how they operate. We should stick to experiments and drop the theories that boast alleged solutions to the problem, such as Gall's phrenology.

Over the course of the controversy, Vogt's profession of ignorance was obscured, and the bold formulations of other materialists were emphasized. Louis Büchner (1855: 27) maintained that "all the forces of nature and spirit lie in matter" and there find their manifestation, hence "matter is the original ground [*Urgrund*] of all being". Heinrich Czolbe (1855: 106–107) conceived "consciousness as a quality that depends on the structure of the brain", arguing that consciousness, being an activity that turns onto itself, resulted from loops of movements in the brain. Based on such statements, critics attacked the materialist's poor understanding of science. Immanuel Fichte (1855: 112) compared Czolbe's allegedly "self-explanatory axiom" on consciousness to Vogt's "assurance" that the brain produces thought, arguing that he had "searched in vain for even an approximate explanation of how it is possible". According to Fichte (1854: 172), indeed, the explanation of how the movements in the brain become "self-conscious" was "the unsurpassable problem of all materialism". Thus the present limits of

scientific inquiry, that had been recognized by Vogt, were turned into intrinsic limits. On the contrary, the identity of consciousness, the subjective-objective structure of consciousness and the very fact of self-consciousness destroyed materialism and proved the existence of "soul" as different from the organism (175–178).

To be sure, Vogt's ontological materialism – notwithstanding its epistemological caution – was sufficient to deny the immortal soul.[4] Wagner reacted to this challenge making a distinction of two kinds of materialism. The "materialism of exact science" was actually a "frivolous materialism" (Wagner 1852: 314), based on a mistaken view of science. Wagner subscribed to a kind of materialism that had been first formulated in the Bible and consisted in the thesis of the "eternal conjunction of matter and spirit", culminating in the belief in the "resurrection of the flesh". This traditional view – according to Wagner – entailed that "in a certain sense, psychology cannot be materialistic enough" and, being a part of natural science, this science "can progress on a strictly physiological basis alone" (313). Indeed, the investigation of nerves and brain as the "material substratum of psychic activity" could lead to great philosophical accomplishments. Wagner's views were a typical combination of epistemological skepticism and faith. Scientific progress in anatomy and physiology did not produce any danger for the matter of faith, for science and grace concerned "two worlds". In this regard, Wagner invoked the authority of Kepler, Newton and Haller (314–315). A closer model for this approach was Kant.

Vogt's mention of the brain as the organ of the soul touched a problem that Kant had examined in his essay on the anatomist Thomas Sömmering's *On the Organ of the Soul* (1796). Sömmering (1796: 37–38) had maintained that the ventricular fluids in the brain could be taken as the seat of the soul: they were "animated".[5] According to Kant (1900: XII, 32–34), the anatomical and physiological analysis of the "mind" (*Gemüth*, *animus*) was fully legitimate, but the very idea of a seat of the "soul" was contradictory. Not only the soul as substance lay beyond the field of possible experience; it made no sense to localize in the brain "pure consciousness", conceived as the faculty of rational representations, because it followed "a priori principles"

rather than "empirical laws" (31).[6] Wagner (1844: II: 68–69) accepted Kant's criticism of Sömmering's "life force". When he faced Vogt's materialistic revival of the seat of the soul, he asked for the help of Hermann Lotze. Lotze (in the 1846 essay *Soul and Life of the Soul*) defended the separation of thought from its material "conditions", arguing – in Kantian spirit – that "the necessity of the conjunction in a logical syllogism, or in aesthetical and moral evaluation, . . . can never be requested on the basis of a corporeal cooperation [*Mitwirkung*]" (Lotze 1866: II: 144). A kind of anti-reductive view was also formulated by Immanuel Fichte with respect to "consciousness", or the "I", in a philosophical language that was also reminiscent of the transcendental idealism of his father Johann Gottlieb Fichte (Fichte 1854: 63). Transcendental idealism served as a limitation of the domain of science and hence as an antidote to the destruction of religion and morality. According to Wagner (1854: 29–30), the solution to the problem of the organ of the soul did not lie in the empirical field of scientific psychology and anthropology and required a "true dualism". This kind of approach would be reprised and reworked in successive stages of the controversy.

18.3 Materialism Denied: Cells, Souls and the Limits of Science

In the second half of the 19th century, a number of scientists displayed a peculiar attention to the distinction of their own views from those of materialists, especially when the two sounded similar. Nevertheless, some historians have defined their views as materialist. Thus the views of these scientists represent interesting cases in our story. Most of them belonged to the school of physiology initiated by Johannes Müller. Müller himself was certainly not a materialist: in his textbook of physiology, he maintained that a "life principle", or soul, is diffused in the whole organism, and that a "force of organization operates according to rational ideas" (Müller 1840: 107, 506–507).[7] Nevertheless, Müller's belief that physiology had to be philosophical and his

open-mindedness concerning different opinions set the stage for broadly different views among his former students (Otis b).

Rudolf Virchow's conception of living matter is an exemplary case. His progressive political ideas, his direct engagement in the 1848 revolution and his groundbreaking work on cell theory apparently correspond to the profile of a scientific materialist. Virchow represented organisms as state-like communities of elementary parts, the cells, that were capable of self-reproduction. After attending his class in Würzburg, his student Ernst Haeckel wrote to his parents:

> Virchow is through and through a matter-of-fact person, a rationalist, and a materialist. He regards life as the sum of functions of the particular organs, which differ from one another materially, chemically, and anatomically. The entire living body reduces thus to a sum of particular centers of life, whose specific activities are bound up with the properties of their elementary parts, ultimately the properties of cells, out of which the whole body is constructed. Thus the activity of the soul [is to be regarded as] the inherent property of the living nerve cells, movement the result of the formation of the muscle cells, etc.[8]

In this report Virchow appears to have taught that "life" was a special property of the cells. Indeed, he characterized his view as *vitalism* rather than materialism. However, he contrasted the "old" vitalism of "life-force" – described as a kind of unscientific spiritualism – to his own "new" vitalism, based on the empirical study of the cell: "life-force" was in this case "the law of motion, whose perceivable result is the formation of the cell". The ultimate consequence of this view would be a "mechanical cell theory" (Virchow 1856, in part. 11–12).

In fact, a few years later Virchow was accused of being a materialist. The charge was formulated by another co-founder of cell theory, Matthias Jacob Schleiden, in his essay "On the Materialism of Modern German Natural Science, its Essence and its History" (1863). According to Schleiden (1863: 8), materialism was a "terrible power" that lay often "unspoken" in the

minds of "so-called philosophers coquetting with natural sciences" and "the majority of natural scientists". Virchow was no exception, although he protested at this characterization. Schleiden drew this conclusion commenting on Virchow's account of living beings in the "Four Addresses on Life and Illness" (1862). Here Virchow described life in the cells with what sounded as a kind of mechanistic materialism, for every activity of organisms is insperable from mechanics and chemistry. To be sure, he pointed out that this "mechanical conception of life is not materialism": while the former is an empirical method of explanation, the latter claims that everything can be explained on the ground of matter and hence "goes beyond experience" (Virchow 1862: 12). Schleiden was unconvinced, dismissing Virchow's text as a heap of conceptual confusion that turned out to support the "harshest materialism" (Schleiden 1863: 49).

A few months later, Virchow replied in an address to the Society of German Natural Scientists and Physicians. He claimed that the theory of the cell state did not explain the identity of the self, which transcended the field of natural science, as "an independent soul, an independent mental power . . . upon which ground one's religious knowledge must be formulated, accordingly as it conforms to one's conscience and feeling" (Virchow 1864: 41–42). This controversy shows the distinction of two different ways of distancing one's theory from materialism. Schleiden (1863: 57) presented himself as a "student of Kant", arguing that Kantian philosophy was a key to a correct understanding of the foundations of natural science. In particular, it provided the idea that space, mathematics and scientific laws belong to the "organization of our reason" (30). This sounded as a version of the physiological Kantianism that was rising as an alternative to idealism and materialism. Virchow did not focus on philosophical details and resorted to the simple thesis that science only concerns the empirically known and therefore cannot address the transcendent soul. A similar alternative – as we will see below – would soon return in the accounts of materialism of Friedrich Albert Lange and Emil du Bois-Reymond respectively.

Ernst Haeckel's conception of matter appears as a tentative way out between the discredited "scientific materialism" and the skeptical or religious limitations of science. A former

student of Müller and assistant to Virchow in 1856, Haeckel meditated on vitalism and on the cell state theory of organisms, and eventually he elaborated original views of these theories. In the 1866 lecture "On the Division of Labor in the Life of Nature and Humans", he commented on the cell state theory arguing that the "true elementary organisms and true first-order individuals" are cells and that every cell has a certain degree of "sensitivity" (*Empfindlichkeit*) and brain cells have "self-consciousness" (Haeckel 1869: 28-29. Cf. Reynolds 2008). These formulations might sound like a vital materialism, but Haeckel wanted to defend rather a Spinozistic-Goethean conception of life and reacted to this characterization. After his endorsement of Darwinism, in *The History of Creation* (1870), Haeckel made a distinction between monism and materialism against the "malice" of his critics. First, he claimed that "scientific materialism, which is identical with our Monism, affirms in reality no more than that everything in the world goes on naturally – that every effect has its cause, and every cause its effect". It "rejects any belief in the miraculous" and the "supernatural". "Accordingly, nowhere in the whole domain of human knowledge does it recognize real metaphysics, but throughout only physics". On the other hand, "Moral, or Ethical materialism", which is the "actual" materialism, "proposes no other aim to man in the course of his life than the most refined possible gratification of his senses" (Haeckel 1870: 33; Engl. tr. 1876: I: 36–37). This disconnection of the "materialist natural philosophy" from the despicable "atheism" could be compared to the limitation of the "domain of human knowledge" with respect to the belief in a transcendent truth (in Virchow's style). But Haeckel pointed out that he wanted to stick to the phenomenal and to defend a "hypothesis" that went beyond Darwinian naturalism, that is, to admit, "with Goethe", that there is "no matter without spirit" and "no spirit without matter" (xxvii).[9] In this perspective, not only dualism but also the alternative between materialism and spiritualism had to be dismissed.

Haeckel's views were rejected by authoritative critics. Virchow – who had dropped his former political radicalism after the Paris Commune – attacked Haeckel's Darwinism in a 1877 address to the Society of German Natural Scientists and Physicians. He reframed the traditional

insinuations on the moral and political consequences of materialism and dismissed both Haeckel's endorsement of the hypothesis on the descent of man from ape and the cell soul as crass misunderstandings of scientific evidence (Virchow 1877: 66–69).[10]

Emil du Bois-Reymond – another former student of Müller – served as the Rector of the University of Berlin and the President of the Berlin Academy of Sciences and was a major spokesman for science in the context of the newly founded German Empire. His views of science deserve to be examined here, because they were close to Vogt's, and indeed he has been termed a "non-reductive materialist" (Tennant 2007, 748).[11] In 1842, du Bois-Reymond formulated the program of the so-called Berlin School of Physiology (or school of "organic physics"), joining other students of Müller including Ernst Brücke and Hermann von Helmholtz in the assertion that "no forces operate in the organism other than those common to physics and chemistry" and that, "where these do not suffice in the explanation by means of mathematico-physical method", one must assume new forces that "always reduce to only attractive and repulsive components" (du Bois-Reymond 1918: 108). In the Preface to his groundbreaking 1848 *Investigations on Animal Electricity*, du Bois-Reymond (1887, in part. 9–12) presented this physicalism as an extension to physiology of Helmholtz's program in "On the Conservation of Force" (1847). This approach was meant to reject vital force and speculative natural philosophy as well as materialism. A precedent for this view, indeed, was Alexander von Humboldt (who supported du Bois-Reymond's academic career). In the *Essay on the Excited Muscle- and Nerve Fibers, with Conjectures on the Chemical Process of Life in the Animal and Vegetal World*, Humboldt (1797: II, 43–39) claimed that "everything that happens in the organic matter can be investigated according to mechanical and chemical laws". In turn, this epistemology depended on Kant's philosophy of natural science.[12]

Against this background, du Bois-Reymond conducted his experimental investigations on animal electricity, concluding that the latter was identical to electricity in inorganic matter. This could provide new support to previous naturalist and materialist accounts of organisms, and indeed du Bois-Reymond connected his own views to a tradition including Democritus,

Epicurus, Lucretius, La Mettrie and Darwin (du Bois-Reymond 1886: 188, 196, 198). Nevertheless, he emphasized the limits of natural science in his famous 1872 address "On the Limits of Natural Science" (*Über die Grenzen des Naturerkennens*). In this speech, du Bois-Reymond claimed that natural science would never solve two problems: the understanding of the essence of matter and force, and the explanation of how consciousness results from brain processes. The latter point remarkably corresponded to a vexed question of the materialism controversy. Du Bois-Reymond maintained that "not only is consciousness inexplicable by its material conditions in the present status of science, which everyone will readily admit, but that, even according to the nature of things, it never can be explained by these conditions" (du Bois-Reymond 1886: 117).[13] This conclusion was sealed with the formula: *Ignorabimus* ("we will never know"), which became popular among commentators and gave rise to the so-called *Ignorabimus* controversy.[14]

Haeckel (1874: xii–xiii, 181) promptly reacted, writing that du Bois-Reymond's "seemingly humble but actually presumptuous *Ignorabimus*" actually "is the *Ignoratis* of the infallible Vatican". In fact, in his speech du Bois-Reymond celebrated the progresses of natural science and apparently did not want to diminish science with respect to faith. Among these progresses he mentioned Franciscus Donder's "measurement of the duration of simpler mental operations" – a result that depended on Helmholtz's groundbreaking measurement of the speed of neural transmission in 1850 – as an example of the new "direct insight in the material conditions of mental phenomena" (122). He notably formulated a considered judgment about Vogt's infamous urine simile: "Vogt's expression [is not] worthy of blame on the ground that it represents mental activity as being the result of material conditions in the brain. Its faultiness lies in this, that it leaves the impression on the mind that the soul's activity is in its own nature as intelligible from the structure of the brain, as is the secretion from the structure of a gland" (128–129).

Similarly, Darwin's theory of evolution taught that "the soul came into being as the result, gradually attained, of certain material combinations" (127), but this theory fell short of

explaining this connection. In other words, du Bois-Reymond clearly separated an ontological from an epistemological question. As he put it:

> Whether we shall ever understand mental phenomena from their material conditions is a very different question from that other, whether these phenomena are the product of material conditions. The former question might be decided in the negative without in the least affecting the latter, to say nothing of negating it (ibid.).

The epistemological problem depended on the very structure of scientific explanations, which only concern motion, energy and conservation laws, hence mental phenomena "lie beyond the law of causality" (122–123). On the whole, one could concede the connection between "definite movements of definite atoms in my brain" and the facts of consciousness such as "I feel pain, pleasure; I experience a sweet taste", but still conclude: "It is utterly inconceivable how consciousness should result from their joint action" (123).[15]

In the light of these arguments, du Bois-Reymond can hardly be characterized as a materialist. His epistemology was based on the "apodictic certainty" of the "propositions of mechanics" (106). This view was explicitly indebted to Kant's in the *Metaphysical Foundation of Natural Science*, which had inspired, in turn, Helmholtz's view of science in "On the conservation of force". Indeed, Du Bois-Reymond would have easily subscribed to Helmholtz's statement that "materialism is an equally ungrounded metaphysical speculation or hypothesis as spiritualism" (Helmholtz 1867: 796).

Du Bois-Reymond granted that *monism* appeared as "the easiest solution to the problem" of consciousness. But this solution required a knowledge of the nature of matter and force, which would provide an understanding of "how the underlying substance senses, desires and thinks", and since this understanding lay beyond the limits of scientific knowledge it was "idle" to dwell on the hypothesis (1886: 129). Thus du Bois-Reymond denied the scientific value of Fechner's hypotheses of plant- and "World-Souls".[16]

It is not surprising that Haeckel – as we have seen above – harshly replied to these arguments. At the 1877 Congress of German Natural Scientists and Physicians, the botanist Karl von Nägeli (1877: 38–39, 41) also defended the consciousness of atoms as a natural explanation and concluded: "we shall know!" Du Bois-Reymond (1886: 388, 413), in turn, replied that such hypotheses revived "the spirit of a false philosophy of nature". The controversy between du Bois-Reymond and Haeckel went on. After du Bois-Reymond reprised and expanded his *Ignorabimus* in *The Seven World-Riddles* (including life, consciousness and freewill among the latter), Haeckel replied with his *The World-Riddle* (1899). In this bestselling book, he took for granted that

> the formation of chains of reasoning that hang together, abstraction and concept-formation, the expansion of cognitive understanding by means of the plastic activity of imagination, and finally consciousness, thinking and philosophizing, *are just as much functions of the ganglion cells or neurons of the cerebral cortex*.
>
> (14)

He also repeated his claims about the monist implications of science, arguing that physical objects have a mental side, which is manifest in different ways from chemical reactions to animal consciousness (ch. 12). These issues would be debated throughout the 20th century, from the Vienna Circle to contemporary philosophy of mind.

18.4 Materialism Transformed: Lange's History and Critique of Materialism

Most of the arguments analyzed in the previous section were debated at the Congresses of German Natural Scientists and Physicians. It is remarkable that major figures of German scientific institutions, speaking in front of their peers, separated the progress of science from the

philosophical legacies of idealism and materialism. This disengagement of science from traditional philosophies, which might have been motivated by the political and religious polarization of the early materialism controversy, resulted in original investigations of the foundations and limits of science. This was also a leitmotif of the philosopher Friedrich Albert Lange's monumental study of materialism.

Lange's *History of Materialism and Critique of its Present Importance* aimed at providing a "definitive solution to certain cardinal points in the controversy on materialism" and included a long and detailed examination of the anatomical and physiological explanations of mental activity (1866: 410–500; 1873/75: II, 311–452).[17] Indeed, although Lange's historical account ranged from Greek antiquity to the present, his critical perspective was largely determined by the recent controversy. The very choice of a *historical* approach also depended on this context. "Scientific materialists" such as Büchner (1855: 29–30) characterized materialism as the culmination of a progress of liberation of the masses from religious superstition in the tradition of the Enlightenment. Lange was very active in the development of the labor movement in Rhineland liberal and socialist circles and he elaborated a "socialist Darwinism" (Weikart 1998) in his book *The Labor Question* (1865). His theoretical views in the *History of Materialism* have to be considered against this background: while he broadly shared the progressive ideals of "scientific materialists", Lange disagreed with the conception of science that accompanied their ethical and political ideas.

First, according to Lange the development of physics showed that atomistic representations of matter are a mistaken effect of sensory experience, while matter is actually reduced to forces (Lange 1866: 364–365; 1873/75: II: 203–211). With respect to materialist anatomists and physiologists, he maintained that they conflated empirical evidence with ungrounded hypotheses, thus producing a mistaken and metaphysical "comprehensive world view [*Weltanschauung*]" (1866: 60). This critique was based on the distinction of an epistemological from a metaphysical materialism: a "consequent materialism" was a fundamental "maxim" of natural science, while materialism "in metaphysical sense" was a

delusion (440), possibly associated with ethical egoism and harmful to the progressive ideal of reforming society. In the first sense, materialism appeared as the "most consequent and simplest" understanding of nature and provided a new "critique" of the cognitive powers against metaphysical speculation and religious superstition. Nevertheless, the investigation of the foundations of scientific explanations showed the limited validity of materialism and consequently – as Lange put it in Kantian jargon – allowed to "save the ideas in a practical way" (iv).

To be sure, Lange's Kantianism was certainly unorthodox (his thought has been also described as "naturalist" or "skeptic", rather than Kantian).[18] Lange notably rejected the Kantian notion of a priori in the foundations of natural science and morals, while he defended the regulative value of ideas of reason. In this perspective, the moral law was not a pure rational imperative, it was rather "an element in the empirical process of our thought" that must adapt to historically variable interests and values to become desirable and effective (Russo Krauss 2023).

For present purposes, I will focus on Lange's arguments concerning natural science and materialism.[19] First of all, Lange maintained that the "subjective state" of the perceiver corresponds to a "limit to materialism" and of natural science in general, because it is "impossible" to determine "the relation of the subjective phenomenon of sensation to the objectively observed nervous process" (Lange 1866: 456). This critique was crucial, for materialism *intrinsically* involved a tendency to "leave its own sphere" and collapse into ungrounded metaphysical hypotheses as soon as traditional atoms "defined by size, figure and weight" are endowed with further properties: "With the assumption of intrinsic qualities the atom has already become a monad, and we pass on into Idealism or into pantheistic naturalism" (Lange 1866: 28). This happens when one tries to explain consciousness, since this inevitably involves *attaching* consciousness to matter (cf. ix, 48, 214–221).[20]

In this perspective, Lange criticized all kinds of hypostatizing claims in contemporary neurophysiology. Mental processes were indeed "joint effects" of the brain (435) and the cortex could be considered as a "necessary factor" of higher faculties, but not as the latter's "seat"

(443). Against the localization of mental processes in material elements or brain parts, Lange suggested that they can be rather analyzed in terms of "numerical relations and the kinds and ways of the joint action of organic processes" (458). A model for this approach was Kant's "*formalist* formulation" of the mind-body relation as opposed to Sömmering's "materialistic" formulation in the essay "On the Organ of the Soul" (459).

With respect to Vogt's controversial urine simile, Lange argued that we cannot indeed consider "'thought' as a separate product in addition to the material processes", hence "the subjective state of the sentient individual is at the same time to external observation an objective one, a molecular movement" (456). In the light of Helmholtz's conservation law, he added that this subjective state "must, on the law of the conservation of energy, fit into the unbroken causal series". It is "not a special link in the chain of organic processes, but as it were merely the *aspect of some of these processes, from another side*". However, the relation between the subjective quality of sensation and the concomitant nervous processes was inscrutable:

> We stumble here, indeed, upon a limit to materialism, but only in carrying it out with the most rigid consequence. We are, in fact, of the opinion that there is *hardly anything to look for* in sensation over and above the above mentioned nerve processes; only these processes have themselves a quite different mode of appearing [*Erscheinungsweise*], namely, that which the individual calls *sensation*. It is quite conceivable that some time we shall succeed in determining more precisely that portion of the physical processes *which temporally coincides with the origin of a sensation in the individual*. This would be extremely interesting, and we certainly could offer no objection if this particular portion of the circuit of nerves processes were then designed straightforwardly as "sensation". A more exact definition of the relation of the subjective phenomenon of sensation to the objectively observed nervous process would, on the contrary, be *impossible*.
>
> (1866: 456)[21]

This view recalls Emil du Bois-Reymond's account in the 1872 Address, which Lange in fact praised in the second edition of the *History of Materialism* (1873/75: II: 148–162).

A second limit of physiological explanations concerned the "spiritual [*geistige*] value of the content of sensation" (Lange 1866: 456). Lange pointed out that aesthetic and logical ideas did not require any supernatural element. His claim was that descriptions of the underlying physical process cannot account for their specific value:

> We have not the slightest occasion . . . to seek for that which is spiritually significant, the artistically moulded sensation or the ingenious [*sinnvollen*] thought, outside the ordinary processes of sensation. Only, of course, let us not proceed like a man who should try to discover the melodies that an organ can play in the individual pipes. . . . *All these effects of the constellation of simple sensations rest upon mechanical conditions which, when physiology has progressed far enough, we may be able to discover*. Sensation, and with it our whole spiritual existence, may still be the incessantly changing result of the co-operation of elementary activities, infinite in number and in the variety of their combinations, which may themselves be localized, somewhat as the pipes of an organ are localized, but not its melodies.
>
> (Lange 1866: 457, 483)[22]

According to Lange, the ideas of the beautiful and the good cannot be explained by a "materialistic metaphysics". For example, artistic ideas cannot be reduced to epiphenomena of physiological processes (277). This non-reductive account of artistic form depended on post-Kantian aesthetics. Lange had notably a strong interest in Schiller's aesthetic education with its focus on "the step from rough matter to beauty" and its moral and social implications (Schiller 1992: 645).[23] Lange wanted to separate the historical and cultural value of "spiritual" expressions – as it had been recognized by Hegel – from their metaphysical hypostatization.[24] Kant's critique of dogmatic metaphysics left freedom to "metaphysics, as a constructive art in the composition of concepts" (1866: 269).[25]

Lange supported these views of "spiritual" values with a kind of emergentism that might have been inspired by John Stuart Mill:[26] while ideas depend on the "interaction of all the elements of the individual mind", they can only be compared with other ideas as to their "value" (347). The aesthetic experience of art, in particular, regards "relations of sensations" (289) – that we may call second-level properties – whose unity appears as a form. On the whole, even though we know that meaningful sensations are based on physiological processes, and we can analyze these processes in terms of their material parts, we cannot analyze those complex *sensations* and the attached values in the same way. Besides, while physiology is subject to universal natural laws, aesthetics is subject to historically and culturally contingent rules of taste.

Lange found a crucial confirmation of the non-reducibility of perceptions to physical processes and laws in Helmholtz's physiology of the senses. Helmholtz had characterized Kant's forms and laws as "the contribution of our particular innate laws of the mind, as it were, of the organization of our mind [*Organisation des Geistes*], to our representations" (1884: I: 379).[27] He devoted his 1867 *Handbook of Physiological Optics* to the corroboration and elaboration of this view. Lange considered this accomplishment as a "developed or corrected Kantianism" (Lange 1866: 482). He turned this view of empirical representations against the "naive belief in the sensible world" of materialists (1866: 483). Contrary to the claims of this direct realism – that had been defended, for example, by Büchner (1855: 172–174) and Czolbe (1855: 14–15) – Lange pointed out that the "organization of the mind", or "psycho-physical organization", is like a kaleidoscope, a set of conditions that modifies human representation (Lange 1866: 236, 249, 256. Cf. Lange 1873/75, II: 125-127). He summed up the implications of this "developed Kantianism" for the theory of knowledge with two theses:

1. The sense-world is a product of our organisation.
2. Our visible (bodily) organs are, like all other parts of the phenomenal world, only pictures of an unknown object.

(Lange 1866: 493)

In order to pass from the metaphysical to the phenomenalistic view of materialism one had to follow its "consequences" starting from the basic questions: "What is the body? What is matter? What is the physical? And modern physiology, just as much as philosophy (and physics!), must answer that they are all only our representations; *necessary* representations, representations resulting according to *natural laws*, but still never the things themselves". Lange concluded that the "consequent materialistic view thus changes round [. . .] into a consequent idealistic view" (Lange 1866: 496). Materialism turns into a kind of idealism.

These antireductionist and idealist claims were reprised in the second edition of the *History of Materialism*, where Lange – possibly reacting to Hermann Cohen's critique of the first edition with its physiological language – denied that sensory intuition, conceived in Kantian style as the result of a synthesis, can be analyzed in terms of brain processes:

> We may . . . refer the origin of the psychical image of the intuition which becomes conscious in the subject to a direct synthesis of the individual impressions, even if these are dispersed in the brain. How such synthesis is possible remains a riddle.

(1873/75: II: 419)

In this idealist framework, Lange (1873/75: II: 147) concluded that "the whole worldview of materialism is, as it were, incorporated into the Kantian system without altering its basic idealistic character". Lange conceived this "nested" version of materialism in the framework of his notion of "psychophysical organization" and called it "materialism of the phenomenon" (II: 398).[28]

On the whole, according to Lange materialism had been a powerful idea for the cultural fight against superstition and the development of natural science; nonetheless it turned out to be an ultimately unstable doctrine. Lange's critique of the metaphysical tendency of materialism

and his theory of the transition from scientific materialism to idealism left a significant legacy in Marburg Neo-Kantianism and 20th-century philosophy of science.

18.5 Conclusions

In this critical overview, I have tried to show that materialism was both a driving force and a constant object of controversy over the development of German philosophy and natural sciences in the 1840s to 1870s. Although the "materialism controversy" was loaded with religious and political issues, it turned out to elicit a fruitful investigation of the epistemological meaning and scope of materialism, which was carried out in connection to the debate on Darwinian biology. Most scientists and philosophers, including Virchow, du Bois-Reymond, Haeckel and Lange, avoided the endorsement of materialism. Nevertheless, their views can be conceived as original developments of materialist ideas. On the whole, materialism was defended as a consequence of science and a revolutionary idea, criticized as a mistaken and morally despicable opinion, recognized as a partial truth or transformed into a different doctrine that corrected some theoretical defects of the former one, but still included the recognition that the progress of natural sciences led in a certain sense to materialism.

Notes

References

Arndt, A., and Jaeschke, W. (eds.) (2000) *Materialismus und Spiritualismus. Philosophie und Wissenschaften nach 1848*. Hamburg: Meiner.

Bayertz, K., Gerhard, M., and Jaeschke, W. (eds.) (2007a) *Weltanschauung, Philosophie und Naturwissenschaft im 19. Jahrhundert. Bd. 1. Der Materialismus-Streit*. Hamburg: Meiner.

Bayertz, K., Gerhard, M., and Jaeschke, W. (eds.) (2007b) *Weltanschauung, Philosophie und Naturwissenschaft im 19. Jahrhundert. Bd. 2. Der Ignorabimus-Streit*. Hamburg: Meiner.

Beiser, F. (2014a) *After Hegel: German Philosophy (1840–1900)*. Princeton, NJ: Princeton University Press.

Beiser, F. (2014b) *The Genesis of Neo-Kantianism (1796–1880)*. Oxford: Oxford University Press.

Büchner, L. (1855) *Kraft und Stoff. Empirisch-Naturphilosophische Studien. In allgemein-veständlicher Darstellung*. Frankfurt a.M.: Meidinger Sohn & Cie.

Cabanis, P.J.G. (1980) *Rapports du physique et du moral de l'homme*. Genève: Slatkine.

Czolbe, H. (1855) 'Die Elemente der Psychologie vom Standpunkte des Materialismus', *Zeitschrift für Philosophie und philosophische Kritik*, 26, pp. 91–109.

Czolbe, H. (1856) *Entsethung des Selbstbewusstseins*. Leipzig: Costenoble.

Du Bois-Reymond, E. (1886) *Reden*, vol. 1. Leipzig: Veit.

Du Bois-Reymond, R. (1887) *Reden*, vol. 2. Leipzig: Veit.

Du Bois-Reymond, E. (1912) *Reden*, 2nd ed., 2 vols. Leipzig: Veit.

Du Bois-Reymond, E. (1918). *Jugendbriefe von Emil du Bois-Reymond an Eduard Hallmann*. Berlin: Reimer.

Edgar, S. (2016) 'The Physiology of the Sense Organs and Early Neo-Kantian Conceptions of Objectivity', in F. Padovani, A. Richardson, and J.Y. Tsou (eds.), *Objectivity in Science*. Cham: Springer, pp. 101–122.

Feuerbach, L. (1850) 'Die Naturwissenschaft und die Revolution', *Blätter für literarische Unterhaltung*, 268–271, pp. 1069–1083.

Fichte, I.H. (1834) *Die Idee der Persönlichkeit und der individuellen Fortdauer*. Elberfeld: Büschler.

Fichte, I.H. (1854) 'Die Seelenlehre des Materialismus, kritisch Untersucht', *Zeitschrift für Philosophie und philosophische Kritik*, 25, pp. 58–77, 169–179.

Fichte, I.H. (1855) 'Nachwort des Herausgebers', in Czolbe.

Finkelstein, G. (2013) *Emil du Bois-Reymond. Neuroscience, Self, Society in Nineteenth-Century Germany*. Cambridge, MA: The MIT Press.

Goethe, J.W. (1977) *Sämtliche Werke in 18 Bänden*. München: dtv.

Gregory, F. (1977) *Scientific Materialism in Nineteenth Century Germany*. Dordrecht: Reidel.

Haeckel, E. (1869) *Ueber Arbeitstheilung in Natur – und Menschenleben*. Berlin: C.G. Lüderitz.

Haeckel, E. (1870) *Natürliche schöpfungsgeschichte: Gemeinverständliche wissenschaftliche vorträge über die entwickelungslehre im allgemeinen und diejenige von Darwin, Goethe und Lamarck im besonderen*. Berlin: Reimer.

Haeckel, E. (1874) *Antropogenie oder Entwickelungsgeschichte des Menschen*. Leipzig: Engelmann.

Haeckel, E. (1876) *History of Creation or the Development of the Earth and Its Inhabitants by the Action of Natural Causes. A Popular Exposition in General, and that of Darwin, Goethe, and Lamarck in Particular*. New York: Appleton & Co.

Haeckel, E. (1899) *Die Welträthsel, gemeinverständliche Studien über Monistische Philosophie*. Bonn: Emil Strauss.

Haeckel, E. (1921) *Entwicklungsgeschichte einer Jugend: Briefe an die Eltern, 1852–1856*. Leipzig: K. F. Koehler.

Hagner, M., and Wahrig-Schmidt, B. (eds.) (1992) *Johannes Müller und die Philosophie*. Berlin: Akademie Verlag.

Helmholtz, H. (1867) *Handbuch des physiologischen Opticks*. Leipzig: Voss.

Helmholtz, H. (1913) *Die Lehre von den Tonempfindungen als physiologische Grundlage für die Theorie der Musik*, 6th ed. Braunschweig: Vieweg.

Humboldt, A. (1797) *Versuch über die gereizte Muskel-und Nervenfaser, nebst Vermuthungen über den chemischen Process des Lebens in der Thier- und Pflanzenwelt*, vol. 2. Posen: Decker; Berlin: Rottmann.

Hussain, N.J.Z., and Patton, L. (2021) 'Friedrich Albert Lange', in Edward N. Zalta (ed.), *The Stanford Encyclopedia of Philosophy*, winter 2021 ed. https://plato.stanford.edu/archives/win2021/entries/friedrich-lange/.

Kant, I. (1900) *Kant's gesammelte Schriften*. Berlin: Reimer; Berlin-New York: De Gruyter.

Köhnke, K.Ch. (1986) *Entstehung und Aufstieg des Neukantianismus: Die deutsche Universitätsphilosophie zwischen Idealismus und Positivismus*. Frankfurt a.M.: Suhrkamp.

Köhnke, K.Ch. (1991) *The Rise of Neo-Kantianism*. Cambridge: Cambridge University Press.

Lange, F.A. (1866) *Geschichte des Materialismus und Kritik seiner Bedeutung in der Gegenwart*. Iserlohn: Baedeker.

Lange, F.A. (1873/75) *Geschichte des Materialismus und Kritik seiner Bedeutung in der Gegenwart*, 2nd ed., 2 vols. Iserlohn: Baedeker.

Lange, F.A. (1897) *Einleitung und Kommentar zu Schillers Philosophische Gedichte*. Bielefeld-Leipzig: Velhagen.

Lange, F.A. (1925) *History of Materialism and Criticism of its Present Importance*, 3rd ed. London: Kegan Paul.

Lotze, H. (1866) *Kleine Schriften*. Leipzig: Hirzel.

Mill, J.S. (1843) *A System of Logic, Ratiocinative and Inductive*, 2 vols. London: John Parker.

Moleschott, J. (1852) *Der Kreislauf des Lebens. Physiologische Antworten auf Liebig's Chemische Briefe*. Mainz: Victor V. Zabern.

Morel, C. (ed.) (2017) *L'Allemagne et la querelle du matérialisme (1848–1866). Une crise oubliée*. Paris: Garnier.

Nägeli, K. (1877) 'Die Schranken der naturwissenschaftlichen Erkenntnis', in *Amtlicher Bericht über die acht und dreissigste Versammlung Deutscher Naturforscher und Ärzte in München*. München: Straub, pp. 28–29, 35.

Otis, L. (2007) *Müller's Lab*. Oxford: Oxford University Press.

Pecere, P. (2016) 'Kant's *Über das Organ der Seele* and the Limits of Physiology', in R. Hanna et al. (eds.), *Kant's Shorter Writings*. Newcastle upon Tyne: Cambridge Scholars Publishing, pp. 214–230.

Pecere, P. (2020) 'Reconsidering the *Ignorabimus*: Du Bois-Reymond and the Hard Problem of Consciousness', *Science in Context*, 33(1), pp. 1–18.

Pecere, P. (2021) 'Physiological Kantianism' and the Organization of the Mind: A Reconsideration', *Intellectual History Review*, 31(4), pp. 693–714.

Pecere, P. (2022) 'Mechanism, Organization, Mind: A Kantian Legacy in Nineteenth Century Psychology', in C.T. Wolfe, A. Clericuzio, and P. Pecere (eds.), *Mechanism, Life and Mind in Modern Natural Philosophy*. Cham: Springer, pp. 321–344.

Pecere, P. (2023) 'Materialism, *Lebenskraft* and the Limits of Science: Metaphysical Vitalism in Post-Kantian Scenarios', *Notes and Records of The Royal Society*, 77(4). DOI: 10.1098/rsnr.2021.0078.

Reynolds, A. (2008) 'Ernst Haeckel and the Theory of the Cell State: Remarks on the History of a Bio-Political Metaphor', *History of Science*, 46(2), pp. 123–152.

Russo Krauss, C. (2023) 'Friedrich Albert Lange's Theory of Values', *British Journal for the History of Philosophy*, 31, pp. 1–22.

Schiller, F. (1992) 'Briefe über die Ästhetische Erziehung des Menschen', in Otto Dann et al. (eds.), *Friedrich Schiller's Werke und Briefe*, vol. 8. Frankfurt am Main: Deutsche Klassiker Verlag, pp. 556–676.

Sömmering, S.T. (1796) *Über das Organ der Seele*. Königsberg: Nicolovius.

Tennant, Neil. (2007) 'Mind, Mathematics and the *Ignorabimusstreit*', *British Journal for the History of Philosophy*, 15(4), pp. 745–773.

Virchow, R. (1856) 'Alter und neuer Vitalismus', *Archiv für pathologische Anatomie und Physiologie und für klinische Medicin*, 9, pp. 3–55.

Virchow, R. (1862) *Vier Reden über Leben und Kranksein*. Berlin: Georg Reimer.

Virchow, R. (1864) 'Ueber den vermeintlichen Materialismus der heutigen Naturwissenschaft', in *Amtlicher Bericht über die acht und dreissigste Versammlung Deutscher Naturforscher und Ärzte in Stettin*. Stettin: Hessenland's Buchdruckerei, pp. 35–42.

Virchow, R. (1877) 'Die Freiheit der Wissenschaft im modernen Staatsleben', in *Amtlicher Bericht der 50. Versammlung Deutscher Naturforscher und Aerzte in München*. Munich: Akademischen Buchdruckerei von F. Straub, pp. 65–78.

Vogt, C. (1847) *Physiologische Briefe für Gebildete aller Stände*. Stuttgart, Tübingen: Cotta.

Wagner, R. (1844) *Samuel Thomas Soemmering's Leben und Verkehr mit seiner Zeitgenossen*. Leipzig: Voss.

Wagner, R. (1852) 'Physiologische Briefe. VI. Physiologie, Psychologie und christliche Weltanschauung', *Allgemeine Zeitung [München]*, 20 Januar 2020, Beilage, pp. 313–315.

Wagner, R. (1854) *Über Wissen und Glauben mit besonderer Beziehung zur Zukunft der Seelen*. Göttingen: Wigand.

Weikart, R. (1998) *Socialist Darwinism: Evolution in German Socialist Thought from Marx to Bemstein*. San Francisco: International Scholars Publication.

Wolfe, C.T. (2016) *Materialism. A Historico-Philosophical Introduction*. Cham: Springer.

Wundt, W. (1880) *Grundzüge der physiologischen Psychologie*, 2 Bde. Leipzig: Engelmann.

---

1 For an overview see Gregory 1977; Bayertz, Gerhard and Jaeschke 2007a; Beiser 2014: 53–69; Morel 2017.

2 The neo-Kantian Wilhelm Windelband (1872: 2: 741) blamed those – such as Feuerbach – who "guarded the swine of materialism" and drank from the "dregs of communism". See Arndt and Jaeschke 2000: 227.

[3] The importance of this problem for the German academic environment and the rise of Neo-Kantianism is emphasized by Klaus Christian Köhnke (1986. Engl. transl. Köhnke 1991).

[4] Here I term "ontological" materialism what has been defined straightforwardly as "materialism", that is the thesis that "everything that exists is material, or is the product of interaction between or relations between material entities" (Wolfe 2016: 10). I want to emphasize that the *epistemological* problem of explaining sensations and rational values represented a separate issue.

[5] Sömmering did not consider this hypothesis materialistic. It was rather a case of "transcendental physiology". With this phrase, he probably meant a kind of dualist metaphysical vitalism.

[6] For an analysis of Kant's "anti-reductionist" arguments in this essay see Pecere 2016.

[7] Müller's views have been connected to different philosophical sources, such as Aristoteles and Schelling. See Hagner and Wahrig-Schmidt (1992).

[8] Haeckel to his parents (16 November 1853), in Haeckel 1921: 81.

[9] This account of monism with the reference to Goethe was included in the Preface to the second (1870) edition of the book and not reprised in the Preface to the English edition (1876).

[10] On Virchow's critique of Haeckel see Richards 2008: 94–104.

[11] For a general reconstruction of du Bois-Reymond's life and work see Finkelstein 2013.

[12] Humboldt then added, in Kantian style, that the transcendent ground of empirical objects was unknown. On this Kantian and Humboldtian background see Pecere 2023.

[13] I quote from the English translation by J. Fitzgerald (du Bois-Reymond 1874), with some modifications.

[14] See Bayertz, Gerhard and Jaeschke 2007b; Finkelstein 2013: 269–280; Beiser 2014a: 97–132.

[15] He granted what we would call the "supervenience" of mental or physical states: physical phenomena "are always, and hence necessarily, simultaneous with mental phenomena" (121). For a detailed analysis of du Bois-Reymond's epistemological argument see Pecere 2020.

[16] Besides, the attribution of consciousness to single parts of matter "as so many monads" would not "assist us in understanding the unitary consciousness of the individual" (123).

[17] I will quote (with modifications) from the English translation of the second edition (Lange 1925). Translations of non-corresponding passages from the first edition are mine.

[18] Köhnke 1991: 161–167; Beiser 2014b: 356–397, in part. 358, 386; Edgar 2016: 113n. See Hussain and Patton 2021 for a general assessment.

[19] I provide a more detailed account of Lange's view of materialism, mind and brain in Pecere 2022.

[20] Wilhelm Wundt similarly argued that materialism had the "immanent requirement" to decide whether to deny psychic phenomena or to introduce them as "original properties", thus turning into dualism or Spinozian monism (Wundt 1880: II: 444).

[21] Lange referred to the idea of a possible ground of both brain and mind as an "unknown third" (Lange 1873/75: II: 161–166).

[22] In the second edition, Lange also proposed a hypothesis on the neural correlates of consciousness as a "relation of the intensity of excitations given in the domain of sensation" (Lange 1873/75: II: 439n).

[23] Lange 1866: v. Cf. Lange 1897: 1–25. Cf. Beiser (2014b: 393–397).

[24] Lange (1866: 277, 289) praised Hegel's historical approach to art and religion as an alternative to Kant's, but he rejected its speculative background.

[25] A further source for the analysis of music might have been Helmholtz's distinction of the (physiologically based) pleasure for sounds from the (aesthetically and culturally educated) experience of melody and harmony (Helmholtz 1913: 385–387). In this book Helmholtz devoted considerable space to the analysis of pipes in musical instruments.

[26] According to Mill, "Complex ideas" cannot be considered as the "sum" of the effects of the concurring causes and can be of a different kind from those effects (Mill 1843: II: 502). Mill applied this argument to the origin of moral feelings.

[27] See Edgar 2016; Pecere 2021.

[28] For a more detailed account of Lange's reply to Cohen see Pecere 2021: section 6.