

Kant's Shorter Writings

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Critical Paths Outside the Critiques

Edited by

Rafael V. Orden Jiménez,
Robert Hanna,
Robert Louden,
Jacinto Rivera de Rosales
and Nuria Sánchez Madrid

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KANT'S *ÜBER DAS ORGAN DER SEELE* AND THE LIMITS OF PHYSIOLOGY: ARGUMENTS AND LEGACY

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1. Introduction

Kant's statement on Samuel Sömmering's book *Über das Organ der Seele* (1796), published as an appendix to the latter, has been considered by Michael Hagner as a crucial episode for the end of the paradigm of the organ of the soul, characterised by the attempt to connect a Cartesian substance dualism with the empirical evidence provided by anatomy and physiology. According to Hagner "successive physiological research could only admit this loss and limit itself to what can be empirically established, or it could advance the claim of being itself philosophical, and overcome the Kantian separation".¹ The main alternatives, in nineteenth century Germany, would be an empiricist approach and metaphysical monism.

While it is true that Kant's criticism provided a crucial episode in the history of German physiology, both its originality with respect to the past and its legacy in the nineteenth century are not adequately described by this account. In § 2 of this paper I will provide a brief overview of Kant's theses on the limits of the physiology of mental activities, and detect a original "nomological" argument supporting the claim that consciousness cannot be reduced to physiological properties (a claim which, with different arguments, had been already maintained by different German academic philosophers). In § 3 I will focus on some aspects of Kant's quite intricate legacy in German physiology, showing that Kant's original argument was eventually taken up by Helmholtz.

2. Kant's Arguments on the Separation of Medicine and Philosophy

In his book Sömmering, drawing on his anatomical discoveries, presented a new hypothesis on the “seat of the soul” as located in the ventricular fluids and stated, in Kantian jargon, that the hypothesis belonged to a “transcendental physiology”, since the anatomical data were interpreted in the light of the claim that “a fluid can be animated”.² In his reply Kant, on the one hand, accepted the offer to comment on Sömmering’s book as a philosopher “not wholly unfamiliar with natural science [*Naturkunde*]” (*SOS* 12:31) and devoted most of his text to an original development of Sömmering’s theory of ventricular fluids as the seat of the “*sensorium commune*”. On the other hand, he straightforwardly rejected the issue of the localisation of the soul, together with Sömmering’s superposition of philosophy and physiology. According to Kant the claim that the “soul” has a place in the brain is in general a “contradiction” (*SOS* 12:33) and therefore it has to be left aside in order to avoid an unfruitful conflict between the philosophical faculty, in its “philosophical-psychological division”, with the medical faculty in its “anatomical-physiological” division (*SOS* 12:31).

Kant was already familiar with the problem before receiving Sömmering’s book. The distinction of (the metaphysical problem of) the organ of the soul from the (physiological problem of the) *sensorium commune* had been a standard teaching of his lectures and he had long excluded the metaphysical problem from the domain of scientific investigation.³ In this text Kant does not appear interested in criticising Sömmering’s metaphysics and his evident misreading of transcendental philosophy. Although he admits that he has been asked to evaluate Sömmering’s hypothesis about “a certain principle of vital force” (*Ibid.*) he does not question directly the metaphysical vitalism attached to this concept, probably because he does not want to draw Sömmering into the field of philosophy and raise old problems of his own philosophical itinerary.⁴ On the contrary Kant replies from the point of view of the former university rector with his “response” about the conflict of the faculties (*Ibid.*) and the proposal to leave the concept of the seat of the soul out of the physiological question.

Actually, however, it is the concept of a *seat of the soul* that occasions the disagreement of the faculties concerning the common sensory organ and this concept therefore had better be left entirely out of the picture, which is all the more justified since the concept of the seat of the soul requires *local*

presence, which would ascribe to the thing that is only an object of the inner sense, and insofar only determinable according to temporal conditions, a spatial relation, thereby generating a contradiction. By contrast, a *virtual presence*, which belongs only for the understanding, and which just for that reason is not spatial, provides a concept that makes possible to treat the question posed (regarding the *sensorium commune*) as a merely physiological task. (Ibid.)

With this distinction of spatial and virtual presence Kant wants to separate the empirical domain of physiology, the “common sensory organ”, from the domain of philosophy, the activity of the understanding.⁵ Thereby he accepts the full legitimacy of the physiological problem about the “matter [*Materie*] that makes possible the unifying of all sensory representations in the mind [*Gemüth*]” (*SOS* 12:32). This problem had been presented more clearly in a letter to Sömmering (*C* 12:41, letter to Soemmering of 17 September 1795):

[...] how to form a unified aggregate of sense representations in the mind, given their infinite diversity, or better, how to render that unity comprehensible by reference to the structure of the brain.

In other words, the problem concerned the possibility of connecting different and heterogeneous sensory representations in consciousness, thus preserving the single temporal ordering of experience:

This problem can be solved only if there is some means of associating even heterogeneous but temporally ordered impressions: e.g., associating the visual representation of a garden with the sonic representation of a piece of music played in that garden, the taste of a meal enjoyed there, etc. These representations would disarrange themselves if the nerve-bundles were to affect each other by reciprocally coming into contact. But the water that is in the brain cavities can serve to mediate the influence of one nerve on another and, by the latter's reaction, can serve to tie up in one consciousness the corresponding representation, without these impressions becoming confused—as little as the tones of a polyphonous concert transmitted through the *air* are confused with each other. (Ibid)

Regarding this problem of unification Kant appreciates Sömmering's discovery of the anatomical connection between nerves and ventricular fluids. Nonetheless, given this empirical analysis of the problem, the simple conceptual distinction of virtual presence and spatial presence does not provide an *argument* against the possible identification of this fluid with the seat of the soul. The argument, as it is given in the above quoted passage, is rather this: to ask for a spatial determination of an “object of

inner sense” generates a contradiction; hence the soul’s presence cannot be local, but only virtual, or “dynamical” (*SOS* 12:35). The soul can only be localised by means of its activity, but cannot be assigned an “immediate” presence in space (*Ibid*).

By this argument the conflict of domains would be resolved by means of the simple distinction between inner and outer intuition: this is the way most scholars explicate the text, observing that Kant already used this argument against the localisation of the soul in the 1770 *Dissertation*. Kant would thus substitute an investigation grounded on substance dualism with an “epistemological” reasoning.⁶

But this reading does not match the context of Kant’s argument. Since Kant is making reference to two kinds of *empirical intuition*, it is not clear how this argument can relate to the separation of philosophy and medicine, as grounded on respectively *pure and empirical principles*, which is presented in the first paragraph of the text as the origin of the solution to the conflict about the seat of the soul.

Hence a response is sought over which two faculties could get into quarrel because of their jurisdiction (the *forum competens*), the *medical* faculty, in its anatomical-physiological division, with the *philosophical* faculty, in its psychological-metaphysical division. As happens with all coalition attempts unpleasantries arise between those who want to base everything on empirical principles and those who demand *a priori* grounds [...]—unpleasantries which rest solely on the conflict of the faculties regarding to which of them the question belongs [...]. (*SOS* 12:31)

Indeed Kant is aware of two different problems and, by spelling out a second time his solution in the final paragraph of the text, provides what I consider to be a second, more fundamental argument, followed— after dashes—by the repetition of first one:

[A] The actual task, as formulated by Haller, is still not solved by this [hypothesis on ventricular fluids]. It is not merely a physiological task but it is supposed also to serve as a means of figuring out [*vorstellig machen*] the **unity of consciousness of oneself** (which belongs to the understanding) in the **spatial relation of the soul to the organs of the brain** (which belongs to the outer sense), hence the seat of the soul, as its *local* presence –which is a task for metaphysics, yet one that is not only unsolvable for the latter but also in itself contradictory. –[B] For if I am to **render intuitive** [*anschaulich machen*] the location of my soul, i.e., of my absolute self, anywhere in space, I must perceive myself through the very same sense by which I also perceive the matter immediately surrounding

me, just as it happens when I want to consider my place in the world as a *human being*, namely I must consider my body in relation to other bodies outside me.—But the soul can perceive itself only through the inner sense, while it perceives the body (whether internally or externally) only through outer senses, and consequently it can determine absolutely no location for itself, because for that it would have to make itself into an object of its own outer intuition and would have to place itself outside itself, which is self-contradictory. Thus the required solution of the task regarding the seat of the soul, with which metaphysics is supposed to come up, leads to an impossible magnitude ($\sqrt{-2}$). (SOS 12:34-35, my bold characters and capital letters in brackets)

According to Kant's first argument (A), the "unity of consciousness of oneself" is different from an object of intuition, and the problem "as formulated by Haller", which raises the contradiction, is produced first of all by the very attempt at "rendering intuitive" the former concept, which "belongs to the understanding". A few lines before the quoted passage, Kant identifies this concept with that of the "soul" as the "absolute self" (SOS 12:34): this must be the thinking subject considered by abstracting from any "self-intuition", i.e. the "I think" as "intelligence" (cf. CPR B158n). Indeed Kant also writes, in a footnote appended to a previous paragraph, that it is identical to "pure consciousness" (SOS 12:32n). This last expression suggests a connection to "*a priori* grounds". The contradiction in the localisation task, indeed, is produced by the identification of "something which belongs to the understanding" with "something which belongs to the outer sense"—i.e. by the attempt to represent a condition of the *intellectual* functions by means of sensible *intuition*—and *not* by the identification of an object of inner and outer intuition—i.e. by the confusion of two kinds of intuition.⁷

In the second section (B) Kant argues that the location of the "soul" in this transcendental sense can only be determined by means of the perception of anybody's own *body* and thus by spatial intuition. But—and here he traces a third dash—intuition of oneself only occurs by means of introspection. This reproduces, at a different level, the contradictory task, which is now the identification of an object of inner and outer intuition. Here is the argument already spelled out in the second paragraph of the text against localisation, which is now compared to an imaginary magnitude.

On the whole, while the first argument raises a transcendental problem—the possibility of self-knowledge—the second one merely regards different forms of intuition: as such it would be inadequate to draw the limit between philosophy and medicine, and restrain physiologists from

venturing into dogmatic metaphysics while working on the brain (as it commonly happened in the eighteenth century). This argument belongs to the older theoretical stage of the 1770 *Dissertation*, and could still be compatible with noumenal realism about the soul. Sömmering's misunderstanding of his philosophy may have encouraged Kant to put forward an argument which could be more easily grasped in the context of a traditional dualistic metaphysics. But Kant also wants to clarify what he now thinks is the fundamental point, and hence, in the final paragraph of the text, he formulates the transcendental argument grounded on the concept of pure consciousness.

But how is this transcendental limitation to be connected to the physiological investigation of mind? The explication of this point can be found in a very dense footnote:

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; by this way we gain that, with regard to the thinking subject, we must not cross over into metaphysics, which is concerned with the pure consciousness and with the latter's *a priori* unity in the synthesis of given representations (i.e. concerned with the understanding); rather 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. (*SOS* 12:32n)

Here we have three different concepts—mind, soul as substance and pure consciousness—corresponding to three different cognitive investigations. The soul as *anima* is the metaphysical of immaterial substance, which is merely thought and cannot be the object of any empirical investigation. “Mind” (*Gemüth*) is the faculty “of combining the given representations and effectuating the unity of empirical apperception (*animus*)”. Since it produces unification this faculty must involve some sort of synthesis. As Kant first makes clear, this is the synthesis of *imagination*. Here is the particular synthetic process which—according to the quoted letter to Sömmering—can be rendered “comprehensible by reference to the structure of the brain”.

A few lines before our footnote Kant mentions hypotheses of “having the traces in the brain of the impressions made on it, under the name of *material ideas* (Descartes), accompany the thoughts according to *laws of association*, which, even though they are very arbitrary hypotheses, at

least do not require any seat of the soul" (SOS 12:32). The dismissive attitude of this comment does not exclude the empirical possibility to test similar hypotheses, provided one separates the "physiological task" from metaphysical concepts. Indeed, Kant takes as a positive result of Sömmering's anatomical "discovery" that the ventricular water can perform the functions of the mind and therefore can be identified with the "organ of the soul", which

[...] on the hand, *separates* the nerve bundles that terminate there so that the sensations coming from different nerves are not mixed up, and which, on the other hand, effectuates a thoroughgoing *community* among them so as to prevent any of these sensations, received by the same mind, from being outside the mind (which would be a contradiction). (SOS 12:32-33)

The analogy with the mind's power to combine and unify given representations is evident. As Kant puts it in the quoted letter to Sömmering, this water can connect [*verknüpfen*] representations in "one consciousness" (C 12:41). Hence the empirical synthesis of representations *can* be studied physiologically. Indeed, Kant normally discussed the constant connection of thought with bodily movements in his lectures on anthropology⁸ and in *Der Streit der Fakultäten* (1798) he would speak of the brain as the "seat of representations" (CF 7:106).

Kant's recognition of the possibility of a physiology of mind was not an original view. On the contrary, by connecting mental faculties to neurological correlates with the exclusion of pure intellect, Kant is following a modern tradition that, starting from Descartes, was developed by Boerhaave and Haller, and was eventually included in the framework of Wolffian empirical psychology.⁹ In particular Wolff himself had conceded to materialists that matter, conceived as a mechanism, *can* have representations by means of its movements, although these representations are unconscious, being the machine unable to compare these representations with itself, and therefore cannot be considered "thoughts". And Knutzen, elaborating on this point, claimed that this impossibility depends on the unity of the soul, drawing from this an argument for immortality.¹⁰

Kant's argument against the localisation of "pure consciousness" can be seen as departing from this background and drawing on original elements of transcendental philosophy. With the separation of the *a priori* functions of the synthesis of the understanding from the empirical synthesis of imagination (in mind) Kant clearly makes reference to critical philosophy,

where the synthesis of imagination (both reproductive and productive) has been shown to be itself grounded on the intellectual functions (*CPR* B152). Following this reference we can identify the “unity of consciousness of oneself”, or the “absolute self” of this text with the transcendental condition of *intellectual* synthesis, which has been introduced in the first *Critique* as the “transcendental apperception”, or the “I think” that must accompany any representation (*CPR* A107/B132).¹¹

In the *Metaphysische Anfangsgründe der Naturwissenschaft* we find a passage supporting this reading. In a *Note* to the theorem on the conservation of material substance Kant writes that the “prefix” I corresponds to something “of which, by this term, one has no concept of what it may be” (*MNS* 4:542-543). Contrary to what happens with material substance, there can be no intuitive “representation” (*Darstellung*) of the I, i.e. no intuition “in concreto” corresponding to it.¹² Kant makes a reference to this point in draft H² of *Über das Organ der Seele*, after expounding his hypothesis on the nervous ground of representations:

This explanation is not meant as if I would want to pretend to gain some insight from this correspondence [*Übereinstimmung*] of the nervous system with the unity of the thinking faculty, since nobody understands anything of this schematism of thought and of the exhibition [*Darstellung*] of the unity of consciousness in the intuition in general. (*DOS* 12:412)

Kant’s I think has indeed “reality”, but no “objective reality”. It is also, as we read in the *Nachschrift* of an anthropology lecture, the “ground of all superior cognitive faculties” (*AC* 25:10). Its activity is characterised by means of the logical functions and the laws of pure understanding. This confirms our supposition that the “metaphysical-psychological” domain of philosophy, which is mentioned in Kant’s passage on the conflict of the faculties, is identical with the critical investigation of the *a priori* principles of the cognitive faculties. Indeed Kant writes in draft E² (*DOS* 12:405): “what could unify both faculties would only be the Critique of pure reason, for which however there is no faculty”.

We are now in the position to understand the puzzling examples of pure vs empirical law and religion. The missing piece, moral philosophy, is mentioned in the preface to the *Tugendlehre* (1797), where Kant laments that the moral imperative does not get “into the heads of those who are used to physiological explanations” (*MM* 6:378). We can conclude that Kant’s argument about the impossibility of localising pure consciousness and explaining its activity by the physiology of the brain can be applied to

both *theoretical* and *practical* pure laws, as being both irreducible to empirical laws. In other words, they are grounded on the impossibility of reducing logical and practical normativity to empirical laws of nature: here is the thesis whose legacy I will highlight in the next section.

3. Kantianism and Physiology: Müller to Helmholtz

Among the different direct and indirect lines of influence of Kantian philosophy in physiology I will follow the legacy of Kant's argument in the physiological tradition of the University of Berlin, which eventually led to Helmholtz's reassessment of Kant's original attempt to determine the domains of philosophy and medicine.

Writing a few years after Kant's essay, Karl Rudolphi agrees with the latter's conclusions about Sömmering's ungrounded connection of empirical investigation and metaphysics, but does not enter into the details of Kant's arguments. His main interest is to banish any metaphysical speculations from physiology: "the way of the connection between spirit and body [is] always obscure".¹³ A stronger philosophical commitment characterises his student Johannes Müller. According to Müller, physiology needs a new philosophical foundation, which is exemplarily provided by his theory of the "essential energies belonging to the senses" in the *Vergleichende Physiologie des Gesichtsinnes* (1826, p. xv). The qualitative content of sensations is independent on the kind of stimuli and rather depends on an activity of the senses, which physical explanations of sensory processes (e.g. in Newton's *Opticks*) cannot grasp (ivi, pp. xvi; 45). The background of this theory is a metaphysical vitalism of the sort excluded by Kant, which Müller develops taking inspiration from Goethe's theory of colours and contemporary idealism: "The life of the soul cannot be explained by material modifications of the brain, and must rather be considered as an activity, by its essence totally independent on spatial relations".¹⁴

In Müller's anti-Newtonian and monistic perspective no trace of Kantian philosophy seems to be left. However, Müller's account of perception also emphasises the role of logical operations. His investigation of the origin of the distinction between inner modifications and external causes ends with the conclusion that separating the sensation of one's own body from the sensations of external bodies requires a "judgement". Hence an intellectual act mediates the transition from the pure philosophical to the empirical domain of investigation.¹⁵

But the rediscovery of a kind of Kantian argument regarding the irreducible role of intellectual activity is made by Müller's student Hermann von Helmholtz. Helmholtz wanted to separate Müller's physiology of the senses from Goethe's ungrounded theses on colour perception and from the philosophy of identity, and to connect it to Kant's philosophy (where Kant's teaching, in turn, was emended by some elements of his doctrine of a priori knowledge).¹⁶ The first step is made in *Über Goethes naturwissenschaftliche Arbeiten* (1853), the second is spelled out in *Über das Sehen in Menschen* (1855):

As the latter [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 particular and specific laws of the thinking spirit.¹⁷

Helmholtz's joint development of ideas of Kant and Müller in his physiology of the senses is rooted in his theory of scientific knowledge, which, in turn, answers the need to establish a distinction between principles of thought (logical and epistemological) and empirical principles. For example, in *Über das Sehen* the law of causality is considered "a law of thought, which is given before any experience" (Ibid.). Contrary to Kant, Helmholtz does not provide an a priori proof of this law, although he maintains that it has to be acknowledged as a necessary condition of experience. A second example is the intuition of space. Although Helmholtz denies that the geometrical properties of space can be determined a priori, he maintains that the general form of spatiality is a necessary condition of experience (lastly in *Die Tatsachen der Wahrnehmung* of 1877)¹⁸. On the whole, Helmholtz draws a separation of domains between a very limited set of fundamental concepts and principles of theoretical activity, which do not anticipate any detail of mathematical and physical properties of the world, and empirical investigations.¹⁹

The definitive systematic assessment of his physiology of sensation in the *Handbuch der physiologischen Optik* (1867) is coherent with this general perspective. Helmholtz originally develops the idea of an activity which forms the background of empirical intuition: besides the role of the senses, investigated by Müller, Helmholtz argues that this activity has to be identified with the role of laws and inferences in the elaboration of objective representations. The clarification of this point is located in Book III of the *Handbuch*, whose topic is perception (*Wahrnehmung*). This textual location is in itself revealing, since *Wahrnehmung*—in Kantian terminology—is sensation (*Empfindung*) accompanied by consciousness.

Hence the three sections of Helmholtz's book correspond to physical (light), physiological (sensation) and psychological (representation) elements of vision. The second one involves the activity of the organs investigated by Müller, while only the last one involves, in a Kantian sense, the *activity* of the "spirit" (*Geist*).

According to Helmholtz this activity consists of "unconscious inferences". A crucial example are the inferences made by the mind in order to localise objects in space starting from sensations and to form a geometry out of their mutual relations—something that, as we have seen, had already been conceived by Müller. A second example—this time distinctly non-Müllerian—is the perception of colour properties, which depends on a comparison among classes of colour properties and hence on a perceptual context. In general, according to Helmholtz, representations of external objects are "effects" of the interplay of the nature of the object and the "representing consciousness" (*Handbuch*, III, § 26, 442-443).

The perceptions of external objects belong to the representations and representations are always acts of our psychical activity; hence perceptions can only take place because of psychical activity and the theory of perception belongs properly to the domain of psychology, especially because here the corresponding kinds of mental activities [*Seelenthätigkeiten*] have to be investigated and their laws have to be established. (ivi, 427)

The psychical activities, that lead us to infer that there in front of us at a certain place there is certain object of a certain character, are generally not conscious activities, but unconscious ones. In their result they are equivalent to *inferences*, since we derive the representation of a cause of the observed effect on our senses. (ivi, 430)

The epistemological framework of this account is the theory of signs. According to this theory, representations are signs, used to work out an interpretation of phenomena, which have a practical validity and in this sense are true, but do not bear any similarity to the described objects. This theory is non-committal with regards to metaphysical hypotheses on reality in itself (which is, again, a conclusion it shares with Kantianism).

All our human representations are [...] images of the objects, whose mode is essentially codependent on the nature of the representing consciousness and is conditioned by its properties. Therefore, in my opinion [...] our representations of things *cannot* be anything but symbols, naturally signs for things which we learn to use in order to regulate our movements and actions. (ivi, 443)

There is no evidence that Helmholtz directly drew inspiration from Kant's essay on Sömmering—after all, the issue of the organ of the soul was not anymore on the scientific agenda—and he may have been possibly elaborating on his knowledge of Kant's *Critiques* and the *Metaphysische Anfangsgründe*, mediated by a number of successive thinkers. Nevertheless Helmholtz supports a conception of the role of a priori principles in physiology which reproduces and updates the fundamental points of Kant's transcendental argument on the limits of physiological investigation. Moreover, his ideas are also connected to a similar separation of disciplinary domains. The analysis of perceptions, according to Helmholtz in the *Handbuch*, involves a “psychological part of the physiology of senses”, which draws some contents (but is to be separated) from “pure psychology”, whose essential goal is the establishment of the laws of thought (427).²⁰

In a wider perspective, this systematic articulation corresponds to a “nomological” separation of *philosophy* (in its psychological section, which is rather an epistemology) and *medicine* (in its physiological section) which is quite similar to the one advocated seventy years before by Kant. This point is made clear in Helmholtz's speech *Das Denken in der Medizin* (1877):

Philosophy, if it gives up metaphysics, still possesses a wide and important field, the knowledge of mental and spiritual 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.²¹

4. Conclusions: Kantianism and Cognitive Neurosciences at the End of the Nineteenth Century

In section 3 we saw how Helmholtz expanded Müller's account of sensation in a general theory of representation and found epistemological reasons to go back to Kant's approach about the role of mental activity as grounded on physiologically irreducible principles. This latter move, in turn, involved the separation of the principles of philosophy (identified with “pure psychology”) and medicine as grounded respectively on pure and empirical principles. This separation was independent on any metaphysical hypothesis, and hence excluded both materialism and the metaphysical monism advocated by Müller.

Helmholtz's theories played a crucial role for the further development of a Kantian tradition in both philosophy and physiology. Friedrich Lange, in his popular *Geschichte des Materialismus*, relied heavily on Helmholtz for his interpretation of the physiology of the senses as a form of "corrected Kantianism" as well as for his own account of contemporary neuroscientific attempts to localise mental functions.²² According to Lange, although simple functions (e.g. sensations) can be localised, complex functions (e.g. reasoning) involve a synthetic activity of the subject which we cannot physiologically explain:

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.²³

In his posthumously published *Logische Studien* (1877) Lange would elaborate on this philosophical point:

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 [...] The factual connection of the manifold in the sensation into the unity of a representation can well be a process whereby we, as subjects, first come to being.²⁴

Lange's text is an example of how, by Helmholtz's mediation, the original Kantian strategy of defending the irreducibility of philosophy from materialistic reductionism was still well represented in the late nineteenth century.²⁵ Parallel to this Kantian tradition, a different argumentative strategy grounded on the alleged impossibility of explaining the *qualitative* content of sensations by mechanical processes was followed by different scientists including Müller and Wundt and received a famous formulation in Emil Du Bois-Reymond's speech, *Über die Grenzen des Naturerkennens* (1872). This latter strategy would eventually become dominant in twentieth century antireductionist philosophy of mind, where many aspects of the late nineteenth century German debate have been substantially replicated. Nevertheless, the original Kantian argumentative line was not lost, and continued to play a central role in philosophy of mind and cognitive science. But a historical assessment of this role exceeds the limits of this paper.²⁵

Notes

The citations of Kant's works include both an abbreviation of the English title and the corresponding volume and page numbers in the standard *Akademie Ausgabe*: *Kant's gesammelte Schriften*, edited by the Königlich Preussischen (now Deutschen) Akademie der Wissenschaften, de Gruyter, Berlin 1900 u. ff. Here follows a list of relevant abbreviations. Translations of Kant's works are taken from the Cambridge Edition of the Works of Immanuel Kant, which indicates the corresponding pages of the *Akademie Ausgabe*.

<i>AC</i>	Anthropology Collins (1772-73).
<i>C</i>	Correspondence
<i>CF</i>	<i>The Conflict of the Faculties</i> (1798).
<i>DOS</i>	Draft for 'On the Organ of the Soul' (1795)
<i>ID</i>	"On the Form and Principles of the Sensible and Intelligible World" (Inaugural Dissertation) (1770).
<i>CPR</i>	<i>Critique of Pure Reason</i> . For references to the first <i>Critique</i> , I follow the common practice of giving page numbers from the A (1781) and B (1787) German editions only.
<i>MM</i>	<i>The Metaphysics of Morals</i> (1797).
<i>MNS</i>	<i>Metaphysical Foundations of Natural Science</i> (1786).
<i>SOS</i>	From Soemmering's <i>On the Organ of the Soul</i> (1796).

¹ Hagner, *Homo cereбрalis*, p. 83.

² Sömmering, *Über das Organ der Seele*, pp. 37-38.

³ Sturm, *Kant und die Wissenschaften vom Menschen*, pp. 265-80.

⁴ In a preliminary draft Kant confesses that he had been "tempted" to admit a metaphysical "life force" in order to explain sensibility (*DOS* 12:398), but this passage does not appear in the published text. Confronting Sömmering's animation of matter Kant was recollecting a problem of his past metaphysics which he had discovered in the 1760s. See Pecere, "Monadology, Materialism and Newtonian Forces".

⁵ This conceptual distinction was first presented in the *Inaugural Dissertation* (*ID* 2, 414). There "virtual presence" was still related to "immaterial substances"; now it merely signifies the connection between the activity of human understanding and the body, which cannot be explicated by metaphysical concepts.

⁶ McLaughlin, "Soemmering und Kant", pp. 197-198; Di Giandomenico, "Kant, Soemmering", p. 186; Euler, "Die Suche", pp. 472-473; Sturm, *Kant und die Wissenschaften*, pp. 272-273.

⁷ This point is correctly seen (but not developed into a full analysis of Kant's arguments) by Siegert, "Das trübe Wasser", p. 54: Soemmering 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".

⁸ See e.g. *AC* 25:145. For more references and a critical discussion see Sturm, *Kant und die Wissenschaften*, pp. 275-280.

⁹ For an outline see Hatfield, "Remaking the Science of Mind". For the relevant German context see Sturm, *Kant und die Wissenschaften des Menschen* cit., pp. 53-125.

¹⁰ C. Wolff, *Vernünfftige Gedancken*, § 740. See C. Dyck, "Materialism".

¹¹ Note that transcendental apperception, being the ultimate condition of the any synthesis, is also a condition of the "empirical rule of association" of representations (CPR A112). This parallels the thesis, advanced against Sömmering, that the physiological analysis of association cannot concern the pure I.

¹² The *Darstellung* (*exhibitio*) of concepts provides intuitions "*in concreto*" to the latter and thereby makes sure that they have "objective reality". See MNS 4:478 and CPR B288-291 and the general assessment in Pecere, *La filosofia della natura in Kant*, pp. 185-202.

¹³ See Rudolphi, *Anatomisch-physiologische Abhandlungen*, 189. On Rudolphi and Kant see Hagner, *Homo cerebrialis*, pp. 138-143.

¹⁴ Müller, *Handbuch des Physiologie des Menschen*, II, 516.

¹⁵ Müller, *Handbuch*, II, 355. Cf. Poggi, "Goethe, Müller", 193-194.

¹⁶ See Lenoir, "The Eye as Mathematician", 121-126 for an analysis of how Müller, Lotze and Herbart mediated Helmholtz's rethinking of Kantian ideas in the theory of space.

¹⁷ Helmholtz, *Vorträge und Reden*, I, 396.

¹⁸ Helmholtz, *Vorträge und Reden*, II, 227-234.

¹⁹ For an account of "normativity" in Helmholtz's epistemology, with special regard to the theory of space, see Hatfield, *The Natural and the Normative*.

²⁰ In this respect, Helmholtz agrees with his former assistant Wundt.

²¹ Helmholtz, *Vorträge und Reden*, II, 188 (tr. by D. Cahan in Helmholtz, *Science and Culture*, Chicago: University of Chicago Press, 1995—with a modification).

²² Helmholtz's influence is explicit and evident in many points of Lange's text, e.g.: "[By studying of the mechanics of sensation] we learn that the sensations of colours, the ideas of the magnitude and movement of an object, nay, even the appearance of simple straight lines, are not determined invariably by the given object, but that the relation of sensations to one another determines the quality of each individual one, nay, that *experience* and *habit* influence not only the interpretation of sense impressions, but even the immediate phenomenon itself [...] To see and to infer are really one and the same" (Lange, *Geschichte des Materialismus*, II, 410, 425).

²³ *ivi*, II, p. 419

²⁴ Lange, *Logische Studien*, 1877, p. 135-136

²⁵ On the origin of major developments in contemporary philosophy of mind in the nineteenth century German debate see Tennant, "Mind, Mathematics". For a historico-critical survey see Pecere, "La coscienza come problema scientifico".

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