“Physiological Kantianism” and the “organization of the mind”: A reconsideration

In this paper I reconsider the notion “physiological Kantianism”, applied to Hermann von Helmholtz, Friedrich Lange and other philosophers and scientists of the late 19th century. From Hermann Cohen to contemporary scholarship, this designation has been usually referred to a mistaken “naturalization” of Kant’s original theory of knowledge in terms of organic structures and dispositions. I argue that, on the contrary, although Helmholtz and Lange indeed endorsed a kind of biological innatism, thus modifying to some extent of Kant’s original perspective, their views of the physiology of mental processes coexisted with the recognition of the irreducibility of a priori forms and principles to concepts and laws of physiology. I show that this coexistence of transcendental philosophy and physiology was an elaboration that can be traced back to a neglected late essay by Kant himself and hence should be understood as a genuine element of Kant’s legacy.

Keywords: Kant; neo-Kantianism; neurophysiology; organization; Helmholtz; Lange

(1) Introduction: "Physiological neo-Kantianism" and the naturalization of the a priori

In the second half of the nineteenth century, substantial experimental advances in the anatomy and physiology of the nervous system were often integrated into new interpretations of the Kantian philosophical legacy, resulting in what has been called "physiological Kantianism". According to the standard historiographical view, representatives of "physiological Kantianism", notably Hermann von Helmholtz and Friedrich Albert Lange, developed a "naturalistic" account of Kant's a priori. This characterization sometimes includes a criticism of physiological Kantianism as a mistaken interpretation of Kant's philosophy, produced by the replacement of Kant's transcendental concepts and arguments with anatomical and physiological hypotheses. Frederick Beiser, for example, describes Helmholtz's program to "base Kant's philosophy upon science" as a "failure".[1] Similarly, although it is generally recognized that any kind of neo-Kantianism wanted to supersede Kant in some respect,[2] the thesis that neo-Kantianism becomes "unorthodox" as soon as it connects the transcendental with the physiological still holds sway. As Lanier Anderson puts it, "where such Kantians opt for an empirical or naturalistic account of those [constitutive] principles, thereby denying them transcendental or a priori status, then they will be non-orthodox".[3]

In this paper I will argue that our conception of "physiological neo-Kantianism" as a historical and theoretical mistake should be reconsidered. I will trace the origins of the standard view back to Hermann Cohen's interpretation of Kant and his criticism of Helmholtz' and Lange's interpretation (§ 2). Then I will show that Kant himself examined the problem of separating physiological and philosophical concepts in an essay that was widely read in the nineteenth century and provided a source of

inspiration for the reassessments of the question by "physiological" neo-Kantians (§ 3). I will maintain that likewise Helmholtz' (§ 4) and Lange's (§§ 6–7) use of physiological concepts did not correspond to a straightforward epistemological "naturalization" of a priori forms and principles, which was rather realized by other neo-Kantians (§ 5). Therefore I propose to reframe the concept of "physiological Kantianism" in this wider perspective (§ 8).

(2) 2. Hermann Cohen: origins and critique of "physiological neo-Kantianism"

Our topic is best approached by tracing the historiographical term "physiological Kantianism" back to its origin. The current view of "physiological Kantianism" as a mistaken and hybrid form of Kantian naturalism was developed for the first time by Hermann Cohen, the founder of the Marburg School of neo-Kantianism. In *Kants Theorie der Erfahrung* (1871; 1885[2]), Cohen famously advocated a return to Kant's original understanding of transcendental conditions of experience against interpretations of Kant's unity of consciousness, forms of sensibility and categories in terms of the innate cognitive dispositions of the organism. In particular, Cohen rejected the idea that "the Kantian a priori corresponds to a conception which has recently returned into consideration, namely, that it means a 'psycho-physical organization'".[4] This view, according to Cohen, misunderstands Kant's argument in that it conflates empirical thinking with the a priori unity of consciousness, which, according to Kant, is a universal, logical condition of knowledge in general.[5] Indeed, the psychological or physiological interpretation of the a priori entirely misses the original meaning of transcendental idealism, which regards the "epistemological conditions of *possibility* of knowledge" rather than *real* innate dispositions.[6] This misunderstanding involves the reduction of a priori knowledge as a *logical necessity* to a biological *matter of fact*. In

turn, this mistake entails the conception of the thing-in-itself as a real object, inaccessible to human understanding, rather than as a "negative" concept derived from the conditions of experience and corresponding to the ideal of unconditioned knowledge.

The direct recipient of Cohen's critique was Friedrich Lange. Although Lange's *Geschichte des Materialismus und Kritik seiner Bedeutung in der Gegenwart* (1866; 1873/5[2]) emphasized the epistemological importance of Kant's philosophy and hence had a "liberating" effect for Cohen's reappraisal of Kant,[7] Cohen disapproved its physiological language. "Here is the ground of Lange's mistake," Cohen wrote. "He puts the apriority in the 'psycho-physical organization' of human beings and does not recognize the possibility of experience as the starting point of transcendental investigations".[8] Cohen never made sense of this concept of "organization", which he described as Lange's "epistemological Arcanum".[9]

Lange does seem to conflate a priori and innate knowledge. He describes the necessity of Kantian "a priori knowledge" as "given before any particular experience by the physico-psychological organization of men".[10] In another passage he establishes an analogy between this conception and the recent "physiology of the senses" introduced by Johannes Müller. The latter showed that the quality of our sensations depends on the "constitution [*Beschaffenheit*] of our organs". Lange elaborates on this result:

> The whole system [*Zusammenhang*] also, into which we bring our sense-perceptions– in a word our whole *experience*– is conditioned by a mental organization [*geistige Organisation*] which compels us to feel how we do feel, to think as we do think, while to another organization the very same objects may appear quite different, and the thing-in-itself cannot be represented by any finite being".[11]

According to Lange this analogy discloses a way to reform Kant's thought in the light of new discoveries:

> The physiology of the sense-organs is developed and corrected Kantianism, and Kant's system may, as it were, be regarded as a programme for modern discoveries in this field. One of the most successful inquirers, Helmholtz, has employed the views of Kant as a heuristic principle, and yet in so doing has only followed consciously and consistently the same path by which others too have succeeded in making the mechanism of sensation more intelligible.[12]

As proved by this and other passages, Lange was aware that his was no "orthodox" Kantianism, for he wanted to reform Kant's ideas through the aid of natural science.[13]

Hermann von Helmholtz was the source of Lange's analogy between the physiology of the senses and Kant's theory of the a priori, as well as of the expression "organization of the mind".[14] In his seminal speech *Über das Sehen des Menschen* (1855) Helmholtz celebrated Kant's philosophy for having investigated "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".[15] "As [Müller] has shown the influx of the particular activity of the organs in sense perceptions, so Kant has shown what in our representations derives from the particular and peculiar laws of the thinking mind".[16] While the latter passage suggested an analogy between activity of the organs and activity of the mind, the former presented Kant's a priori laws as innate. It comes as no surprise, then, that Cohen would include Helmholtz among those who had misunderstood Kant's a priori (see endnote n. 8).

Cohen's conception of the a priori went itself beyond Kant, bracketing the latter's references to natural faculties and causes of phenomena as presuppositions of the theory of knowledge. On his interpretation *transcendental* investigation regards, rather than the cognitive faculties of humans, "the supreme principles of an experience

that has obtained objective reality *in printed books*".[17] Moreover, according to Cohen, Kant's idealism has to be interpreted in the light of a Platonic identification of objectivity with a product of ideas: "The a priori, whose possibility as a kind of knowledge is the object of transcendental inquiry, does not merely precede the objects —it constructs them" .[18] This view became the basis of the interpretation of the a priori in the Marburg school. As Cassirer would later recognize, this conception was also "unorthodox", as it "departed in particular points […] from Kant's own results",[19] e.g. by correcting Kant's tendency to assign causal processes to the basis of perception. The investigation of the possibility of knowledge indeed started from something given, but the given, according to Cohen, "does not consist in the material determinedness of things, but in the logical structure of principles and ideas". In this perspective reality had to be conceived as "conceptual thought, not as intuitively visible representation".[20]

The opposition between Cohen's interpretation of the a priori and the views of Helmholtz and Lange grounded the historiographical distinction between a "physiological direction (Helmholtz, Lange)" of Neo-Kantianism and the "logical [*logizistische*] Kantianism (Cohen, Natorp, Cassirer – the Marburg school)", which is given for granted in Friedrich Überweg's famous *History of Philosophy*.[21] This opposition was soon accompanied in the writings of Kantian scholars (even outside the Marburg school) by a negative view of Lange's approach. For example, according to Friedrich Paulsen, Lange's "naturalistic world-view" had the salutary effect of combatting anti-scientific trends in German culture but it was ultimately untenable.[22] According to Karl Vorländer, Lange did not count among the "neo-Kantians in the narrower sense".[23]

Cohen's interpretation was based on an oversimplification of both Helmholtz and Lange. It is true that both writers' conception of *innate* structures and dispositions

resulted in a tendency to interpret Kant's forms and principles a priori as species-specific and thus undermine the epistemological validity of transcendental conditions of the possibility of experience. Nevertheless, I submit that Helmholtz's and Lange's incorporation of the physiology of mental processes coexisted with the recognition that a priori forms and principles cannot be reduced to concepts and laws of natural science.

In this regard we need to be careful about the meanings of "naturalization". In Cohen's time *Naturalismus* – with respect to neurophysiology – had various meanings: it could mean both the thesis that cognitive processes are correlated to the activity of the brain and the thesis that cognitive processes (including a priori forms and principles) can be analysed in terms of natural sciences. In the examination of "physiological" neo-Kantianism, naturalism could be considered as a kind of materialism (as Paulsen did in the above quoted passage) or as a "critical skepticism", ruling out the knowledge of supernatural entities.[24] The mistake that Cohen wanted to correct with respect to physiology and psychology was the thesis that any kind of scientific knowledge (including allegedly a priori principles) can be derived from empirical investigation of natural processes.[25] My conclusion will be that both Helmholtz and Lange admitted psycho-physical correlation,[26] but they *cannot* be characterized as epistemological reductionists in that sense. Both Helmholtz and Lange were well aware that they were reforming Kantianism by advocating the role of empirical investigation into the cognitive faculties, and they believed that this was a better way to determine the transcendental conditions of knowledge than Kant's *exclusively* a priori reasoning, as Lange replied to Cohen (§ 7). At the same time, they defended the irreducible role of a priori principles and norms as conditions of experience. Hence "cognitive normativity", which is considered a cornerstone of Marburg neo-Kantianism,[27] was also relevant for Helmholtz' and Lange's Kantianism.[28] Indeed, the coexistence of empirical

neurophysiology of mind and a priori principles of cognition was already a cornerstone of *Kant's* original approach.

3. Back to Kant: physiology of mind and the a priori

The most important document regarding Kant's views on the physiology of mind and its relation to the philosophical theory of the a priori is the essay on Samuel Soemmering's *Über das Organ der Seele* (1796). Soemmering, who was a prominent professor of physiology in Göttingen, made a bold claim following his discoveries of the convergence of cranial nerves: "If we admit that there is a common sense (*sensorium commune*), and that it lies in the brain; then, I think, it can be taken as probable, if not demonstrated, that it lies in the ventricular water (*aqua ventriculorum cerebri*) […] and that this is the organ [of the soul]".[29]

Soemmering argued that ventricular fluids in the brain can be "animated" and that this kind of hypothesis regarded what he called "transcendental physiology", inviting Kant to express his views on the subject.[30] It comes as no surprise that Kant rejected Soemmering's hypothesis altogether, for he excluded the possibility of knowledge of the soul and its influence on the body. In his reply, published as an appendix to Soemmering's book, Kant argued that the problem of the seat of the soul in the brain is not a physiological task, but rather a metaphysical one, which is "not only unsolvable [...] but also in itself contradictory".[31] The contradiction arises because this localization hypothesis is a means of "figuring out [*vorstellig machen*] the unity of the consciousness of oneself (which belongs to the understanding) in the spatial relationship of the soul to the organs of the brain (which belongs to the outer sense)"[32], that is, we look for an intuition in space corresponding to a non-spatial concept.[33]

But Kant also made a *positive* claim concerning Soemmering's hypothesis, defending the *possibility* of a physiology of mind. He showed interest in Soemmering's discovery of the anatomical discovery and argued that the ventricular water "*separates* the nerve bundles that terminate there so that the sensations coming from different nerves are not mixed up, and […] on the other hand, effects a thoroughgoing *community* among them so as to prevent any of these sensations, received by the same mind, from being outside the mind".[34] Thus this water can perform the mental functions of separating and combining sensations. Given his rejection of the old metaphysical concept of the soul, Kant devoted a footnote to clarify what he means here by "mind":

> By *mind* [*Gemüth*] one means only the *faculty* of combining the given representations and effectuating the unity of empirical apperception (*animus*), not yet a substance (*anima*) according to its nature, which is entirely distinct from that matter and from which is abstracted here […] we are concerned with the power of imagination, to whose intuitions, as empirical representations (even in the absence of their objects), there can be assumed to correspond impressions in the brain".[35]

In this framework the scientific investigation of the brain can provide a neurophysiological correlate of both sensory representations and the operation of separation and combination of sensory representations, which Kant ascribes to the faculty of imagination (with the corresponding law of association of ideas). This hypothesis was not original in post-Cartesian philosophy, but against this tradition Kant thinks that the process is inadequately described as a "*mechanical* organization, based on the juxtaposition of the parts for the formation of a certain shape", and suggests that a better way to understand Soemmering's anatomical findings is to posit a "*dynamical* organization" produced by chemical forces: "then one could say that this water *was being* continuously organized. Which would […] make comprehensible the collective

unity of all sensory representations in a common sense organ (*sensorium commune*), but rather in terms of its chemical dissection [*Zergliederung*]".[36] This striking and unique application of Kant's concept of organization to mental processes depended on the prospects of chemistry, which was the object of Kant's thorough study in the 1790s.[37]

A third claim of Kant's essay regards the conflict of the university faculties. Kant points out that the very idea of the seat of the soul raises a conflict between medicine and philosophy, because it involves radically different approaches to the same subject matter (the soul or – in the perspective of critical philosophy – the "pure I"). Kant deals with this problem by trying to separate the domains of the respective faculties: "the *medical* faculty, in its anatomical-physiological division" and "the *philosophical* faculty, in its psychological-metaphysical division". The conflict arises "between those who want to base everything on *empirical* principles and those who demand *a priori* grounds (a case which still occurs in the attempts of unifying the *pure* doctrine of law with politics as the empirically conditioned doctrine of law, as well as between the *pure* doctrine of religion and the revealed one as equally empirically conditioned)".[38] Kant's solution is to associate the anatomical-physiological investigations of medicine (including the physiology of mind) with *empirical* principles, and the "psychological-metaphysical" division of philosophy with *a priori* (i.e. rational) principles. The examples correspond to the other university faculties of law and theology, but we can easily think of logical-transcendental and moral laws as more examples of this divide between pure and empirical principles.[39]

For our present purposes, what is most interesting is that Kant identifies his own critical philosophy with a new *metaphysical psychology* concerned with the investigation of a priori principles that play a crucial role concerning issues that transcend the limits of medicine. To be sure, this approach has been already defended in

Kant's previous works, as Kant rejected the presumption of rational psychology that the soul can be accessibile by introspection.[40] What is new is the connection of this perspective to the prospects of neurophysiology: in the footnote quoted above, Kant identifies a corresponding *third* concept of the mental besides soul and mind, arguing that physiology "must not cross over into metaphysics [in this new critical sense], which is concerned with pure consciousness and with the latter's *a priori* unity in the synthesis of given representations (i.e. concerned with the understanding)".[41] The concept of pure consciousness, or the "absolute self" (as opposed to the empirical one), corresponds to a priori knowledge. In the *Anthropology* it is designated with the telling expression "logical consciousness"[42], which suggests that this is not the ego of the individual, but rather a *universal* condition of experience and hence of necessary knowledge. Kant therefore agrees with Cohen's remark that "the unity of consciousness does not mean the unity produced in the mind by either nerve molecules, or sensations" (see endnote n. 5). Still, he maintains that this view can coexist with the admission that the brain is the seat of representations, and this coexistence depends precisely on the fact that physiology and philosophy have different principles.

In contemporary terminology, Kant's critical perspective on the physiology of mind can be summarized as follows: 1) *anti-metaphysics* concerning the substantial nature of the mind; 2) acknowledgment of the possibility of the *empirical investigation* of the mind; 3) *anti-reductionism* concerning the connection of philosophy and physiology. For our purposes, it has to be pointed out that Kant's method for discovering a priori knowledge, in the *Critique of Pure Reason*, was unrelated to the empirical investigation that Kant was endorsing here. With this notable exception, all these claims left a lasting legacy to "physiological Kantianism".

4. Helmholtz: the a priori as "organization of the mind"

As it is well known, Helmholtz had subscribed to the program of the "Berlin Physical Society" formulated by Emil du Bois-Reymond in 1842, whose main objective was the banishment of life force and similar metaphysical concepts from physiology and the foundation of the experimental study of organism by means of "physico-chemical" forces.[43] This criticism was addressed not only to speculative idealism, but also to the teacher of the "organic physicists", Johannes Müller. Helmholtz' reappraisal of Kant in *Über das Sehen des Menschen* was inspired by the need to reconnect philosophy and natural science by empirical investigation, thus dismissing the legacy of post-Kantian idealism with its ambition to "expand the amount of our knowledge by pure thinking"[44], while retaining the idea that there are transcendental conditions of experience, such as space and the law of causality.

A link between Helmholtz' program to Kant's views on the prospects and limits of physiology was provided by Alexander von Humboldt, who was Helmholtz's and du Bois-Reymond's academic patron. Humboldt had been influenced by Kant's essay on Soemmering in his 1797 *Versuche über die gereitze Muskel- und Nervenfäser*, which included "conjectures on the chemical process of life". In this work Humboldt regards the causal explanation of representation by means of brain processes as "very subtly expressed by Kant as the √-x […] We do not dare any statement about a transcendental object, about something (the soul), whose phenomenon in us is thought"; we can just suppose that "something material and simultaneously extant corresponds to sensory processes".[45] Humboldt also encourages the "empirical philosopher" to follow the idea that "everything that happens in the organic matter can be investigated according to mechanical and chemical laws".[46] Additionally, he maintains that "psychology shows the possibility that material phenomena may be grounded in something which is not

matter"[47], although he does not entertain the idea of a new metaphysical psychology in Kantian sense.

Helmholtz, who was certainly familiar with Humboldt's work, worked through the elements of Kant's legacy in much greater detail. First, Helmholtz spelled out his anti-metaphysical stance by opposing the concept of the "organization of the mind" to the "assumption of the identity of nature and mind [*Geist*]", which conflates "the laws of the mind" and "the laws of objective reality".[48] Here the Kantian interpretation of "organization the mind" as a set of a priori cognitive principles, separated from empirical natural laws, is meant to overthrow the monistic metaphysical interpretation of this concept in a tradition leading from Goethe and Schelling to his teacher Johannes Müller. Schelling had argued that "philosophy is nothing other than a natural science of our mind [*Naturlehre unsers Geistes*]" and that "organization in general can only be conceived by reference to a mind".[49] Müller had echoed these ideas in claiming that the physiology of the senses had to be "at the same time philosophical and empirical"[50] and had introduced an objective "force of organization [*organisierende Kraft*] that operates according to rational ideas".[51]

As regards the physiology of the senses, Helmholtz' massive investigations, starting from the physico-chemical analysis of sensory stimuli, produced numerous papers and two monumental books: *Die Lehre der Tonempfindungen* (1863) and the *Handbuch des physiologischen Optik* (1867). In the *Handbuch* Helmholtz returned to the non-metaphysical meaning of his inquiry. He underscored the limits of physiological investigation regarding "psychical processes" and took the opportunity to clarify that, while idealism excluded any progress in this field, materialism gave it for granted—hence, "materialism is as equally ungrounded a metaphysical speculation or hypothesis as is spiritualism".[52] Thus Helmholtz's empiricism did not entail any claim

concerning the ultimate nature of living things and he considered both realism and idealism as equally legitimate and untestable hypotheses about reality.[53]

Let me now consider Helmholtz's epistemological anti-reductionism. Helmholtz replaced the realism of Müller with his "sign theory" of knowledge: sensations are not pictures, but signs of the world, involving no resemblance to things.[54] Our knowledge operates on these signs and refers to objects only by means of the law of causality. Relations occurring between signs can thus be interpreted as relations between objects, and therefore Helmholtz declares his preference for a mediated realism with respect to idealism. Although this conclusion is hardly Kantian, Helmholtz argues that transcendental conditions are required in order to explain the transition from sensations [*Empfindungen*] – conceived as merely subjective states – to perceptions of objects [*Wahrnehmungen*]. In particular, he argues that a number of "unconscious inferences" are necessary in order to refer sensations to objects. But these inferences presuppose transcendental conditions such as the law of causality, which is "a law of our thought, preceding all experience", a "pure logical law" formulated by the intellect.[55] In general, Helmholtz regards transcendental concepts and laws as belonging to the "nature of the representative consciousness"[56] and the features of "representations" as signs that depend on the "nature of sense organs and of our mind [*Geist*]".[57]

It is important to point out that, although Helmholtz considers these laws as "innate", he does *not* consider his transcendental claim as reducible to any physiological knowledge. This is particularly clear in his account of space, which is his second example of transcendental condition. Helmholtz rejects the physiological "nativism" of those scientists – notably Ewald Hering – who consider "determinate spatial intuitions" as the product of an "innate mechanism".[58] But while he opposes this nativism – which he identifies with a "naturalistic opinion" – by presenting himself as a supporter of

empiricism, Helmholtz also points out the limits of an entirely empirical account: while "most spatial intuitions" are the product of "experience and exercise"[59], and Kant himself was wrong in considering Euclidian geometry as given a priori with pure intuition, Helmholtz still defends Kant's claim that space in general (with no a priori geometrical structure) is a transcendental form.[60]

Here we get to the core of Helmholtz' Kantianism and the way it departs from Kant's original perspective. For our present purposes it has to be stressed that, besides his different claims over the geometry of space, Helmholtz departs from Kant's account of the a priori in one important *methodological* aspect: the deduction of transcendental conditions depends in part on an *empirical* investigation and cannot be derived by pure thinking. Let us consider the account of space in *Die Tatsachen der Wahrnehmung* (1878). Here Helmholtz uses once more the Kantian concepts of "form of intuition" and "transcendental" to qualify space, time and causality, although he makes clear that he is not following Kant in a strict sense. Helmholtz not only rejects – contrary to "strict Kantians" – the apriority of Euclidian axioms derived from Kant's "transcendental explanation" in the *Transcendental Aesthetics*,[61] he also replaces Kant's "metaphysical exposition": that space is a "form of outer intuition" has to be inferred from experience. In particular, the voluntary movement of our own body shows that space is a constant "relation" among sensations.[62] Without this experience – contrary to Kant's approach – we would not be able to provide an "exposition" of space, even though the result of the investigation is that space in general (without metrical determinations) is an priori form. This empirical side of the account of space derives from the role of motor impulses in the construction of space:

> Space would be a *given form* of intuition, possessed *prior to all experience,* to the extent that its perception were connected with the possibility of motor impulses of

> the will the mental and corporeal capacity for which had to be given to us by our mental and physical organization, before we could have spatial intuition".[63]

Again, that space belongs to the "organization" does not mean that it can be *explained* in any naturalistic sense. Helmholtz' conclusion is rather resonant of Kant's original account, conceiving space as a general manifold of experience as a "transcendental" form (see Friedman, "Helmholtz's Zeichentheorie").

In general, we can conclude that Helmholtz' "organization of the mind" defines a set of epistemological conditions of knowledge (concepts and laws) which are not reducible to anatomical structures and physiological dispositions. These concepts and laws can only be established by empirical investigation, which turns out to be not only an occasion for their discovery (which was true for Kant), but an essential source for the determination of their content and function. Thus, from the point of view of epistemology, Helmholtz *de facto* rejects Kant's sharp separation of transcendental and empirical investigation[64] – a conclusion that Lange, following Helmholtz, would explicitly draw.

Helmholtz's view of the limits of merely anatomical and physiological theories of perception also requires a disciplinary reassessment: since perceptions are always produced "by means of psychical activity", Helmholtz theorized – besides the "physico-physiological investigation" of perceptual processes – the existence of a "pure psychology" concerning "the laws and nature of mental activities".[65] Causality and space where examples of these features of mind. Helmholtz overtly favored the separate formulation of these psychological conditions in order to describe learning processes without postulating alleged "innate mechanisms".[66] "Pure psychology", in this context, did not refer to an experimental discipline, grounded on simple introspection or observation of behavior, but to a theoretical part of *philosophy*, containing a priori

principles that could be applied to physiology.[67] Helmholtz's conception of these "laws", as we have seen, attests to a Kantian argumentative strategy, leading to what Gary Hatfield has called a "normative naturalism".[68] Helmholtz' pure psychology, as we have also seen, was methodologically different from the transcendental "psychology" that we have found theorized by Kant, but its contents and functions, as well as its disciplinary role for establishing the respective autonomy of philosophy and medicine, are traces of the Kantian legacy that I have described.

5. Physiological naturalization of the a priori

While Helmholtz' concept of the "organization of the mind" turns out to have a transcendental twist, there were other occurrences of this kind of phrase in neo-Kantian circles which could justify Cohen's criticism of psychological and physiological naturalism. The school of Fries is an example. In his *Neue Kritik der Vernunft* Fries argues that "with his transcendental knowledge Kant actually meant the psychological, or better the anthropological knowledge, thereby we understand which knowledge our reason possesses a priori".[69] According to Fries, Kant's mistake had been to neglect the importance of empirical psychology and to introduce a priori arguments supporting transcendental forms and principles. The source of Fries' new "philosophical anthropology", which was meant to replace transcendental philosophy, was the "inner experience" of the "human mind" [*Gemüth*].[70] The objective of this natural science of the inner life was the "organization of the spirit [*Geist*]", or "organization of the mind [*Gemüth*]", which Fries separates from the organization of the body.[71] This concept of organization was employed by Mathias Schleiden, a Friesian physiologist and pioneer of cell theory, in his critique of materialism. In *Über den Materialismus in der Naturwissenschaft* (1863) Schleiden maintains that:

> only a minor part of that which we presuppose to exist in the external world, according to our senses, is composed of empirical natural science (so-called *Naturgeschichte*); all the rest, and the most essential part, space, science of space (mathematics) and laws originate from the organization of our reason [*Organisation der Vernunft*], whose knowledge is derived by our inner sense without any reference to space.[72]

Although Schleiden claimed that the Friesians are "the genuine students of Kant"[73], this view actually reduces the a priori to a set of concepts and laws accessible by introspection, discarding the kind of Kantian arguments about transcendental conditions of experience (in this case, spatial perception) that had been reframed by Helmholtz.

In *Kant und die Epigonen* (1865) Otto Liebmann reacted to these views and criticized Fries's philosophy by arguing that "what is a priori can never be known empirically".[74] He would later use the phrase "organization of our intelligence [*Intelligenz*]" to refer to the apriority of space and time.[75] Here Liebmann sided with Helmholtz against physiological nativism and suggested an interpretation of what he also called "intellectual organization", arguing that Euclidian space is not intrinsic to our sensory organs and rather belongs to the "typical formal laws of our intelligence".[76] This use of "law" was interestingly connected by Liebmann to Kant's early formulation of the notion of form as a "law of the human mind" in the 1770 dissertation. Thereby Liebmann could derive the concept of space from the activity of the intellect, thus suggesting that Helmholtz' attempt to reject Kant's notion of pure intuition was compatible with Kantianism.

(3) 5. Lange: neurophysiology, materialism and "corrected Kantianism"

Against the background that we have sketched, we can see that Lange followed the threefold neo-Kantian approach initiated by Humboldt and Helmholtz by means of original ideas and arguments. First, Lange's anti-metaphysical stance is also opposed to

both post-Kantian idealism and materialism. The solution of the controversy over materialism was a major objective of his *Geschichte des Materialismus*, and Lange's neo-Kantian strategy was to separate materialism as a methodology of empirical science – conceived after the model of Kant's "empirical realism" (as "materialism of the phenomenon"[77]) – from materialism as a "comprehensive world view" concerning the essence of reality.[78] In this regard, Lange made the striking claim that materialism, as soon as it tries to consider mind as a material property, turns into a kind of panpsychism (or "pantheistic naturalism" – an expression referring to Gustav Fechner). Thus "materialism, however consequently it may be developed in other respects, always, more or less avowedly, leaves its own sphere".[79]

On the other hand, Lange wholeheartedly subscribed to the program of tracing back any mental phenomenon to its neurophysiological correlates. He warned that localization hypotheses have to regard processes rather than the old-fashioned faculties or forces:

> If the reflection of the inquirer were entirely directed to the *processes* of thinking, feeling, willing, he would more easily consider the *overflowing* of the excitation from one part of the brain to the other, the *progressive disengagement of tensive force*, as the objective element of the psychical act, and not seek after seats of the different forces, but after the *paths* of these currents, their relations and combinations.[80]

For this positive claim on the possibility of neurophysiology of mental processes Lange cited Kant's essay on Soemmering as an exemplary model:

> When *Sömmering* believed to have discovered that the water in brain cavities was the real organ of the soul, one thought of the representations as swimming there like carp in a fish pond. Kant pointed out, on the contrary, that the water may be *chemically affected* by the stimulus of different sense nerves, in such a way that the

> effect of every single representation extends to the whole organ, only in a qualitatively different way.[81]

Lange praises Kant's "formalistic foundation [*Einrichtung*]" of localization, against Soemmering's "materialistic" one. Kant's chemical hypothesis suggests the idea of considering brain processes in terms of "numerical relations", thus supporting the possibility of a mathematical study of physiological processes.[82] In particular Lange thinks of "currents" in the brain, replacing Kant's reference to chemistry with the new avant-garde discipline of his time, the electrophysiology introduced by Emil du Bois-Reymond and Hermann von Helmholtz.

Lange also devotes a great deal of attention to establishing the intrinsic epistemological limits of physiology with respect to the explanation of mental processes. To this effect he uses three arguments, more or less connected to the Kantian legacy. First, he points out the impossibility of *explaining* sensation in terms of its neural correlates:

> 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 […]. 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*.[83]

In contemporary terms, Lange is advocating the supervenience of the mental on the physical and at the same time warning that there is an epistemic gap between the two. He argues that we can think of a common ground of these two sets of facts, but that we

cannot ever obtain any knowledge of this ground, a point that Kant had made in the first *Critique*.[84]

A second argument regards sensations as endowed with aesthetic, linguistic or logical meaning, or what Lange calls (in the terminology of Hermann Lotze) the "spiritual [*geistige*] value of the content of sensation".[85]

> We have not the slightest occasion, therefore, to seek for that which is intellectually 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 tries to discover the melodies that an organ can play in the individual pipes.[86]

From the point of view of empirical investigation, to be sure, "even the most abstract concept in the thinking subject is hardly anything else than the sum of infinitely many very intricate and interconnected nerve impulses".[87] Nevertheless the ideas of the beautiful and the good cannot be explained by a "materialistic metaphysics", decomposing and reducing them to their physical elements. In art, for example, aesthetic ideas form "the basis of our action".[88] Lange supports this view with a kind of emergentism. 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".[89] The aesthetic experience of art, in particular, regards "relations of sensations"[90], which we would call second-level properties. This argument draws upon a number of different sources, including Schiller,[91] Hegel,[92] Mill,[93] and Helmholtz.[94] Lange conceives his conclusion concerning the irreducibility of values as a reform of Kant's tripartition of a priori principles, claiming that we have to separate the "domains" of the beautiful and the good from "empirical truth".[95]

Lange's view of the complexity and irreducibility of mental processes is then expanded into a third claim: a general idealistic about the world that he presents as the

result of the new physiology of the senses. Lange's reference here is Helmholtz' *Über das Sehen des Menschen* (1855). The examination of visual perception led Helmholtz to the conclusion that representation is always, to some extent, shaped by a large number of experiences and therefore is the product of unconscious inferences.[96] The result is "the world of our sensations", which we connect to the "world of reality" by applying the concept of cause to representations.[97] Drawing upon Helmholtz's proof of the "inevitable inductive inference" involved in any perceptual process,[98] Lange concludes that "the relation of sensations to one another determines the quality of each individual one; indeed, that *experience* and *habit* influence not only the interpretation of sense impressions, but even the immediate phenomenon itself"[99], and therefore sensations are "infinitely compound products". This is what Lange calls the "relativity and solidarity of sensations"[100], whose consequence is that phenomenal properties cannot be considered as absolutely real. Thus the "naive belief in the sensible world" of materialism – a sort of direct realism – vanishes.[101] This brings to Lange's "corrected Kantianism", a kind of phenomenalism which once more introduces the concept of organization:

> 1. The sense-world is a product of our organization.
>
> 2. Our visible (bodily) organs are, like all other parts of the phenomenal world, only pictures of an unknown object.
>
> 3. The transcendent basis of our organization remains therefore just as unknown to us as the things which act upon it. We have always before us only the product of both.[102]

Lange's three arguments about sensations (1: subjective qualities inexplainable by brain processes. 2: "spiritual" – i.e. logical, aesthetic or moral – value irreducible to material substratum. 3: phenomenalism, grounded on our cognitive "organization") allow us to

draw some initial conclusions about his alleged naturalism. From the *ontological* point of view, he wants to connect every mental process to a material basis. In this sense Lange may be considered a naturalist, but with the important qualification that he regards the whole "sense-world", including sense organs and objects of perception, as phenomenal. From the *epistemological* point of view, Lange points out the limits of natural science, defending (with arguments n. 1 and 2 above) an anti-reductionism with respect to the mental. Although he does not spell out the thesis of an autonomous psychological domain, he clearly defends the irreducibility of psychological processes to physiology. In the second edition of the *Geschichte* he writes: "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".[103] Similarly, in the posthumously published *Logische Studien*, Lange writes that "the synthesis is the only *psychological fact* that cannot be reduced to physiology or to the mechanics of brain atoms and which must be added to every process in the brain and the nervous system in order for the mechanical fact to become a psychological one" (my italics).[104]

In order to get a clearer picture of Lange's alleged naturalization of the a priori we have to return to his concept of "psycho-physical organization" and consider his reply to Cohen's critique.

(4) 6. Lange's reply to Cohen: "psycho-physical organization"

That Lange's concept of "psycho-physical organization" involved a kind of naturalization of the a priori is suggested by a number of passages. First, Lange endorses the nativist view of the sensory forms of intuition, claiming that space and time depend on "organic conditions which are absent in other beings".[105] These conditions may change and lead to mistakes,[106] therefore our particular form of intuition

does not provide any certainty about the form of reality in itself.[107] He similarly considers the concept of cause as "rooted in our organization"[108] and he argues in general that "the very properties of our organism that determine our whole experience may also influence our intellectual activity".[109]

In the second edition of the *Geschichte*, Lange replaces these passages and tries to highlight the affinity of his views with Cohen's interpretation of Kant, while still identifying both sensory and logical conditions of experience to the "organization of thought".[110] The discussion of the "psycho-physical organization" shows that this concept was not meant to introduce a complete reduction of cognition to physiology, but rather correlated a priori conditions of experience to observable natural processes, on the basis of the "double aspect" monism that, as we have seen, Lange had formulated in the first edition of the book. This discussion is made in a long footnote of the second edition of the book and is clearly a reply to Cohen's criticism in 1871:

> [1] The expression "the psycho-physical organization" is perhaps not happily chosen, but it is an attempt to indicate the idea that the physical organization, as "phenomenon", is at the same time the psychical one. [2] This goes, indeed, beyond Kant, but not so far as it might at first sight be supposed, and in a way that can be defended; [3] at the same time, this modification gives a very intelligible and easily conceivable notion, instead of the scarcely comprehensible Kantian idea of transcendental presuppositions of experience.[111]

Lange here argues that [1] the concept of psycho-physical organization is meant to establish that physical and mental phenomena are correlated. [2] He admits that this is not the original Kantian doctrine. Indeed Kant did not use the concept of organization with respect to the a priori, which he conceived as a set of abstract forms and principles without caring about their physical correlates. At the same time Lange argues that his view was not so far from Kant's, and rightly so, since Kant's philosophy included the

theoretical elements that Lange wanted to develop into his notion of organization: Kant had explicitly correlated a priori principles to the "peculiar constitution of my cognitive faculties"[112], or the "faculties necessarily pertaining to our nature"[113]; in embryology he had endorsed Blumenbach's theory of epigenesis with its "principle of organization"[114]; and in *Über das Organ der Seele*, as we have seen, he had suggested that mental representations can be correlated to "organizing" chemical processes in the brain; finally, as we have seen, he had defended the possibility of a monism which would allow to correlate mental and physical phenomena as belonging to a homogeneous ground. What Kant rejected was the *reduction* of the a priori principles to these empirically accessible processes, something with which Lange agreed. Finally [3] Lange counterattacks, arguing that his own interpretation is more comprehensible than Cohen's, who – as we have seen (n. 18) – disposed of all the Kantian references to the physical correlates of the transcendental conditions of experience and, in order to make sense of the abstract notion of "transcendental presuppositions", endorsed a kind of Platonic idealism.

A few lines later Lange clarifies the phrase "organization of the mind" which was used by Helmholtz and Liebmann to show that the correlation of transcendental conditions and physical organization does not entail the conflation of the two:

> We must not talk, as e.g. *Otto Liebmann* used to do, of the organization *of the mind* [*Geistes*], for this is a transcendental concept, and therefore co-ordinated with other transcendental assumptions. We must rather understand by organization simply, or psycho-physical organization, what to our external sense appears to be that part of the *physical organization* which stands in the most immediate causal relation with the psychical functions.[115]

One may wonder about the epistemic advantage of replacing the transcendental concept of the organization of the mind with that of an observable physical organization

correlated to the psychical functions. What Lange seems to have in mind is this: the concept of psycho-physical organization is useful because it allows us to correlate investigations of physiology (sense organs and nervous system) to conditions of experience (including space and thought), that are defined on the abstract level of second-order properties (relations or values). This is precisely what happened with Helmholtz' researches into the physiology of perception, setting the ground for a scientific correction and reframing of Kant's views. This approach entailed the replacement of Kant's a priori "explanations" and "deductions" with arguments based on new scientific discoveries; indeed Lange draws the conclusion that the investigation of a priori propositions cannot happen by "pure thought", their "permanent value" is "doubtful" and "we are therefore confined in the searching and testing of the universal propositions which do not arise from experience merely to the ordinary means of science; we can only set up probable propositions ".[116]

(5) 7. Conclusions

Our examples have shown that the phrase "organization of the mind" could have quite different meanings and methodological implications:[117] the "organization" could be a physical set of structures (in nativist physiologists) or an abstract set of laws (in Helmholtz); it could be accessible to introspection (for the Friesians), or the result of a more genuine transcendental argument, with the help of empirical data concerning the brain and sensory organs (Helmholtz and Lange). These different notions, aimed at surpassing or reforming Kant's philosophy, produced a confusing and controversial situation. Cohen's attempt at returning to a "pure" interpretation of the a priori, however right in its objective of restoring the original meaning of the transcendental, sacrificed those aspects of Kant's approach that interested those who pursued a connection of Kantian philosophy, psychology and physiology. Lange faced Cohen's challenge and

attempted to clarify the concept of a priori by his notion of "psycho-physical organization".

This notion of organization did not necessarily entail an epistemological "naturalization" of the a priori. It did for physiologists such as Müller and philosophers such as Fries, where the original meaning of transcendental concepts is blurred, if not lost. But Helmholtz and Lange avoided this pitfall of naturalization, I submit, because they expected science to merely *reform* these concepts, not to supersede their transcendental value. Lange's reply to Cohen is telling in this context: the hybrid concept of "organization of the mind", although it introduced physiology into the study of mind, turns out to be a metaphor that had been taken at face value and turned into a speculative concept by *Naturphilosophie*. This was actually something that Helmholtz had recognized when he first used the concept, as he qualified his "organization of the mind" with the clause "as it were". Hence we can conclude that both Helmholtz and Lange were following a different path between the metaphysically-laden post-Kantian *Naturphilosophie* of the early 19th century and the "Platonic", logical neo-Kantianism which eventually became the leading perspective in Marburg. This third way, which we can still call "physiological Kantianism", also left a significant legacy in the history of philosophy, neuroscience and psychoanalysis, whose story and meaning deserves reconsideration.

Bibliography

Baars, Bernard J. and N. M. Gage. *Cognition, Brain and Consciousness. Introduction to Cognitive Science*. Burlington MA: Academic Press, 2010.

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

Büchner, Ludwig. *Kraft und Stoff. Empirisch-naturphilosophische Studien*. Frankfurt a.M.: Weidinger, 1855.

Cassirer, Ernst. "Hermann Cohen und die Erneuerung der Kantischen Philosophie."

Kant-Studien, 17 (1912): 252–273

(6) Cohen, Hermann. *Kants Theorie der Erfahrung*. Berlin: Dümmlers, 1871 (1885^2).

(7) Cohen, Hermann. "Friedrich Albert Lange." Preussische Jahrbücher, 37 (1876): 353–381.

(8) Cohen, Hermann. *Kants Begründung der Ethik*. Berlin: Dümmler, 1877.

De Kock, Liesbet. "Helmholtz's Kant revisited (once more)." *Studies in History and Philosophy of Science*, 56 (2016): 20–32.

Dyck, Corey. *Kant and Rational Psychology*. Oxford: Oxford University Press, 2014.

Edgar, Scott. "The Physiology of the Sense Organs and Early Neo-Kantian Conceptions of Objectivity". In *Objectivity in Science*, ed. by Flavia Padovani, Alan Richardson, and Jonathan Y. Tsou, 101–122. Cham: Springer, 2016.

Ellissen, Otto. *Friedrich Albert Lange. Eine Lebenbeschreibung*. Leipzig: Baedeker, 1894.

Euler, Werner. “Die Suche nach dem “Seelenorgan”. Kants philosophische Analyse einer anatomischen Entdeckung Soemmerings.” *Kant-Studien*, 93 (2002): 453–480.

Finkelstein, Gabriel. *Emil du Bois-Reymond. Neuroscience, Self, and Society in Nineteenth-Century Germany*. Cambridge MA-London: The MIT Press, 2013.

Friedman, Michael. *Kant and the Exact Sciences*. Cambridge Mass.: Harvard University Press, 1992.

Friedman, Michael. “Helmholtz's Zeichentheorie and Schlick's Allgemeine Erkenntnislehre”. *Philosophical Topics* 25(2): 19–50.

Fries, Jakob. *Neue Kritik der Vernunft*. Heidelberg: Mohr und Zimmer, 1807.

Hatfield, Gary. *The Natural and the Normative. Theories of Spatial Perception from Kant to Helmholtz*. Cambridge MA: The MIT Press, 1990.

Hatfield, Gary. “On Classifying Philosophies: Helmholtz as Empiricist or Kantian?” Unpublished paper, 2017 [author’s authorization should be confirmed before publication].

Heidelberger, Michael. “Helmholtz als Philosoph.” *Deutsche Zeitschrift für Philosophie*, 43: 835–44.

Helmholtz, Hermann. Handbuch der physiologischen Optick*,* Leipzig: Voss, 1867.

(9) Helmholtz, Hermann. *Die Tatsachen in der Wahrnehmung*. Berlin: Hirschwald, 1879.

Helmholtz, Hermann. *Wissenschaftliche Abhandlungen*, vol. 1. Leipzig: Barth, 1882.

(10) Helmholtz, Hermann. *Vorträge und Reden*. Bd. 1. Braunschweig: Vieweg, 1884.

(11) Helmholtz, Hermann. *Vorträge und Reden*. Bd. 2. Fünfte Auflage. Braunschweig: Vieweg, 1903.

Helmholtz, Hermann. *Die Lehre von den Tonempfindungen als physiologische Grundlage für die Theorie der Musik*. 6th ed. Braunschweig: Vieweg, 1913 [1863[1]].

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

Hussain, Nadeem J. Z. and Patton, Lydia. "Friedrich Albert Lange". In *The Stanford Encyclopedia of Philosophy* (Winter 2016 Edition), Edward N. Zalta (ed.), URL = <https://plato.stanford.edu/archives/win2016/entries/friedrich-lange/>.

(13) Kant, Immanuel. *Kritik der reinen Vernunft*. 2nd ed. Riga: Hartknoch, 1787.

Kant, Immanuel. *Kant's gesammelte Schriften*, hrsg. von der Preussischen Akademie der Wissenschaften. Berlin: De Gruyter, 1900–.

Köhnke, Klaus Christian. *The Rise of Neo-Kantianism*. Cambridge: Cambridge University Press, 1991.

Kuehn, Manfred. "Interpreting Kant Correctly: On the Kant of the Neo-Kantians." In *Neo-Kantianism in Contemporary Philosophy*. Ed. by Rudolf A Makkreel and Sebastian Luft, 113–131. Bloomington: Indiana University Press, 2010.

Kusch, Martin. "Psychologism." In *The Stanford Encyclopedia of Philosophy* (Winter 2015 Edition), Edward N. Zalta (ed.), URL = <https://plato.stanford.edu/archives/win2015/entries/psychologism/>.

Lange, Friedrich. *Geschichte des Materialismus und Kritik seiner Bedeutung in der Gegenwart.* Iserlohn: Baedeker, 1866.

Lange, Friedrich. *Geschichte des Materialismus und Kritik seiner Bedeutung in der Gegenwart*. 2nd ed., Bd. 2. Iserlohn: Baedeker, 1875.

Lange, Friedrich. *Logische Studien. Ein Beitrag zur Neubegründung der formalen Logik und der Erkenntnisstheorie*. Iserlohn: J. Baedeker, 1877.

Lange, Friedrich. *History of Materialism and Criticism of its Present Importance*, tr. by. Ernest Chester Thomas. Kegan Paul: London, 1925.

Lanier Anderson, R. "Neo-Kantianism and the Roots of Anti-Psychologism." *British Journal for the History of Philosophy*, 13/2 (2005): 287–323.

Lazarus, Moritz. "Einige synthetische Gedanken zur Völkerpsychologie." *Zeitschrift für Völkerpsychologie und Sprachwissenschaft*, 3, 1865, 1–94.

Lembeck, Karl-Heinz. *Platon in Marburg*. Würzburg: Königshausen & Neumann, 1994.

Liebmann, Otto. *Kant und die Epigonen*. Stuttgart: Schober, 1865.

Liebmann, Otto. *Zur Analysis der Wirklichkeit*. Straßburg: Trübner, 1876.

Lotze, Hermann. *Kleine Schriften*, Leipzig: Hirzel, 1886.

McLaughlin, Peter. "Soemmering und Kant. *Über das Organ der Seele* und den *Streit der Fakultäten*." In *Samuel Thomas Soemmering und die Gelehrten der Goethezeit*, ed. by Gunter Mann and Franz Dumont, 191–201. Stuttgart: Fischer, 1985.

Mill, John Stuart. *A System of Logic, Ratiocinative and Inductive*. 2 vols. London: John Parker, 1843.

Müller, Johannes. *Zur vergleichenden Physiologie des Geischtsinnes des Menschen und der Thiere*. Leipzig: Knobloch, 1826.

Müller, Johannes. *Handbuch der Physiologie des Menschen*, Bd. 2. Coblenz: Hölscher, 1840.

Patton, Lydia. "Anti-psychologism about Necessity: Friedrich Albert Lange on Objective Inference." *History and Philosophy of Logic*, 32 (2011): 139–152.

Paulsen, Friedrich. *Aus meinem Leben*. Jena: Diederichs, 1906.

Pecere, Paolo. "Il 'platonismo' e la conoscenza scientifica da Cohen a Cassirer." In *Il platonismo e le scienze*, ed. by Riccardo Charadonna, 193–216. Roma: Carocci, 2012.

Pecere, Paolo. "Kant's *Über das Organ der Seele* and the Limits of Physiology: Arguments and Legacy." In *Kant's Shorter Writings*, ed. by Rafael V. Orden Jiménez, Robert Hanna, Robert Louden *et al.*, 214–230. Newcastle upon Tyne: Cambridge Scholars Publishing, 2016.

Piché, Claude. "Hermann Lotze et la genèse de la philosophie des valeurs." *Les Études philosophiques*, 4 (1997): 493-518.

Schelling, Friedrich Wilhelm. *Ideen zu einer Philosophie der Natur*. In *Werke*, ed. by Manfred Durner, Bd. 5. Stuttgart: Fromman-Holzboog, 1994.

Schiller, Friedrich. *Briefe über die ästhetische Erziehung des Menschen*. In *Friedrich Schiller's Werke und Briefe*, ed. by Otto Dann *et al.*, Bd. 8, 556–676. Frankfurt am Main: Deutsche Klassiker Verlag, 1992.

Schleiden, Mathias. *Über den Materialismus der neueren deutschen Naturwissenschaft*. Leipzig: Engelmann, 1863.

Siegert, Bernhard. "Das trübe Wasser der reinen Vernunft. Kantische Signaltechnik." In

Poetologien des Wissens um 1800, ed. by Joseph Vogl, 53–68. München: Fink, 1999.

Sömmering, Samuel. *Über das Organ der Seele*, Königsberg: Nicolovius, 1796.

Sturm, Thomas. "Kant on Empirical Psychology." In *Kant and the Sciences*, ed. By Eric Watkins, 163–184. Oxford, Oxford University Press, 2001.

Sturm, Thomas. *Kant und die Wissenschaften vom Menschen*. Paderborn: Mentis, 2009.

(14) Turner, R. Steven. "Vision Studies in Germany: Helmholtz versus Hering." Osiris, 8 (1993): 80–103.

Überweg, Friedrich. *Grundriß der Geschichte der Philosophie*. Bd. 4: *Deutsche Philosophie im 19. Jahrhundert*. 12th ed., bearb. von Traugott Konstantin Oesterreich. Berlin: Mittler, 1923.

Vaihinger, Hans. *Hartmann, Dühring und Lange*. Iserlohn: Baedeker, 1876.

Vorländer, Karl. Review of H. Cohen, *Einleitung zu F. A. Lange's Geschichte des Materialismus*. *Kant-Studien*, 1 (1897): 268–272.

Vorländer, Karl. *Geschichte der Philosophie*, 2nd ed., Leipzig: Dürr'schen, 1908.

1 Notes

Beiser, *Genesis of Neo-Kantianism*, 205. On Lange's Kantianism as a kind of "naturalism" see Köhnke, *Rise of Neo-Kantianism*, 163–164; Edgar, "Physiology of Sense-Organs", 113, n. 13; Hussain and Patton, "Friedrich Albert Lange".

2 Cf. Kuehn, "Interpreting Kant Correctly".

3 Lanier Anderson, "Neo-Kantianism Roots Anti-psychologism," 306. Cf. Kuehn "Interpreting Kant Correctly", 116, regarding the "opposition between naturalism and Kantian idealism" in Marburg neo-Kantianism.

4 Cohen, *Kants Theorie der Erfahrung*, 210.

5 "The unity of consciousness does not mean the unity produced in the mind [*Geist*] by either nerve molecules or sensations". Ibid., 141.

6 Ibid., 124.

7 Beiser, Genesis of Neo-Kantianism, 477.

8 Cohen, *Kants Theorie der Erfahrung*, 208. Cohen considers psychological and physiological interpretations of the a priori as equally wrong and reciprocally connected, from Herbart to Helmholtz (Cohen, *Kants Theorie der Erfahrung*, 2nd ed., 197–238. Cf. Cohen, *Kants Theorie Erfahrung*, 123–127, on Jakob Fries and Jürgen Bona-Meyer.

9 Cohen, "Friedrich Albert Lange", 373.

10 Lange, *Geschichte des Materialismus*, 249. I will quote from corresponding passages of the English translation of the third edition, Lange, *History of Materialism* (vol. and pp. after a slash). Translations of non-corresponding passages from the first edition are mine.

11 Ibid., 236/II, 158. Cf. Ibid., 253: space and time depend on "organic conditions" which "may be lacking in other beings"; Ibid., 253–254: Kant "has not proved" that these forms do not "correspond to the thing-in-itself"; Ibid., 255–256: while spatial intuitions are only given in experience, "the disposition to spatial representation is given a priori".

12 Ibid., 482/III, 202.

13 See Lange's letter to Conrad Kambli, September 27, 1858, quoted in Ellissen *Friedrich Albert Lange*, 106. Cf. Lange, *Geschichte des Materialismus*^{2}, 1.

14 Helmholtz had lectured in Heidelberg while Lange was also teaching there (1855-58). In 1857 Lange taught his first class on the "History of Materialism", starting the project that eventually led to his *magnum opus*.

15 Helmholtz, *Vorträge und Reden*, vol. 1, 379.

16 Ibid., 396.

17 Cohen, *Kants Begründung der Ethik*, 27, my italics. To be sure, Cohen did not reject psychological and physiological investigations of cognition (I thank an anonymous reviewer for pressing me on this point). Cohen's early works – including the first edition of *Kants Theorie der Erfahrung* – were indeed influenced by Herbart's psychology. It is also important, in the present context, to remind the influence of the *Völkerpsychology* of Hermann Steinthal and Moritz Lazarus, on whose journal Cohen published his first essays. Lazarus' methodological interpretation of Hegel's objective spirit seems to have influenced Cohen's original conception of the a priori in the above quoted passage. According to Lazarus, *Einige synthetische Gedanken*, 44–45, "books and writings" are among the "supports (*Träger*)" for the "enduring expression" of the "objective spirit" that, in turn, serves as a collective "*content*, *norm* and *instrument* [*Organ*] for men's subjective activities", such as science.

18 Cohen, *Kants Theorie der Erfahrung*, 46. On the importance of Plato for Marburg Neo-Kantianism see Lembeck, *Platon in Marburg*; Pecere, "Platonismo, Cohen, Cassirer".

19 Cassirer, "Hermann Cohen," 252.

20 Ibid., 267.

21 Überweg, *Grundriss*, 417.

22 Paulsen, *Aus meinem Leben*, 147.

23 Vorländer, *Geschichte*, 423–436.

24 Vaihinger, *Hartmann, Dühring, Lange*. In recent scholarship on Kantianism there are also different uses of the phrase "naturalization of the a priori": it can mean that cognitive principles were merely correlated to natural processes or epistemologically reduced to psychological and/or physiological concepts and laws. The latter notion seems to ground the negative view of Helmholtz in the interpretation of Beiser (quoted above).

25 This naturalistic approach included what was beginning to be qualified in those years as "psychologism" (Kusch, "Psychologism").

26 Lange clearly spelled out the supervenience of mental on brain states: see below p. 20.

27 Cassirer, "Hermann Cohen", 267.

28 Regarding Helmholtz compare Hatfield, *Natural and Normative*, who introduces the category of "normative naturalism" (see below p. 16). For a reassessment on Helmholtz' Kantianism see de Kock, "Helmholtz's Kant" and Hatfield, "On Classifying Philosophies".

29 Soemmering, *Organ der Seele*, 31–32.

30 Ibid., 37–38.

31 Kant, *Gesammelte Schriften*, XII, 35.

32 Ibid., XII, 34.

33 Kant actually conflates two arguments here: the first regards the opposition of inner vs outer intuition of the soul, the second the opposition of intellectual (a priori) vs intuitive (empirical) sources of knowledge. As Siegert correctly puts it, Soemmering's mistake here is that he looks for a "material correlate of a transcendental function, whose unity is a condition of possibility for consciousness to have objects as representative contents at all" ("Das trübe Wasser", 54). Most commentators only

detect the first argument (see McLaughlin, "Soemmering und Kant", 197–198; Euler, "Suche nach Seelenorgan", 472–473; Sturm, *Kant Wissenschaften Menschen*, 272–273); but the second one is more coherent with Kant's solution of the conflict of the faculties (Pecere, Kant's *Organ der Seele*). I address this issue below in this paragraph.

34 Kant, *Gesammelte Schriften*, XII, 32–33.

35 Ibid., XII, 32n. As shown by many other passages, Kant did not doubt that brain states corresponded to empirical representations. See e.g., *Anthropologie Collins,*in 145 and *Streit der Fakultäten*, where the brain is described as the "seat of representations" (see respectively *Gesammelte Schriften*, XXV, 145; VII, 106). For more references and a critical discussion see Sturm, *Kant und die Wissenschaften*, pp. 275-280. This view is particularly emphasized in writings of the late 1790s. Soemmering's work might have easily raised Kant's attention to this point. I thank an anonymous reviewer for pressing me on this point.

36 Ibid., XII, 33–34.

37 Friedman, *Kant and the Exact Sciences*, 264–290.

38 Kant, *Gesammelte Schriften*, XII, 31.

39 See e.g. the *Tugendlehre* (1797), were Kant laments that the moral imperative does not get "into the heads of those who are used to physiological explanations" (Ibid., VI, 378), and the *Jäsche Logik* (1800), where Kant opposes *logical* (a priori) principles to *psychological* (empirical) principles of thinking (Ibid., IX, 14).

40 On Kant's critique of rational psychology in the context of 18th century German psychology see Dyck, *Kant and Rational Psychology*. Kant included a new metaphysical psychology in the systematic plan of the *Doctrine of Method*, as an a priori doctrine grounded on the mere empirical concept of the soul as an object of inner sense (*Kritik der reinen Vernunft*, 874). However, in the *Metaphysische Anfangsgründe der Naturwissenschaft* (1786), he decided to exclude this doctrine because the application of mathematics to date of inner sense was very limited (*Gesammelte Schriften*, IV, 471). On the critique of introspection as a methodological basis of psychology, which was particularly addressed in the Preface to the latter work, see Sturm, "Kant on Empirical Psychology." The approach of the "pragmatic anthropology", based on the observation of behavior, integrated the approach of "physiological anthropology".

41 Ibid., XII, 32n.

42 Ibid., VII, 133–134.

43 Finkelstein, *Emil du Bois-Reymond*, 64.

44 Helmholtz, *Vorträge und Reden*, I, 368.

45 Humboldt, *Versuch über Nervenfaser*, 1797, 43.

46 Ibid., 48–49.

47 Ibid., 48.

48 Helmholtz, *Vorträge und Reden*, I, 379.

49 Schelling, *Ideen*, 93, 95.

50 Müller, *Zur vergleichenden Physiologie*, xviii.

51 Müller, Handbuch der Physiologie, 107.

52 Helmholtz, *Handbuch der Physiologischen Optick*, 796.

53 See Helmholtz, *Vorträge und Reden*, II, 238–241, and Hatfield, "On Classifying Philosophies".

54 Helmholtz, *Handbuch der Physiologischen Optick*, 442–444.

55 Ibid., 447 (*Verstand*; *Geist*), 454 (*rein logisches Gesetz*), 430 ("cause" as a condition for the localization of objects in perception).

56 Ibid., 443.

57 Ibid., 446.

58 Turner, "Vision Studies". In a later essay Helmholtz opposes the "unchanging laws of space", as a feature of mental activity, to the alleged "physiological mechanisms of nerves" of nativists (*Vorträge und Reden*, II, 343).

59 Helmholtz, *Handbuch der Physiologischen Optick*, 438.

60 Thus, when Helmholtz quotes Kant's claim that "the general intuition of space is a original form of our representation" (Ibid., 441), he is denying that space is given as an *intuition*, not that it is an original *form*.

61 Helmholtz, *Vorträge und Reden*, II, 229, 244.

62 Ibid., 226.

63 Ibid., 225. De Kock, "Helmholtz's Kant" (and in previous papers), has argued that the role of voluntary motion in the formation of spatial perception entailed that free will is a transcendental condition of experience, which Helmholtz would conceive after the model of Fichte. Heidelberger, "Helmholtz als Philosoph", had already discussed the Fichtean references in Helmholtz and the pointed out the analogies between the respective theories of space as grounded on the interplay between the I and the Not-I. Against this view, Hatfield, "On Classifying Philosophies," has maintained that Helmholtz's view of motor impulse is itself empirical, deriving from the muscular activity, and does not presuppose a representation of the I and its activity. Therefore, according to Hatfield, we should downplay Helmholtz's occasional praises of Fichte as rhetorical statements and remember that Helmholtz standardly grouped Fichte with Schelling and Hegel as a negative example of idealism. I do not want settle this issue here: in both cases, Helmholtz's debt to the original Kantian model is not excluded.

64 Cf. Ibid., 356.

65 Helmholtz, *Handbuch der Physiologischen Optick*, 427.

66 Helmholtz, *Handbuch der Physiologischen Optick*, 441 (angeborene[n] Mechanismus), 431 (vorgebildete organische Structuren).

67 See Helmholtz, *Vorträge und Reden*, II, 188: "Philosophy, if it gives up metaphysics, still possesses a wide and important field, the knowledge of spiritual and mental processes and their laws. Just as the anatomist, when he has reached the limits of microscopic vision, must try to gain an insight into the action of his optical instrument, in like manner every scientific enquirer must study minutely the chief instrument of his research – the human thought – as to its capabilities".

68 Hatfield, *The Natural and the Normative* cit., p. 261-265, has considered the normative element in Helmholtz' theory of space as an ideal model for the non-eliminative naturalism or "soft naturalism" of a number of XXth century philosophers. Here I consider normativity, with regards to neurophysiological reduction, as an aspect of Helmholtz' Kantianism.

69 Fries, *Neue Kritik*, xxxv–xxxvi.

70 Ibid., xxxviii–xli.

71 Ibid., 4.

72 Schleiden, *Über den Materialismus*, 30.

73 Ibid., 57.

74 Liebmann, *Kant und Epigonen*, 150.

75 Ibid., 68, 95.

76 Ibid., 168.

77 Lange, *Geschichte des Materialismus*^{2}, 398.

78 Lange, *Geschichte des Materialismus*, 60.

79 Ibid., 48/I, 144. Cf. Ibid., ix, 48.

80 Ibid., 442/III, 131.

81 Ibid., 458.

82 Ibid., 458–459.

83 Ibid., 456/III, 160.

84 Kant, *Kritik der reinen Vernunft*, 428.

85 Lange, *Geschichte des Materialismus*, 456. Cf. Lotze's *Seele und Seelenleben* (1846), in *Kleine Schriften*, II, 144: "the necessity of the conjunction in a logical syllogism, or in aesthetical and moral evaluation [...] can never be requested on the basis of a joint corporeal action". On the Kantian origins of Lotze's theory of value see Piché, "Hermann Lotze", 512.

86 Lange, *Geschichte des Materialismus*, 457/III, 161.

87 Ibid., 457. In the second edition of the book, Lange modifies the above quoted passage about the "infinite" nerve impulses" with "very many [*sehr viele*]" (*Geschichte des Materialismus*^{2}, 375/III, 161). This correction seems to imply that Lange does not want to introduce an *infinity* problem here, but merely recognize the *extremely high* number of relations. Anyway the irreducibility does not depend on this empirical complexity. It is a categorical irreducibility.

88 Lange, *Geschichte des Materialismus*, 277.

89 Ibid., 347.

90 Ibid., 289.

91 See Ibid., v. Compare the account of beauty and moral with respect to the physical in Schiller, *Briefe äesthetische Erziehung*, 645.

92 See Lange, Geschichte des Materialismus, 277, 289.

93 Cf. Mill, *System of Logic*, II, 502: "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.

94 Lange's source here can be Helmholtz, *Lehre von Tonempfindungen*, 385–387, where Helmholtz analyzes the perception of melodies and defends the impossibility to reduce musical taste to physiology.

95 Lange, *Geschichte des Materialismus*, 269.

96 Helmholtz, *Vorträge und Reden*, 390–394.

97 Ibid., 395.

98 Lange, *Geschichte des Materialismus*, 482.

99 Ibid., 483/III, 203.

100 Ibid., 484/III, 204.

101 Ibid., 483/III, 204. Cf. Büchner, *Kraft und Stoff*, 172–174.

102 Lange, *Geschichte des Materialismus*, 493/III, 219.

103 Lange, *Geschichte des Materialismus*[2], 419/III, 214.

104 Lange, *Logische Studien*, 135–136.

105 Lange, *Geschichte des Materialismus*, 253.

106 Ibid., 250.

107 Ibid., 497–499.

108 Ibid., 264.

109 Ibid., 269.

110 See Lange, *Geschichte des Materialismus*[2], 27–28/III, 188–189.

111 Ibid., 125–126 n. 25/II, 193.

112 Kant, *Kritik der Urteilskraft*, *Gesammelte Schriften*, V, 397.

113 Ibid., 403.

114 Ibid., 424.

115 Lange, *Geschichte des Materialismus*[2], 127/II, 195. The introduction of a *causal* relation, here, seems to produce an inconsequence with respect to Lange's thesis that psychic and physical phenomena are "ways of appearing" of the same reality. Lange may be thinking that causal correlation happens on the phenomenal level, while mind and matter – as he repeats below in a footnote (p. 127) – can be thought as grounded in "something unknown".

116 Ibid., 31/II, 194–195. Lange also rejected the analytic-synthetic distinction, arguing that there is a single set of necessary propositions (see Lange, *Logische Studien*, 9, and Patton, "Anti-psychologism about Necessity").

117 In contemporary cognitive sciences the notion has two similarly different meanings. It can mean an *anatomical* order of physical parts or a *functional* interconnection of parts (see e.g. Baars and Gage, *Cognition, Brain*, 217).