Open Library of Humanities

Part of the Ubiquity Partner Network

# Le foucaldien

Open Access Journal for Research along Foucauldian Lines

**Research**

**How to Cite:** Borck, Cornelius. "Cooperation and Critique in Neuroscience: Loops of Feedback Between Philosophy, the Psy Sciences and Neurophenomenology." *Le foucaldien* 5, no. 1 (2019): 8, 1–36. DOI: https://doi.org/10.16995/lefou.57

**Published:** 16 December 2019

## Peer Review:

This article has been peer reviewed through the double-blind process of *Le foucaldien*, which is a journal published by the Open Library of Humanities.



## Open Access:

*Le foucaldien* is a peer-reviewed open access journal.

## Digital Preservation:

The Open Library of Humanities and all its journals are digitally preserved in the CLOCKSS scholarly archive service.

Le foucaldien
Open Access Journal for Research along Foucauldian Lines

Borck, Cornelius. "Cooperation and Critique in Neuroscience: Loops of Feedback Between Philosophy, the Psy Sciences and Neurophenomenology." *Le foucaldien* 5, no. 1 (2019): 8, 1–36. DOI: https://doi.org/10.16995/lefou.57

**RESEARCH**

# Cooperation and Critique in Neuroscience: Loops of Feedback Between Philosophy, the Psy Sciences and Neurophenomenology

Cornelius Borck
Universität zu Lübeck, DE
cornelius.borck@uni-luebeck.de

In the long history of tenuous relations between psychology, psychiatry and philosophy the rise of neuroscience is typically regarded as decisive turn towards biological reductionism. Roughly since the turn of the millennium, however, the story has become more complicated. The emergence of social and cultural neuroscience seemed to indicate a new trend toward interdisciplinary cooperation across the nature-culture divide. Situating the emergence of this transdisciplinary agenda in the longer history of biologicalization in psychiatry and neuroscience, however, allows differentiating a mere rhetoric of bridging between neuroscience and humanities from conceptually more stringent studies such as in neurophenomenology. While some actors developed sophisticated experimental settings here for mediating between opposing approaches, others contributed by performative interventions, as critique comes in different forms and formats. In effect, these different lines of work keep the question regarding human nature open; certainly not the least achievement.

**Keywords:** critical neuroscience; historiography; socio-political contextualization; francisco varela; human nature; dissensus

## 1. Introduction

"The central problem of the human sciences remains unresolved," the incoming editors of the journal *History of the Human Sciences* recently stated: "Despite the new claims championed within molecular biology, evolutionary psychology, artificial intelligence and the cognitive neurosciences, one of the central organizing categories of each of those disciplines – the human – has resisted definition."[1] After many years of massive research, such a statement may sound like the deconstruction of a scientific ethos, but the lamentable diagnosis was certainly meant as good news for the intellectual endeavor of the human sciences: So far, attempts to take the human and the question of human nature as being merely an empirical problem awaiting to be solved by innovative technologies of observation and experimental intervention have failed to arrive at convincing and comprehensive answers. Not that these projects did not deliver a wealth of data and information, but the debate on their significance continues – and rightly so. Protracted deliberations on human nature are suitable ways to keep society going, to protect the social organism, to care for and cultivate the achieved.

Writing for *Le foucaldien* on the shifting relations between psychology and philosophy in light of the neurosciences brings up Michel Foucault's famous dictum that "man is a recent invention" of European culture, "and one perhaps nearing its end."[2] The human sciences, and psychology in particular, are certainly "an invention of recent date" within the history of knowledge. One and a half centuries after establishing psychology as laboratory science and with neuroscience as the latest offspring in this history of experimentalization, brain research currently colonizes the human sciences and aims to reduce them to new branches and provinces of neuroscience, confirming Michel Foucault's gloomy prophecy in unprecedented and then unexpected ways. The recent rise of neuroscience seems to confirm at least a specific interpretation of Foucault's prophecy: Aren't the advances of brain research

---

[1] Felicity Callard, Rhodri Hayward, and Angus Nicholls, "Editorial," *History of the Human Sciences* 29, no. 3 (2016): 3.

[2] Michel Foucault, *The Order of Things: An Archaeology of the Human Sciences*, transl. Alan Sheridan Smith (Oxford: Routledge, 1989), 422.

and the pervasive powers of "the neuro" (Rose/Abi-Rached) indicative of a profound transformation of "our thought", threatening the central role of culture, philosophy and social sciences in understanding the human?[3]

Arguing along similar lines, Fernando Vidal and Francisco Ortega warn, in their recent book *Being Brains*, that the brain sciences thrive on an ideology and mere creed, because their dominance has not (yet) been justified by any major scientific breakthroughs.[4] Sharing their concerns and agreeing with their analysis in general, I want to escape the totalizing gaze implicit in their diagnosis: The neurosciences are a moving target, certainly in terms of technological advances, but also with regard to changing methods and theoretical orientations. These may not replace abruptly neuro-based explanations with introspective accounts and socio-political processes, but the boisterous reductionism from the days of the *Decade of the Brain* seems to have meanwhile cleared the way for more comprehensive approaches and more cooperative relations with the humanities. In an afterword to a collection of essays on *Transdisciplinarity in the Age of the Brain*, Joseph Dumit has recently described these shifting relations between brain sciences and humanities with the metaphor of "twisting the neurohelix."[5] Does this trend towards transdisciplinary cooperation entail new perspectives for the psy sciences or does it, on the contrary, require new critical interventions from different angles?[6] And does this shift indicate that

---

[3] Nikolas Rose and Joelle M. Abi-Rached, *Neuro: the new brain sciences and the management of the mind* (Princeton: Princeton University Press, 2013).

[4] Fernando Vidal and Francisco Ortega, *Being Brains. Making the Cerebral Subject* (New York: Fordham University Press, 2017).

[5] Joseph Dumit, "Afterword: Twisting the neurohelix," in *The neuroscientific turn: transdisciplinarity in the age of the brain*, ed. Melissa M. Littlefield and Jenell M. Johnson (Ann Arbor: University of Michigan Press, 2012), 233.

[6] The proper history of "psy sciences" as shorthand and collective noun for the terrain covered by psychology, psychiatry, psychoanalysis and psychotherapy is somewhat difficult to trace. The term seems to have surfaced in blogs and internet forums, before it was also used in scientific publications, cf. Harry Yi-Jui Wu, Wen-Ji Wang, "Making and Mapping Psy Sciences in East and Southeast Asia", *East Asian Science, Technology and Society* 10 (2016): 109–120. A major step in its genealogy obviously was Nikolas Rose who introduced "psychosciences" on the first pages of his *Inventing Our Selves: Psychology, Power, and Personhood* (Cambridge: Cambridge University Press, 1998).

neuroscientists learned from the waves of critique, which the rise of reductionist neuroscience had kindled, and did they do so in more but strategic ways?

Such questions are obviously far too broad for being addressed and answered in this single paper. In addition, they rely on a rather monolithic conceptualization of neuro that ignores the complexity and diversity of this vast field of research. The diagnosis of *the neuro*, however, has become so dominant and seems to be so widely shared among actors from both sides of the divide that it has lost much of its critical potential. Instead of continuing along this ostensibly clear-cut opposition between bioscientific attempts to explain "the human" and their critique by the social and human sciences, I suggest to look at the effects of critique and the forms of cooperation: How do critique and cooperation articulate as forms of feedback and how did they contribute to the trends and developments in the field? Does transdisciplinary cooperation provide new spaces of intervention and new interfaces for reflexive engagement, if "critique has run out of steam", to use Bruno Latour's famous phrase?[7] For pushing critical analysis and keeping the argument sharp, I suggest to focus on cultural neuroscience and neurophenomenology as two examples for new forms of transdisciplinary cooperation.

I start in section 2 by situating cultural neuroscience in the history of the biologicalization of the human mind. The (rather critical) analysis of the conceptual validity of cultural neuroscience provides the basis for differentiating two different understandings of neurophenomenology in sections 3 and 4. Introducing here Francisco Varela and how he takes the hard problem seriously, I want to discuss his version of neurophenomenology as a radical form of philosophical critique, extending the genealogy from Kant's fundamental analysis of antinomies via Husserl to cognitive science. The paper concludes in section 5 by contrasting more recent studies that build on Varela by building sophisticated experimental settings with a performative form of critique, exploiting the productive potential of constraints rather than viewing them as epistemic limitations. This form of critique, revolving around feedback

[7] Bruno Latour, "Why has critique run out of steam? From matters of fact to matters of concern," *Critical Inquiry* 30 (2004): 225–248.

and reflexivity, dissensus and paradox, translates the genealogy of critique from Kant to Husserl and Varela into a form of material philosophy of artistic practice.

## 2. Situating Cultural Neuroscience within "Our Thought" and the Historiography of the Human

Foucault wrote *Les mots et les choses* more than half a century ago. Published in 1966, the book propelled its author to international visibility in the emerging movement for radical critique and social revolution for which "1968" now stands as global signifier.[8] Its semicentennial in 2018 saw a re-evaluation of the international student movements as turning point towards liberalism on the one hand and terrorism on the other,[9] but most agree that Foucault and his allies started a "long-lasting summer of theory", according to Philipp Felsch's swan-song on this intellectual debate.[10] In the psy sciences, the changing approaches to "our thought" played out particularly strongly in the arena of mental health, where multiplying initiatives for dehospitalization were to transform psychiatric practice during the 1970s, and with it an understanding of the human.[11] In parallel with, though unrelated to, these institutional changes, an epistemic transformation of psychiatry as academic discipline set in, a trend towards focusing on the brain and biological processes, as indicated by the revisions for the third edition of the *Diagnostic and Statistical Manual (DSM-III*) in 1980.[12] Leading psychiatrists started to promote a re-orientation towards biologically explainable, brain-based diseases, allegedly delivering, finally, what Wilhelm

---

[8] *The global 1960s: convention, contest, and counterculture*, ed. Tamara Chaplin, and Jadwiga E. Pieper Mooney (London: Routledge, 2017).

[9] *The Routledge handbook of the global sixties: between protest and nation-building*, eds. Jian Chen, Martin Klimke, Masha Kirasirova, Mary Nolan, Marilyn Young, and Joanna Waley-Cohen (London: Routledge, 2018).

[10] *Europe's 1968: voices of revolt*, eds. Robert Gildea, James Mark, and Anette Warring (Oxford: Oxford University Press, 2017). Norbert Frei, *1968: Jugendrevolte und globaler Protest* (rev. new ed, München: Deutscher Taschenbuch-Verlag, 2018). Philipp Felsch, *Der lange Sommer der Theorie: Geschichte einer Revolte 1960 – 1990*, (München: Beck, 2015).

[11] Despo Kritsotaki, Vicky Long and Matthew Smith, eds., Deinstitutionalisation and after: post-war psychiatry in the western world (Cham: Palgrave Macmillan, 2016).

[12] *Diagnostic and statistical manual of mental disorders*, ed. American Psychiatric Association, 3. Edition (Washington, 1980). Rick Mayes, and Allan V. Horwitz, "DSM-III and the revolution in the classification of mental illness", *Journal of the History of the Behavioral Sciences* 41, no. 3 (2005): 249–267.

Griesinger had proclaimed already 150 years ago, namely that "psychiatry is moving from the 'troubled mind' to the 'broken brain'."[13] Professionals and historians agree that the psy sciences have undergone a massive shift towards molecular biology and the brain sciences in this process, away from psychological and psychodynamic theorizing[14] – a transformation meanwhile lamented even by some of its former advocates.[15]

This shifting orientation in psychiatry pre-dated the American President declaring the final ten years of the millennium to be the *Decade of the Brain* with the ensuing intensification of neuroscientific research. Early forms of functional imaging had made headlines during the 1980s and had kindled hopes to turn brain visualization into a diagnostic tool for mental illnesses. Neuroimaging still has to deliver on that front, but it nonetheless emerged as powerful domain during the 1990s.[16] Brain-centered research now dominated the psy sciences and it was as heavily celebrated as criticized. Neuro-popularizer Susan Greenfield, for example, got appointed CBE in Britain for explaining the brain to the wider public,[17] while American psychologist William Uttal diagnosed the rise of a *New Phrenology* in psychology's attempts to establish itself as brain science.[18] In Germany, eleven "leading brain researchers" published an infamous "manifesto" on how best to adapt society to the insights

---

[13] Nancy C. Andreasen, *The broken brain: the biological revolution in psychiatry*, (New York, NY: Harper & Row, 1984), viii.

[14] Andrew Scull, "Contending Professions: Sciences of the Brain and Mind in the United States, 1850–2013," *Science in Context* 28, no. 1 (2015): 131–161. The swiftness by which the University of Lübeck recently got its psychology program accredited, although this program focuses exclusively on neuroscience and therapeutic applications, can be quoted as just one small piece of evidence.

[15] Nancy C. Andreasen, "DSM and the Death of Phenomenology in America: An Example of Un-intended Consequences," *Schizophrenia Bulletin* 33, no. 1 (2007): 108–112. This indicates also probably a more general shift within psychology from theory and imagination towards empirical knowledge and practice in the name of a new culture of evidence.

[16] Joseph Dumit, *Picturing personhood: brain scans and biomedical identity* (Princeton, NJ: Princeton University Press, 2004).

[17] Susan Greenfield, *The Human Brain: A Guided Tour* (New York: Basic Books, 1997).

[18] William R. Uttal, *The new phrenology: the limits of localizing cognitive processes in the brain* (Cambridge, MA: MIT Press, 2001).

from neuroscience that kindled a massive public debate,[19] and Thomas Metzinger revamped philosophy around cognitive science by declaring himself to be "no one",[20] while others diagnosed a revival of neuromythology, Karl Jasper's once famous scathing critique of localization.[21]

At the end of the century, neuro branched off into the humanities and social sciences with claims which were to proof surprisingly accurate while being overstated at the same time: Neuroeconomics started in the year 2000 with *Mind & Society* as "journal of cognitive and epistemological studies on economics and social sciences."[22] Neurophilosophy got advertised as "unified science of mind and brain", and neuroethics was introduced as "anticipating the future".[23] Already this brief list indicates that many of the newer approaches thrived on multi-disciplinary perspectives. This is a distinctive feature of much research in neuroscience in general as it was an effect of the massive investment in this domain. Particular attention by the public sphere was gained by experimental approaches that bridged across the nature/culture divide and addressed phenomena at the intersection of brain, mind, and society. The promise was to find new scientific ground for social and philosophical questions.

---

[19] Christian E. Elger, Angela D. Friederici, Christof Koch, Heiko Luhmann, Christoph von der Malsburg, Randolf Menzel, Hannah Monyer, Frank Rösler, Gerhard Roth, Henning Scheich, and Wolf Singer, "Das Manifest. Elf führende Neurowissenschaftler über Gegenwart und Zukunft der Hirnforschung," *Gehirn und Geist* 3, no. 6, (2004): 31–37. Michael Pauen, *Illusion Freiheit? Mögliche und unmögliche Konsequenzen der Hirnforschung* (Frankfurt am Main: Fischer, 2004). *Hirnforschung und Willensfreiheit: Zur Deutung der neuesten Experimente*, ed. Christian Geyer (Frankfurt am Main: Suhrkamp, 2004).

[20] Thomas Metzinger, *Being no one: the self-model theory of subjectivity* (Cambridge: MIT Press, 2003). *Grundkurs Philosophie des Geistes [Bachelor, Master, Promotion]*, ed. Thomas Metzinger (Paderborn: Mentis-Verlag, 2006).

[21] Felix Hasler, *Neuromythologie: eine Streitschrift gegen die Deutungsmacht der Hirnforschung* (Bielefeld: Transcript-Verlag, 2012). Karl Jaspers, *General psychopathology*, transl. by J. Hoenig and Marian W. Hamilton (Manchester: University Press, 1963).

[22] *Mind & society: cognitive studies in economics and social sciences*, (Heidelberg: Springer, 2000). Paul W. Glimcher, *Decisions, uncertainty, and the brain: the science of neuroeconomics* (Cambridge, MA: MIT Press, 2003).

[23] Patricia Smith Churchland, *Neurophilosophy: toward a unified science of the mind-brain* (Cambridge: The MIT Press, 1986). *Neuroethics: anticipating the future*, ed. Judy Illes (Oxford: Oxford University Press, 2017).

In part, this trend was a consequence of technological advances in neuroimaging.[24] Faster scanning sequences and new algorithms for data analysis made the visualization of, for example, connections instead of isolated spots possible, kindling a conceptual move from localization to networks.[25] Researchers realized that they could use similar technologies not only for bold reductionist claims, but also for visualizing interaction and hence for testing more complex hypotheses: If the technology served so well for "reducing" psychic functions and mental states to brain processes, it could also be used for objectifying hitherto problematic states such as, for example, psychogenic paralysis[26] or hallucination[27] as "real" brain phenomena. As I have argued elsewhere, brain research, together with the public debates surrounding it, should better be understood as a cultural phenomenon curating the mind-brain problem, keeping it alive and open, rather than as a process of scientific progress towards explaining mental phenomena according to the reigning materialist epistemology.[28]

Around the year 2010, a similar transdisciplinary approach lead to the emergence of cultural neuroscience as the sub-discipline with its own conferences, journals and handbooks.[29] Propagating fruitful dialogue between nature and culture

---

[24] Robert Turner, and Daniel de Haan, "Bridging the gap between system and cell: the role of ultra-high field MRI in human neuroscience," *Progress in Brain Research* 233 (2018): 179–220.

[25] David Papo, Javier M. Buldú, Stefano Boccaletti, and Edward T. Bullmore, "Complex network theory and the brain." *Phil. Trans. R. Soc. B* 369 (2014): 20130520. http://doi.org/10.1098/rstb.2013.0520 [Introduction to Theme Issue 'Complex network theory and the brain']. Georg Northoff, *The spontaneous brain: from the mind-body to the world-brain problem* (Cambridge: The MIT Press, 2018).

[26] Floris P. de Lange, Karin Roelofs, Ivan Toni, "Increased self-monitoring during imagined movements in conversion paralysis," *Neuropsychologia* 45, no. 9 (2007): 2051–2058.

[27] Robin L. Carhart-Harris, Suresh Muthukumaraswamy, Leor Roseman, Mendel Kaelen, Wouter Droog, Kevin Murphy, Enzo Tagliazucchi, Eduardo E. Schenberg, Timothy Nest, Csaba Orban, Robert Leech, Luke T. Williams, Tim M. Williams, Mark Bolstridge, Ben Sessa, John McGonigle, Martin I. Sereno, David Nichols, Peter J. Hellyer, Peter Hobden, John Evans, Krish D. Singh, Richard G. Wise, H. Valerie Curran, Amanda Feilding, and David J. Nutt, "Neural correlates of the LSD experience revealed by multimodal neuroimaging," *PNAS – Proceedings of the National Academy of Science of the USA* 113, no. 17 (2016): 4853–4858.

[28] Cornelius Borck, "Animating Brains," *Medical History* 60 (2016): 308–324.

[29] Joan Y. Chiao, "Cultural neuroscience, a once and future discipline," *Progress in Brain Research* 178 (2009): 287–304. Beth Azar, "Your brain on culture. The burgeoning field of cultural neuroscience is finding that culture influences brain development, and perhaps vice versa," *APA Science Watch* 41, no. 10 (2010): 44. *The Oxford Handbook of Cultural Neuroscience*, ed. Joan Y. Chiao, Shu-Chen Li, Rebecca Seligman, and Robert Turner (Oxford: Oxford University Press, 2016).

instead of gridlocked opposition, actors advertised cultural neuroscience as perfect bridge across the two-cultures gulf and the rift between the sciences and the humanities; one author even envisioned a new paradigm for psychiatry.[30] Following the ideology of transdisciplinary collaboration between nature and culture as offered by neuroimaging's multiple modalities, researchers pushed theoretical rigor or conceptual succinctness to the back.

A prominent example for this trend is a new chapter on cultural neuroscience in the most recent edition of Michael Gazzaniga's well-established textbook of cognitive science. The first few lines give a flavor of the rhetoric meanwhile prevailing in this subfield:

> Culture and the brain were once thought of as mutually exclusive views on variation in behavior and were subjects of study divided by relatively strict divisions across the natural and social sciences. Although it is clear now that culture and social experience may readily shape brain function, this was not always the case. […] Progress in the emerging field of cultural neuroscience has been bolstered by accumulating evidence for neuroplasticity.[31]

The brief reference to "neuroplasticity" sufficed as buzzword for explaining why formerly contradictory or at least adversary approaches should flourish hand in hand. There was no need, apparently, for further justifications; it now seemed obvious that the brain was a cultural object, as it had previously been obvious that brains were biological products of the anonymous process of evolution.

Cultural neuroscience could thus be celebrated as offering a perfect mediation between hitherto disconnected approaches to human life. Or, as Shinobu Kitayama and Jiyoung Park claimed in a special issue on cultural neuroscience of the journal with the telling acronym *SCAN* (*Social, Cognitive, Affective Neuroscience*):

---

[30] Kamaldeep Bhui, "Cultural neuroscience: a meta-paradigm for psychiatry?," *British Journal of Psychiatry* 210 (2017): 89–90.

[31] Nalini Ambady, and Jonathan B. Freeman, "The Cultural Neuroscience of Human Perception," *The Cognitive Neurosciences*, ed. Michael S. Gazzaniga, George R. Mangun (Cambridge: MIT Press, 2014), 777.

> Cultural neuroscience can make important contributions to the study of culture by providing important insights about how 'deep' culture can go into the human brain. If nothing else, it would be very hard to maintain, with the currently available behavioral evidence alone, the position that culture is no more than a superficial overlay that may be best stripped out in the study of the human mind. [...] Moreover, because the brain reflects culture, brain activation patterns can provide important information about the very characteristics of the cultures themselves that are compared.[32]

Regardless of the celebratory prose, it should be noted how culture is not introduced here as an epistemic milieu nor conceptualized in any specific way, but just alluded to as phenomenon objectified by neuroimaging. In this example, cultural neuroscience shall connect relevant pieces of "information" from the two sides of the nature/culture divide without much concern for theoretical constraints, appropriate ways of mediation or the formatting effects of investigative technologies.

Exploring cultural specificities as brain-based phenomena, some authors reported differences in brain activation for religious denominations.[33] The typically western (and schematic) idea that a Christian would focus more actively and frequently on her "self", while a Buddhist would aim to "transgress the self", inspired studies that found different patterns for Chinese Christians compared to Chinese Buddhists, for example.[34] Whatever the evidence for such "different thinking styles" (analytic vs. holistic, religious vs. non-religious, Christian vs. Buddhist, etc), the dominant problem remains their inbuilt tendency of stereotyping, pushing towards monolithic, if not openly racist, conceptualizations of religion, nationality and other cultural

---

[32] Shinobu Kitayama, and Jiyoung Park, "Cultural neuroscience of the self: understanding the social grounding of the brain," *SCAN – Social, Cognitive, and Affective Neuroscience* 5 (2010), 125.

[33] Ying Zhu, and Shihui Han, "Cultural differences in the self: from philosophy to psychology and neuroscience," *Social and Personality Psychology Compass* 2 (2008), 1799–1811.

[34] Shihui Han, Xiaosi Gu, Lihua Mao, Jianqiao Ge, Gang Wang, and Yina Ma, "Neural substrates of self-referential processing in Chinese Buddhists," *SCAN – Social, Cognitive, and Affective Neuroscience* 5 (2010), 332–339.

constructs.[35] Building on critical scholarship from within neuroscience, I've argued elsewhere that such studies, far from engaging in productive interdisciplinary dialogue, foreclose intercultural interaction and intellectual exchange by arriving at allegedly objective evidence that is ill-founded on highly problematic and un-reflected concepts.[36]

Cultural neuroscience is in this regard a typical example and easy target for the type of critique brought forward by Vidal and Ortega that neuroscience expresses more of a creed and does not result from major scientific breakthroughs. With its shallowness, cultural neuroscience is a striking example of how neuro has become "uncomfortably protean".[37] Many of these studies are interdisciplinary by labeling, by declaring the approach to be so on basis of applying neuroimaging to a cultural phenomenon, with, in fact, no humanities scholars actively involved in the study design, data generation or the interpretation of results. Transdisciplinary cooperation is carried out here strictly according to a division of labor and of scientific credit, with the cultural experts restricted to the role of delivering useful classification systems for the diverse manifestations of human life, typically in form of objectifying tests scores, that are then investigated "scientifically" by means of the available neuroscience tools.

The peak of enthusiasm for cultural neuroscience, however, appears to have occurred some five years ago, at least according to the number of publications and reviews listed in the US National Library of Medicine. Cultural neuroscience has also become a target for scientific critique from within neuroscience, insisting on the scholarly specificity of humanities perspectives.[38] As long as neuroscience extends

---

[35] Marina Martínez Mateo, Maurice Cabanis, J. Stemmans, and Sören Krach, "Essentializing the binary self: individualism and collectivism in cultural neuroscience," *Frontiers in Human Neuroscience* 7 (2013), 289. Andreas Heinz, Daniel J. Müller, Sören Krach, Maurice Cabanis, and Ulrike P. Kluge, "The uncanny return of the race concept," *Frontiers in Human Neuroscience* 8 (2014), 836.

[36] Cornelius Borck, "Auf der Suche nach der verlorenen Kultur: Vom Neuroimaging über Critical Neuroscience zu Cultural Neuroscience – und zurück zur Kritik," *Berichte zur Wissenschaftsgeschichte* 41 (2018), 238–257.

[37] Vidal and Ortega, *Being Brains*, 187.

[38] Marina Martínez Mateo, Maurice Cabanis, Nicole Cruz de Echeverría Loebell y, and Sören Krach, "Concerns about cultural neuroscience: a critical analysis," *Neuroscience and Biobehavioral Reviews* 36 (2012), 152–161.

its cultural dominance by exerting transdisciplinary cooperation along such lines, it calls for "dissensus" as radical response to the often celebrated "consensus" on a brain-mind-culture continuum, as Cynthia Kraus has convincingly argued.[39] The vagueness of cultural neuroscience and its striking conceptual limitations shed some light on transdisciplinary cooperation as neuroscience rhetoric, lacking proper forms of scholarly cooperation and exchange.

## 3. Neurophenomenology, Loosely Speaking

Vague rhetoric is not limited to cultural neuroscience but finds its complements in neurophenomenology. In addition, neurophenomenology is an actors' term with a broad spectrum of meanings. Here, the equivalent to shallow conceptualizations of culture is a loose speaking of "phenomenology" without buying into the philosophy of that name. A telling example is a paper entitled "Wittgenstein's neurophenomenology", alluding to the famous philosopher, but not engaging with his philosophy:

> His work on the inner and the outer, the relation between language and sensation or perception, and on the embodied nature of emotion and its communication, is important for an understanding of neurological impairment beyond our experience. [...] He did not engage in empirical science, nor obtained data in any conventional sense. But his genius was not confined to abstract philosophy. His powers of observation and introspection led him to explore lived experience in new ways, some of which are only now being approached empirically.[40]

Such lines are typical, in my view, of a new flavor, an irreverently versatile approach in addressing philosophical issues from the psy sciences under the new neuro: Instead of taking Wittgenstein's writings as a brilliant reflection on the socio-linguistic preconditions of concepts according to his ordinary language philosophy, he is just int-

---

[39] Cynthia Kraus, "What is feminist critique of neuroscience? A call for dissensus studies," *Neuroscience and critique: exploring the limits of the neurological turn*, ed. Jan De Vos, Ed Pluth (London: Routledge, 2016), 100–117.

[40] Jennifer Cole, "Wittgenstein's neurophenomenology," *Medical Humanities* 33, no. 1 (2007), 59–64.

roduced as a genius in observation and introspection — whose insights can now be approached experimentally.

The implicit argument here seems to go in three steps as follows: Wittgenstein was great in differentiating sensory data and linguistic impressions as the two manifestations of philosophically relevant phenomena. He has formulated his insights in such precise ways that they can now guide neuroscientific investigations. And eventually, so one could assume, these scientific investigations would decide about the appropriateness of Wittgenstein's reflections and could base philosophy on a proper scientific grounding. At last, neuroscience has reached Wittgenstein's level of observational acumen by means of philosophical reflection. He has delivered so rich material that, thanks to the new methods, science can finally make real progress in understanding the mind. But how is this conceived as philosophical project and as epistemically valid research? Wittgenstein determined in his philosophy the epistemological preconditions of that very realm which neuroscientific investigations are mobilized to explore in their material and/or biological specificities. Hence the results of such studies always follow from Wittgenstein's analysis, rather than inform these epistemological preconditions.

This philosophical fuzziness of "neurophenomenology" became possible on basis of the common use of the word "phenomenology", especially in medicine and clinical practice, simply for referring to "phenomena" without any philosophical intentions or methodological precision. According to this usage, "the phenomenology" of a particular condition, disease or case (like "the phenomenology of tics", for example), simply signifies its clinical appearance. In this rather loose understanding, "phenomenology" denotes the empirical appearance of something, across the entire spectrum from the individual case to the typical.[41] If the phenomenology of something is basically its appearance, "neurophenomenology" can be the condition of "a phenomenon" related to neurology or neuroscience and situated in the borderlands between appearance and experience. A proper discourse analysis could draw

[41] Joseph Jankovic, and Stanley Fahn, "The phenomenology of tics," *Movement Disorders* 1, no. 1 (1986), 17–26.

here from many similar titles, all published after the year 2000. These titles, papers and books testify by their mere existence to the reigning discourse without delivering much of what they claim to explain.

In its extreme form, "neurophenomenology" is little more but the name for an idiosyncratic gluing-together of private research interests with a self-made philosophy of mind and brain, as the following example demonstrates. In *Neurophenomenology and Its Applications to Psychology*, Susan Gordon shows surprising robustness in applying the term: Instead of providing a systematic introduction of the concept and of reviewing the relevance of the field for psychology, as one would expect from the title, she combines four papers by other authors (on neurophenomenology – whatever it is – in relation to emotion, to pedagogy, to meditation and to William James) with her private theory of "psychoneurointracrinology":

> This chapter introduces a psychoneurointracrine model of the embodied self and examines the interrelationship between psychological, neurological, and intracrinological processes forming a mind-brain continuum within the person. Psycho (psychological) refers to constructs variously referred to as psyche, self, soul, mind, and consciousness. Neuro (neurological) refers to the composition and reactions within the nervous system. Intracrine (intracrinological) refers to the intracellular biosynthesis of steroids, the binding of receptors, and the formation of enzymes that catalyze the creation of hormones within the cell. It is argued that self has neural correlates in the hypothalamic-pituitary-gonadal (HPG) and hypothalamic-pituitary-adrenal (HPA) axes of the body, which are responsible for enactive engagement and the development of meaning through their connections to the higher-order functions of the brain.[42]

The author offers her own solution to the mind-brain problem, so long sought after, by a unifying theory based on an obvious mereological fallacy, infusing brain chemicals with mysterious "enactive" powers.

---

[42] Susan Gordon, "Psychoneurointracrinology: the embodied self," *Neurophenomenology and Its Applications to Psychology*, ed. Susan Gordon, (New York: Springer, 2013), 115.

Such philosophical vagueness of "neurophenomenology" points to an important aspect of the current style in relating between philosophy, neuroscience and the psy sciences, e.g. the combination of epistemically radically heterogeneous perspectives. Some studies seem to share sincere concerns, while others exhibit philosophical inconsistencies and "neurophenomenology" seems to serve its role as mere catchword covering up shortcomings. Others address directly the problems of mediating experimentally between psychic experiences and experimental observations. Because these trends all sail, in one way or another, under the umbrella term "neurophenomenology", they call for conceptual critique and a careful re-examination of phenomenology's aims in light of the new neuro.

The guilt for the fuzzy ambivalence of "neurophenomenology", however, does not fall exclusively on the want-to-be philosophers among the neuroscientists. The *Oxford Handbook of Neuroethics* seems to provide, at first glance, a good example for more comprehensive and interdisciplinary approaches also by actors from the camp of the humanists. The editors invited neuroscientist and NIH representative Alan Lashner for an introductory chapter on "Bridging neuroscience and society", for example.[43] On closer inspection, however, the volume turns out to follow strictly a hierarchy of knowledge, controlled and regulated entirely by neuroscience and ignoring the sociopolitical context of this research or the philosophical underpinnings of the knowledge thereby yielded. John-Dylan Haynes sets the tone for the following chapters when he opens by explaining the current state of brain reading, as the following chapters all start in the same manner by explaining some experimental findings as "neurobiological basis" for deducing some "neuroethical implications".[44]

---

[43] Alan I. Leshner, "Bridging neuroscience and society: Research, education and broad public engagement," *Oxford Handbook of Neuroethics*, ed. Judy Illes, and Barbara J. Sahakian (Oxford: Oxford University Press, 2011), V–XII.

[44] John-Dylan Haynes, "Brain reading: decoding mental states from brain activity in humans sets the tone for the chapters when he starts by explaining the current state of brain reading mental states," *Oxford Handbook of Neuroethics*, ed. Judy Illes, and Barbara J. Sahakian (Oxford: Oxford University Press, 2011), 3–14. Following chapters on "The neurobiological basis of morality" by Christopher Suhler and Patricia Curchland or on "Neuroethical implications for the understanding of executive function" by Monica Luciana, "Neural foundations to … volitional control" by Mario Beauregard give the flavor of the volume.

It would be cheap to lament a decline of ethics and moral philosophy in the arena of competing knowledge claims and enforced interdisciplinary cooperation. All the more noteworthy are initiatives employing philosophy for questioning and critiquing knowledge. The most significant example of this line of sociopolitical reflection and philosophical critique is probably *Critical Neuroscience*. The group published a meanwhile well-established textbook combining a sociopolitical contextualization of neuroscience knowledge along the lines of the *Frankfurt School* with critical analyses from STS and historical epistemology. Initiated by young scholars and graduate students in search for an interdisciplinary forum of discussion and exchange in Germany in 2003, *Critical Neuroscience* quickly moved from the national to the international level. The group managed to convene a small, but remarkable series of conferences that resulted in the branding of the group's agenda.[45] *Critical Neuroscience* became the name for a reflexive, culturally sensible and politically responsible form of pursuing neuroscience by investigating mental and neural phenomena not independent of their historical, linguistic and sociopolitical contexts.[46] However, it would mean to exaggerate the outreach of the group's arguments to claim *Critical Neuroscience* responsible for neuroscience diverting into social and cultural domains. On the contrary, the field moved there for the reasons sketched out above, i.e. thanks to technological opportunities or simply because of serendipity and competitive advantages.

## 4. Neurophenomenology, Strictly Speaking

In a more specific understanding, neurophenomenology designates a field of study where "phenomenology" is linked to the philosophical program of this name and reflects how it could be mobilized for neuroscience. In this meaning, the term describes a specific intervention into brain research and cognitive science from philosophy. As first use of the term "neurophenomenology" counts a book with the subtitle

---

[45] Suparna Choudhury, and Jan Slaby, "Introduction. Critical Neuroscience—Between Lifeworld and Laboratory," *Critical Neuroscience: A Handbook of the Social and Cultural Contexts of Neuroscience*, ed. Suparna Choudhury, and Jan Slaby (Chichester: Wiley Blackwell, 2012), 1–26.

[46] Suparna Choudhury, Saskia Kathi Nagel, and Jan Slaby, "Critical Neuroscience: Linking Neuroscience and Society through Critical Practice," *BioSocieties* 4 (2009), 61–77.

"Toward a neurophenomenology of consciousness" that discussed the shortcomings of the prevailing reductionism in cognitive science.[47] This points already to the context to be analyzed here, namely discussions on the structure of consciousness in relation to the nature of neuronal processes, but the book did not engage with phenomenology as a philosophical program. It was Francisco Varela who formulated the project of bringing phenomenology to cognitive science and to marrying the two to a new form of neuroscience under the name of "neurophenomenology".

Varela introduced neurophenomenology in 1996 as name for attempts to mediate between third-person observations and first-person accounts. The idea was to bring the full weight of phenomenology as philosophical exploration of introspective experiences into debates in cognitive science on the "hard problem" of *qualia* as lived experiences:

> The phenomenological approach starts from the irreducible nature of conscious experience. Lived experience is where we start from and where all must link back to, like a guiding thread. [...] On the whole, my claim is that neurophenomenology is a natural solution that can allow us to move beyond the hard problem in the study of consciousness. [...] In other words, instead of finding 'extra ingredients' to account for how consciousness emerges from matter and brain, my proposal reframes the question to that of finding meaningful bridges between two irreducible phenomenal domains. In this specific sense neurophenomenology is a potential solution to the hard problem by casting in an entirely different light on what 'hard' means. ... What do phenomenological accounts provide? At least two main aspects of the larger picture. First, without them the firsthand quality of experience vanishes, or

[47] *Brain, symbol & experience: toward a neurophenomenology of human consciousness*, ed. Charles D. Laughlin Jr., John McManus, Eugene G. D'Aquili, (New York: Columbia University Press, 1990). The subtitle provides evidence for the long history of the pragmatic understanding of "neurophenomenology" and thus demonstrates that a "neuro" prefix already functioned as stylish title well before the takeoff of neuro.

> it becomes a mysterious riddle. Second, structural accounts provide constraints on empirical observations.[48]

Compared to the widespread parlance of "neurophenomenology" described above, Varela's plea stands out by a series of remarkable specifications (to be discussed below) – and the question arises how the more recent work following under that label lives up to his ideas, now that neurophenomenology has become a branch of empirical neuroscience.

With the search for "meaningful bridges" between "matter and brain" on the one hand and "conscious experience" on the other, Varela seems to have anticipated today's rhetoric of cultural neuroscience mediating between brain function and social experience. But one would have to clarify immediately how his project focused explicitly on the conceptual conundrum which cultural neuroscience shunts by obfuscation. The shortcomings of the one-sided variants of transdisciplinary cooperation discussed above are exposed here right as starting point and would have been mended, so it seemed, with a well-balanced form of cooperation: The cognitive scientist and brain researcher would collaborate properly with the philosopher as phenomenologically trained observer for bringing the synergies of the two approaches to fruition by facing and addressing the epistemic problems. And yet, Varela did not speak of synergies. Instead he started with lived experience and empirical observations as two irreducible domains, the epistemological core of his argument rests in the negative and gains its strength from a negative epistemology: The two perspectives do not complement but constrain and control each other.

Varela conceived of phenomenology as an epistemological critique of cognitive science and of cognitive science as an empirical program challenging first-person accounts. Mistaking Varela's neurophenomenology as new gateway opening cognitive science by means of neuroimaging to the vital spheres of lived experience would replace his epistemological rigor by the vagueness so typical of much work

---

[48] Francisco J. Varela, "Neurophenomenology: a methodological remedy for the hard problem," *Journal of Consciousness Studies* 3 (1996), 340–344.

in cultural neuroscience and resulting in allegedly "significant correlations". Varela did not envision neuroimaging as the mediating technology bridging between first-person experiences and experimental observations and connecting the richness of subjective accounts with the vast territories of neuroscience data. According to the paper cited above, his neurophenomenology was molded in terms of constraints and limitations imposed by the different perspectives. Cultural neuroscience by contrast often imagines a mutual adding of layers of information from different directions for arriving at an allegedly complete pictures. The connection Varela spoke of was not a technological tool bridging hitherto isolated realms, but consisted in the necessary epistemological precondition because of the irreducibility of experience on the one hand and because of the material obstinacy of nervous systems on the other. He conceived of this connection in terms of limitations and searched for methodologies that would guide reflection and theorizing precisely along these constraints.

At the core of Varela's idea rests a methodological intervention. Irreducibility and constraints function as analytical arguments for a rigid methodological turn toward epistemological questions. Varela continued on a path along which Edmund Husserl had radicalized Kant's critical philosophy: "Zurück zu den Sachen selbst!"[49] However, there was no direct link from Husserl's *epoché* to brain research, and the import occurred only after a long detour by Varela via second-order cybernetics, systems theory and Humberto Maturana's concept of autopoiesis, back to Maurice Merleau-Ponty and forward from there, via Eastern philosophy and meditation, to consciousness studies an cognitive science:

> The study of mental phenomena is always that of an experiencing person. We claimed that cognitive science cannot escape this circulation, and must cultivate it instead. We explicitly draw from Asian traditions, Buddhism in particular, as living manifestations of an active, disciplined phenomenology.[50]

---

[49] Edmund Husserl, *Logische Untersuchungen*, Vol. II, Part 1 (Tübingen: Niemeyer, 1913), 6; quoted by Varela, "Neurophenomenology," 336.

[50] Varela, "Neurophenomenology," 346.

By 1996, when Varela introduced the concept of neurophenomenology, he had already been instrumental, together with the Dalai Lama, in founding the *Mind & Life Institute*, one of the leading centers in brain research and meditation.

Soon afterwards the Dalai Lama became as famous as popular a subject of neuroimaging studies and spoke at a meeting of the Society for Neuroscience.[51] In most of these studies, however, little is left from Varela's insistence on constraints. Instead, researchers like Richard Davidson or Tania Singer, for example, have published as empirical findings that meditation and compassion training correlate significantly with distinctive patterns in neuroimaging studies.[52] There is nothing wrong with such studies per se, but the convincing strength of Varela's epistemological intervention rested, by comparison, in his abstinence from images and his adherence to the limitations of the available approaches:

> One day the intellectual history of the peculiar twists and turns of this problem space will be reviewed thoroughly. But it has a déjà-vu aura to it, reminding us of many swings of the pendulum, between rejecting and total fascination with the scientific discussions of conscious experience. This can hardly be otherwise, since any science of cognition and mind must, sooner or later, come to grips with the basic condition that we have no idea what the mental or the cognitive could possibly be apart from our own experience of it.[53]

During the last few decades the pendulum has been swinging back and forth at a particularly fast pace. Reductionism may reject experience for objective reasons – and

---

[51] John Geirland, "Buddha on the Brain," *Wired*, February 1, 2006. https://www.wired.com/2006/02/dalai/.

[52] Helen Y. Weng, Andrew S. Fox, Alexander J. Shackman, Diane E. Stodola, Jessica Z. K. Caldwell, Matthew C. Olson, Gregory M. Rogers, and Richard J. Davidson, "Compassion training alters altruism and neural responses to suffering," *Psychological Science* 24 (2013), 1171–1180. Haakon Engen, Boris Bernhardt, Leon Skottnik, Matthieu Ricard, and Tania Singer, "Structural changes in socio-affective networks: Multi-modal MRI findings in long-term meditation practitioners," *Neuropsychologia* 116, no. A (2018): 26–33.

[53] Varela, "Neurophenomenology," 331, 334f.

yet, "we have no idea what the mental […] could possibly be apart from our experience". With his argument for embodiment, Varela responded to a massive wave of reductionist neuroscience, before the field started to embrace the living brain and vital models.[54] Neurophenomenology was, for Varela, the name for a doubled skepticism, vis-à-vis speculative subjectivity *and* objectivist hubris. But what does follow from there, if the recent rise of neurophenomenology is indicative of a regained fascination with lived experience?

Shaun Gallagher, for example, provides a fine variant of neurophenomenology for an adventurous and ambitious way of incorporating the philosophical weight of phenomenology into empirical neuroscience. Coming also from cognitive science, he envisioned space travel rather than meditation as extraordinary experience and even arranged his book *Neurophenomenology of Awe and Wonder* in the form of a liftoff, starting the countdown with the introduction and numbering the chapters backwards. Like Varela, Gallagher addresses the question how best to align first- and third-person perspectives for neuroscience research. His book takes (simulated) space travel as exemplary instance of truly exceptional human (and exceptionally human) experiences with an unknown neuronal and psychophysiological basis:

> It seems that senses of awe and wonder come as close to human universals as could be imagined and if we look at long-standing philosophical discussions of such things, the result of that universality has been that we have gone outside of ourselves to explain or understand our senses of awe and wonder. […] And yet, that move has, until recently, taken us away from considering awe and wonder as phenomena worth understanding in their own right. […] The aim of this study was to explore what traditionally might be called the inner space of experience, while travelling in outer space. […] The study of the experience of those who have travelled to space avoids the temptation

[54] *Vital Models: The Making and Use of Models in the Brain Sciences*, ed. Tara Mahfoud, Sam McLean, and Nikolas Rose, *Progress in Brain Research* 233 (2017), 2–226.

> to either reduce awe and wonder to mundane experience or explain it completely by reference to some internal processes caused be external stimuli.[55]

Gallagher and colleagues report in this book on a complex research project for which they teamed up with scholars in linguistics, art history and hermeneutics on the one hand and experts in psychophysiology, neurophysiology, computer sciences and simulation studies on the other, for perfecting psychophysiological measurements related to experiences of awe and wonder as simulated in experiments with space travel. One might be tempted to laugh at the simplicity of the simulation, consisting in a room mimicking the interior of a space ship with an outlook through appropriately shaped "windows", where the appropriate film sequences of views through a space module upon planet earth and/or the moon and stars were provided on computer screens. However, the experiments with the makeshift space ship worked well enough to make the volunteers wonder and to reflect on their experiences, although nobody had left the surface of the earth, let alone gravity. And the experienced states of awe and wonder corresponded with specific changes in EEG recordings, although the subjects did nothing but look at the images of planet earth or stars. The experiments thus demonstrated the experimental testability of awe and wonder, two exquisitely human and cultural experiences.

And yet, the study on awe and wonder has little to offer beyond an amazing effort to mimicking space travel without going (and getting) there. The disappointment does not so much result from the obvious discrepancies between the simulation and the imagined real but from the rather frustratingly limited information in the psychophysiological data, demonstrating awe and wonder as bodily experiences but void of meaning. Could it have been otherwise? If Varela's strength rested in the radical negativity of his skepticism, nonetheless securing consciousness its place at the table, the weakness of today's attempts to translate his concepts into experimentally testable designs lies in overcoming these limitations. Gallagher and his team

---

[55] Shaun Gallagher, Lauren Reinerman-Jones, Bruce Janz, Patricia Bockelman, and Jörg Trempler, *A neurophenomenology of awe and wonder: towards a non-reductionist cognitive science* (Basingstoke: Palgrave Macmillan, 2015), 2.

wanted to connect the best of both worlds – but Varela had already seen that such a hope is in vain, if it ignores limitations and constraints as truly significant insights. Perhaps neuroscience progresses better by failures than by breakthroughs.

Gallagher and his co-authors conceived of neurophenomenology, like Varela, as "non-reductionist cognitive science" that should start by critically evaluating methodology. Before embarking on space travel, Gallagher had teamed up with Dan Zahavi for positioning phenomenology as missing link between philosophy of mind and cognitive science,[56] and he had edited a handbook linking phenomenology with cognitive science.[57] Working out the details of awe and wonder as empirical correlations, however, did not arrive at experiences as empirically explicable qualities, so it seems; the attempt to explore consciousness in terms of neuro determinants was destined to failure, calling for further experimental refinements.[58] In consequence, Gallagher started most recently to "rethink the mind" by an "enactivist intervention", conceiving of mind as radically social, interactive process and emphasizing the "enactive" concept of mind that Varela (together with Evan Thompson and Eleanor Rosch) had developed in the 1990s.[59]

In light of this line of empirical research and philosophical reflection, neurophenomenological research appears as perfect example for research as a way of curating the mind-brain problem, developing ever more refined methodological considerations for arriving at even more sophisticated experimental arrangements – and for safeguarding experiences from explanation. Apparently, neurophenomenology functions best as a critical program insisting on subjective experience.

---

[56] Shaun Gallagher, and Dan Zahavi, *The phenomenological mind: an introduction to philosophy of mind and cognitive science* (London: Routledge, 2008).

[57] *Handbook of phenomenology and cognitive science*, ed. Shaun Gallagher, and Daniel Schmicking, (Berlin: Springer, 2009). Of the 33 chapters, however, just two had "neurophenomenology" in their title; apparently, the neuro had not yet been assigned the role of master concept.

[58] A good example of this tendency provide Patricia Bockelman, Lauren Reinerman-Jones and Shaun Gallagher, "Methodological lessons in neurophenomenology: review of a baseline study and recommendations for research approaches," *Frontiers in Human Neuroscience* 7 (2013), 608.

[59] Shaun Gallagher, *Enactivist interventions: rethinking the mind* (Oxford: Oxford University Press, 2017). Francisco J. Varela, Evan Thompson, and Eleanor Rosch, *The embodied mind: Cognitive science and human experience* (Cambridge: MIT Press, 1992).

Neurophenomenology reported fascinating results, and the actors secured some turf by propagating its message. Along this trajectory, Varela and his allies in neurophenomenology moved away from narrowly focusing on the hard problem and explored, for example, first-person accounts of visual perception but encountered new limitations as the experimental subjects had to be trained in phenomenology.[60] And yet the succinctness with which Varela determined neurophenomenology to bring constraints to the fore still stands out as major insight, towering over the positive data from further studies. A specific productivity of neurophenomenology appears to rest on the negative, e.g. as critique of shortcomings and as skepticism towards overblown interpretations of results.

## 5. Concluding by Performing Critique

Among the more surprising turns in recent debates on neuroscience is a paper critiquing *Critical Neuroscience* as armchair philosophy indulging arrogantly in ignorance vis-à-vis the true significance of rigorous experimental approaches. Andreas Roepstorff, one of the authors in Gallagher's handbook and a leading figure in transdisciplinary approaches to neuroscience, argued that *Critical Neuroscience* misses opportunities for "enacting" its critique if it insists on social context regardless of the specificities of a particular experiment – which may yield insights precisely by shunning context. Taking the example of an experiment demonstrating the superiority of collaboration over individual work in specific situations, the authors concluded that in this case precisely the "formal and context-denying conventions of neuroscientific experimentation" had yielded significant evidence in form of robust data.

Instead of reading Roepstorff's exchange with *Critical Neuroscience* as self-opinionated dispute between opposing paradigms, the paper can be taken as an intervention. It performed an argument by pointing to the emptiness of the repeated

---

[60] Antoine Lutz, Jean-Philippe Lachaux, Jacques Martinerie, and Francisco J. Varela, "Guiding the study of brain dynamics by using first-person data: Synchrony patterns correlate with ongoing conscious states during a simple visual task," *PNAS – Proceedings of the National Academy of Sciences of the United States of America* 99, no. 3 (2002), 1586–1591.

invocation of context if that misses the rigor and force of what a "tightly-bound neuroscientific experiment can actually do."[61] Read in this way, the paper confirms some of the observations made here, although it seems to contradict them at first glance. As performative act, the paper pushes a highly reflexive argument contextualizing specific methodological approaches and their effects. It thus relies on much more than it ostensibly advertises and is thus indicative of the trend to transdisciplinary methods instead of boldly reductionist approaches. And like Varela's insistence on limitations, its strength relies in a critical, if not frankly negative mode, engaging in an adversarial mode of collaboration: *Critical Neuroscience* is critiqued here not for safeguarding context-denying experimentation but for opening a space of new possibilities. From the dispute does not follow that philosophical and sociopolitical reflections preempt empirical work; on the contrary, Roepstorff and his co-authors engaged in it.

Performing critique can also occur as reflexive practice by repeating experiments. When John Dylan Haines repeated Benjamin Libet's experiments on the neuronal timing of mental decisions in around 2000, i.e. at the peak of reductionist claims and the neuro hype, he claimed that he was able to show that subjectively "free" decisions are encoded by brain activity up to ten seconds before awareness.[62] At that historical moment, Haynes' experiments seemed to confirm that conscious decision making is nothing but a nice illusion, and he did much to foster this interpretation. Some years later, however, and in the slightly changed climate of cultural awareness and transdisciplinary cooperation, he and his team started to wonder whether they could also test Libet's more speculative hypothesis of a mental "veto", the intellectual ability to stop an action already encoded. And again they succeeded. The team now showed that subjects were able to win a "duel" against a brain-computer interface

---

[61] Des Fitzgerald, Svenja Matusall, Joshua Skewes, and Andreas Roepstorff, "What is so critical about Critical Neuroscience? Rethinking experiment, enacting critique," *Frontiers in Human Neuroscience* 8 (2014), 365.

[62] Chun Siong Soon, Marcel Brass, Hans-Jochen Heinze, and John-Dylan Haynes, "Unconscious determinants of free decisions in the human brain," *Nature Neuroscience* 11 (2008), 543–545.

predicting their brain's decisions.[63] Whereas the first paper "proved" human beings to be neuronally predetermined machines, the second demonstrated that the very same human beings could outwit such machines.

There is not much sense in arguing one of these experiments to be superior to the other or to accuse Haynes of simply hopping on the bandwagon of paradigm changes. Varela's conceptualization of neurophenomenology, Roepstorff's critique of *Critical Neuroscience* and Haynes' repetitive experiments that science is not about determining an outside reality because science is part and parcel of this reality – just like the society and culture in which it takes place. Changing paradigms have multiple reasons. Scientific advances and technological developments do play a certain role, but others result from the concerted efforts of critical scholars, the wider public or simply the changing contour of general concerns. Haynes' most recent feedback experiments with brain-computer interfaces returns to the performative arts from the 1960s, when composers like Alvin Lucier created paradoxical and self-contradictory interventions like his *Music for Solo Performer*. In this piece of creative research, the artist on stage hooked himself up to an EEG device, picking up his brain signals and transforming regular and powerful brain waves like an alpha rhythm into electric signals driving drums. The condition necessary for generating an alpha rhythm, however, did not match a situation of attention and awareness like being on stage. On the contrary, brains generate alpha waves during states of relaxation and disconnection from sensorial input. – Exactly this contradictory constellation was the challenge that Lucier turned with his performance into a famous piece of music.[64]

Alpha waves were generated by the performer as long as he relaxed and disengaged from any specific thoughts. Since this was a public performance on stage with the task to generate sound, any relaxation was difficult; by listening to some sound

---

[63] Matthias Schultze-Krafta, Daniel Birmana, Marco Rusconia, Carsten Allefelda, Kai Görgena, Sven Dähnee, Benjamin Blankertz, and John-Dylan Haynes, "The point of no return in vetoing self-initiated movements," *PNAS – Proceedings of the National Academy of Sciences of the United States of America* 113, no. 4 (2016), 1080–1085.

[64] Cornelius Borck, "Media, Technology, and the Electric Unconsciousness in the 20th Century," *L'ère électrique: The electric age*, ed. Olivier Asselin, Silvestra Mariniello, Andrea Oberhuber (Ottawa: Les Presses de l'Université d'Ottowa, 2011), 33–60.

already generated – if the relaxation had been successful so far – the performer would have inevitably concentrated and thus extinguished the neuronal source of the sound and hence the music. At the core of the piece was thus a contradictory constellation of self, brain, and machine. The performance revolved around the very concept of a contradictory constellation, turning precisely the incompatible interferences between a self, a brain, and a machine into soundscape; just like Haynes would connect the self with a brain-computer interface several decades later. The performance accessed a zone of uncertainty that Haynes explored scientifically. "Self or brain?" would obviously be a misplaced question in such an arrangement that yielded its aesthetic and epistemic insights from exploring the dead ends of neurophysiology. The performance from the 1960s and the experiment some fifty years later demonstrate the contradictory inconsistencies of attempts to outwit the brain and/or self by means of advanced scientific knowledge.

Lucier performed an "enactive" intervention – and he did so many years before brain research arrived there. His performance had turned the stalemate that Haynes explored in the laboratory into a space for unexpected aesthetic experiences. Back then, there was no "neuro" in the sense of shorthand for a discursive formation and an alliance of powerful research institutions, but cybernetics and control dominated the discursive space of brain research – including many of the psy sciences before Foucault set in. Lucier performed the experimental thought style of the 1960s, while Haynes embodied the rigor of the *Decade of the Brain*, before he succumbed to the fascination of machines that Lucier had already celebrated. Feedback, cooperation and critique operate the better the closer they articulate; their articulation, however, appears to change over time, with the more fundamental alignments becoming visible only at historical distance. Haynes' turning from reductionism to competitive alliance of self and machine repeated artistic research form the 1960s and testified to some of the fundamental insights by the neurophenomenology of the 1990s without buying into them.

Today, neuro may dominate "our thought", but it does not prevail as monolithic framework with a single overarching agenda. Neuro is rather the collective effect of thousands of researchers working with different tools on many different

questions. Precisely because of the pervasiveness of brain-based explanations and neuro arguments, any analysis of their dominance should carefully evaluate the specific articulation of psy science with philosophy in the neuro turn. "Culturalizing" neuroscience may function like a superficial amalgamate and new directions like cultural neuroscience should be carefully scrutinized as branches of neuroscientific research. But such critique is itself part of the game, participating at performing neuroscience and shaping its more questionable or not-so-problematic sociopolitical effects. *Critical Neuroscience* has certainly helped to highlight some problematic forms of neuroscience, whether it has also contributed to new problematic forms remains to be determined. But critique should continue to engage with the tensions between the psy sciences, philosophy and neuroscience for letting the human sciences thrive.

## Acknowledgements

The paper started as a presentation at the conference "Philosophie und Psychologie" in Vienna in December 2017, I want to thank the participants of this conference, Andreas Gelhard, Mareike Smolka, Patrick Kilian and especially the two referees for very valuable and helpful comments.

## Bibliography

Ambady, Nalini, and Jonathan B. Freeman. "The Cultural Neuroscience of Human Perception." In *The Cognitive Neurosciences*, edited by Michael S. Gazzaniga, and George R. Mangun, 777–785. Cambridge: MIT Press, 2014.

American Psychiatric Association (ed.). *Diagnostic and statistical manual of mental disorders*. 3 Edition, Washington: American Psychiatric Association, 1980.

Andreasen, Nancy C. "DSM and the Death of Phenomenology in America: An Example of Un-intended Consequences." *Schizophrenia Bulletin* 33, no. 1 (2007): 108–112. DOI: https://doi.org/10.1093/schbul/sbl054

Andreasen, Nancy C. *The broken brain: the biological revolution in psychiatry*. New York, NY: Harper & Row, 1984.

Azar, Beth. "Your brain on culture. The burgeoning field of cultural neuroscience is finding that culture influences brain development, and perhaps vice versa." *APA Science Watch* 41, no. 10 (2010): 44. DOI: https://doi.org/10.1037/e620872010-019

Bhui, Kamaldeep. "Cultural neuroscience: a meta-paradigm for psychiatry?" *British Journal of Psychiatry* 210 (2017): 89–90. DOI: https://doi.org/10.1192/bjp.210.1.89

Bockelman, Patricia, Lauren Reinerman-Jones, and Shaun Gallagher. "Methodological lessons in neurophenomenology: review of a baseline study and recommendations for research approaches." *Frontiers in Human Neuroscience* 7 (2013): 608. DOI: https://doi.org/10.3389/fnhum.2013.00608

Borck, Cornelius. "Animating Brains." *Medical History* 60 (2016): 308–324. DOI: https://doi.org/10.1017/mdh.2016.25

Borck, Cornelius. "Auf der Suche nach der verlorenen Kultur: Vom Neuroimaging über Critical Neuroscience zu Cultural Neuroscience – und zurück zur Kritik." *Berichte zur Wissenschaftsgeschichte* 41 (2018): 238–257. DOI: https://doi.org/10.1002/bewi.201801899

Borck, Cornelius. "Media, Technology, and the Electric Unconsciousness in the 20th Century." *L'ère électrique: The electric age*, edited by Olivier Asselin, Silvestra Mariniello, and Andrea Oberhuber, 33–60. Ottawa: Les Presses de l'Université d'Ottowa, 2011.

Callard, Felicity, Rhodri Hayward, and Angus Nicholls. "Editorial." *History of the Human Sciences* 29, no. 3 (2016): 3–7. DOI: https://doi.org/10.1177/0952695116643465

Carhart-Harris, Robin L., Suresh Muthukumaraswamy, Leor Roseman, Mendel Kaelen, Wouter Droog, Kevin Murphy, Enzo Tagliazucchi, Eduardo E. Schenberg, Timothy Nest, Csaba Orban, Robert Leech, Luke T. Williams, Tim M. Williams, Mark Bolstridge, Ben Sessa, John McGonigle, Martin I. Sereno, David Nichols, Peter J. Hellyer, Peter Hobden, John Evans, Krish D. Singh, Richard G. Wise, H. Valerie Curran, Amanda Feilding, and David J. Nutt. "Neural correlates of the LSD experience revealed by multimodal neuroimaging." *PNAS – Proceeding of*

*the National Academy of Science of the USA* 113, no. 17 (2016): 4853–4858. DOI: https://doi.org/10.1073/pnas.1518377113

Chaplin, Tamara, and Jadwiga E. Pieper Mooney, eds. *The global 1960s: convention, contest, and counterculture*. London: Routledge, 2017. DOI: https://doi.org/10.4324/9781315200828

Chen, Jian, Martin Klimke, Masha Kirasirova, Mary Nolan, Marilyn Young, and Joanna Waley-Cohen, eds. *The Routledge handbook of the global sixties: between protest and nation-building*, London: Routledge, 2018. DOI: https://doi.org/10.4324/9781315150918

Chiao, Joan Y. "Cultural neuroscience, a once and future discipline." *Progress in Brain Research* 178 (2009): 287–304. DOI: https://doi.org/10.1016/S0079-6123(09)17821-4

Chiao, Joan Y., Shu-Chen Li, Rebecca Seligman, and Robert Turner, eds. *The Oxford Handbook of Cultural Neuroscience*. Oxford: Oxford University Press, 2016. DOI: https://doi.org/10.1093/oxfordhb/9780199357376.013.24

Choudhury, Suparna, and Jan Slaby. "Introduction. Critical Neuroscience—Between Lifeworld and Laboratory." *Critical Neuroscience: A Handbook of the Social and Cultural Contexts of Neuroscience*, edited by Suparna Choudhury, and Jan Slaby, 1–26. Chichester: Wiley Blackwell, 2012. DOI: https://doi.org/10.1002/9781444343359.ch

Choudhury, Suparna, Saskia Kathi Nagel, and Jan Slaby. "Critical Neuroscience: Linking Neuroscience and Society through Critical Practice." *BioSocieties* 4 (2009): 61–77. DOI: https://doi.org/10.1017/S1745855209006437

Churchland, Patricia Smith. *Neurophilosophy: toward a unified science of the mind-brain*. Cambridge: The MIT Press, 1986.

Cole, Jennifer. "Wittgenstein's neurophenomenology." *Medical Humanities* 33, no. 1 (2007): 59–64. DOI: https://doi.org/10.1136/jmh.2006.000232

Dumit, Joseph. "Afterword: Twisting the neurohelix." In *The neuroscientific turn: transdisciplinarity in the age of the brain*, edited by Melissa M. Littlefield, and Jenell M. Johnson, 233–240. Ann Arbor: University of Michigan Press, 2012.

Dumit, Joseph. *Picturing personhood: brain scans and biomedical identity*. Princeton, NJ: Princeton University Press, 2004.

Elger, Christian E., Angela D. Friederici, Christof Koch, Heiko Luhmann, Christoph von der Malsburg, Randolf Menzel, Hannah Monyer, Frank Rösler, Gerhard Roth, Henning Scheich, and Wolf Singer. "Das Manifest. Elf führende Neurowissenschaftler über Gegenwart und Zukunft der Hirnforschung." *Gehirn und Geist* 3, no. 6 (2004): 31–37.

Engen, Haakon, Boris Bernhardt, Leon Skottnik, Matthieu Ricard, and Tania Singer. "Structural changes in socio-affective networks: Multi-modal MRI findings in long-term meditation practitioners." *Neuropsychologia* 116, no. A (2018): 26–33. DOI: https://doi.org/10.1016/j.neuropsychologia.2017.08.024

Felsch, Philipp. *Der lange Sommer der Theorie: Geschichte einer Revolte 1960–1990*. München: Beck, 2015. DOI: https://doi.org/10.17104/9783406668548

Fitzgerald, Des, Svenja Matusall, Joshua Skewes, and Andreas Roepstorff. "What is so critical about Critical Neuroscience? Rethinking experiment, enacting critique." *Frontiers in Human Neuroscience* 8 (2014): 365. DOI: https://doi.org/10.3389/fnhum.2014.00365

Foucault, Michel. *The Order of Things: An Archaeology of the Human Sciences*. Oxford: Routledge, 1989.

Frei, Norbert. *1968: Jugendrevolte und globaler Protest*. Revised new edition, München: Deutscher Taschenbuch-Verlag, 2018.

Gallagher, Shaun. *Enactivist interventions: rethinking the mind*. Oxford: Oxford University Press, 2017. DOI: https://doi.org/10.1093/oso/9780198794325.001.0001

Gallagher, Shaun, and Daniel Schmicking, ed. *Handbook of phenomenology and cognitive science*. Berlin: Springer, 2009.

Gallagher, Shaun, and Dan Zahavi. *The phenomenological mind: an introduction to philosophy of mind and cognitive science*. London: Routledge, 2008. DOI: https://doi.org/10.4324/9780203086599

Gallagher, Shaun, Lauren Reinerman-Jones, Bruce Janz, Patricia Bockelman, and Jörg Trempler. *A neurophenomenology of awe and wonder: towards a non-reductionist*

*cognitive science*. Basingstoke: Palgrave Macmillan, 2015. DOI: https://doi.org/10.1057/9781137496058

Geirland, John. "Buddha on the Brain." *Wired*, February 1, 2006. https://www.wired.com/2006/02/dalai/.

Geyer, Christian, ed. *Hirnforschung und Willensfreiheit: Zur Deutung der neuesten Experimente*. Frankfurt am Main: Suhrkamp, 2004.

Gildea, Robert, James Mark, and Anette Warring, eds. *Europe's 1968: voices of revolt*. Oxford: Oxford University Press, 2017.

Glimcher, Paul W. *Decisions, uncertainty, and the brain: the science of neuroeconomics*. Cambridge, MA: MIT Press, 2003. DOI: https://doi.org/10.7551/mitpress/2302.001.0001

Gordon, Susan. "Psychoneurointracrinology: the embodied self." *Neurophenomenology and Its Applications to Psychology*, edited by Susan Gordon, 115–148. New York: Springer, 2013. DOI: https://doi.org/10.1007/978-1-4614-7239-1_5

Greenfield, Susan. *The Human Brain: A Guided Tour*. New York: Basic Books, 1997.

Han, Shihui, Xiaosi Gu, Lihua Mao, Jianqiao Ge, Gang Wang, and Yina Ma. "Neural substrates of self-referential processing in Chinese Buddhists." *SCAN – Social, Cognitive, and Affective Neuroscience* 5 (2010): 332–339. DOI: https://doi.org/10.1093/scan/nsp027

Hasler, Felix. *Neuromythologie: eine Streitschrift gegen die Deutungsmacht der Hirnforschung*. Bielefeld: Transcript-Verlag, 2012. DOI: https://doi.org/10.14361/transcript.9783839415801

Haynes, John-Dylan. "Brain reading: decoding mental states from brain activity in humans sets the tone for the chapters when he starts by explaining the current state of brain reading mental states." *Oxford Handbook of Neuroethics*, edited by Judy Illes, and Barbara J. Sahakian, 3–14. Oxford: Oxford University Press, 2011. DOI: https://doi.org/10.1093/oxfordhb/9780199570706.013.0013

Heinz, Andreas, Daniel J. Muller, Sören Krach, Maurice Cabanis, and Ulrike P. Kluge. "The uncanny return of the race concept." *Frontiers in Human Neuroscience* 8 (2014): 836. DOI: https://doi.org/10.3389/fnhum.2014.00836

Husserl, Edmund. *Logische Untersuchungen*. Tübingen: Niemeyer, 1913.

Illes, Judy ed. *Neuroethics: anticipating the future*. Oxford: Oxford University Press, 2017. DOI: https://doi.org/10.1093/oso/9780198786832.001.0001

Jankovic, Joseph, and Stanley Fahn. "The phenomenology of tics." *Movement Disorders* 1, no. 1 (1986): 17–26. DOI: https://doi.org/10.1002/mds.870010103

Jaspers, Karl. *General psychopathology*, transl. by J. Hoenig and Marian W. Hamilton. Manchester: University Press, 1963.

Kitayama, Shinobu, and Jiyoung Park. "Cultural neuroscience of the self: understanding the social grounding of the brain." *SCAN – Social, Cognitive, and Affective Neuroscience* 5 (2010): 111–129. DOI: https://doi.org/10.1093/scan/nsq052

Kraus, Cynthia. "What is feminist critique of neuroscience? A call for dissensus studies." *Neuroscience and critique: exploring the limits of the neurological turn*, edited by Jan De Vos, Ed Pluth, 100–117. London: Routledge, 2016.

Kritsotaki, Despo, Vicky Long, and Matthew Smith, eds. Deinstitutionalisation and after: post-war psychiatry in the western world. Cham: Palgrave Macmillan, 2016. DOI: https://doi.org/10.1007/978-3-319-45360-6

Lange, Floris P. de, Karin Roelofs, and Ivan Toni. "Increased self-monitoring during imagined movements in conversion paralysis". *Neuropsychologia* 45, no. 9 (2007): 2051–2058. DOI: https://doi.org/10.1016/j.neuropsychologia.2007.02.002

Latour, Bruno. "Why has critique run out of steam? From matters of fact to matters of concern." *Critical Inquiry* 30 (2004): 225–248. DOI: https://doi.org/10.1086/421123

Laughlin, Charles D. Jr., John McManus, Eugene G. D'Aquili, eds. *Brain, symbol & experience: toward a neurophenomenology of human consciousness*. New York: Columbia University Press, 1990.

Leshner, Alan I. "Bridging neuroscience and society: Research, education and broad public engagement." *Oxford Handbook of Neuroethics*, edited by Judy Illes, and Barbara J. Sahakian, V–XII. Oxford: Oxford University Press, 2011.

Lutz, Antoine, Jean-Philippe Lachaux, Jacques Martinerie, and Francisco J. Varela. "Guiding the study of brain dynamics by using first-person data: Synchrony patterns correlate with ongoing conscious states during a simple visual task."

*PNAS Proceedings of the National Academy of Sciences of the United States of America* 99, no. 3 (2002): 1586–1591. DOI: https://doi.org/10.1073/pnas.032658199

Mahfoud, Tara, Sam McLean, and Nikolas Rose, eds. *Vital Models: The Making and Use of Models in the Brain Sciences. Progress in Brain Research* 233 (2017): 2–226.

Martínez Mateo, Marina, Maurice Cabanis, J. Stemmans, and Sören Krach. "Essentializing the binary self: individualism and collectivism in cultural neuroscience." *Frontiers in Human Neuroscience* 7 (2013): 289. DOI: https://doi.org/10.3389/fnhum.2013.00289

Martínez Mateo, Marina, Maurice Cabanis, Nicole Cruz de Echeverría Loebell, and Sören Krach. "Concerns about cultural neuroscience: a critical analysis." *Neuroscience and Biobehavioral Reviews* 36 (2012): 152–161. DOI: https://doi.org/10.1016/j.neubiorev.2011.05.006

Mayes, Rick, and Allan V. Horwitz. "DSM-III and the revolution in the classification of mental illness." *Journal of the History of the Behavioral Sciences* 41, no. 3 (2005): 249–267. DOI: https://doi.org/10.1002/jhbs.20103

Metzinger, Thomas. *Being no one: the self-model theory of subjectivity*. Cambridge: MIT Press, 2003. DOI: https://doi.org/10.7551/mitpress/1551.001.0001

Metzinger, Thomas, ed. *Grundkurs Philosophie des Geistes [Bachelor, Master, Promotion]*. Paderborn: Mentis-Verlag, 2006.

Northoff, Georg. *The spontaneous brain: from the mind-body to the world-brain problem*. Cambridge: The MIT Press, 2018. DOI: https://doi.org/10.7551/mitpress/11046.001.0001

Papo, David, Javier M. Buldú, Stefano Boccaletti, and Edward T. Bullmore. "Complex network theory and the brain." *Phil. Trans. R. Soc. B* 369 (2014): 20130520. DOI: https://doi.org/10.1098/rstb.2013.0520

Pauen, Michael. *Illusion Freiheit? Mögliche und unmögliche Konsequenzen der Hirnforschung*. Frankfurt am Main: Fischer, 2004.

Rose, Nikolas. *Inventing Our Selves: Psychology, Power, and Personhood*. Cambridge: Cambridge University Press, 1998.

Rose, Nikolas, and Joelle M. Abi-Rached. *Neuro: the new brain sciences and the management of the mind*. Princeton: Princeton University Press, 2013. DOI: https://doi.org/10.1515/9781400846337

Schultze-Krafta, Matthias, Daniel Birmana, Marco Rusconia, Carsten Allefelda, Kai Görgena, Sven Dähnee, Benjamin Blankertz, and John-Dylan Haynes. "The point of no return in vetoing self-initiated movements." *PNAS Proceedings of the National Academy of Sciences of the United States of America* 113, no. 4 (2016): 1080–1085. DOI: https://doi.org/10.1073/pnas.1513569112

Scull, Andrew. "Contending Professions: Sciences of the Brain and Mind in the United States, 1850–2013." *Science in Context* 28, no. 1 (2015): 131–161. DOI: https://doi.org/10.1017/S0269889714000350

Siong Soon, Chun, Marcel Brass, Hans-Jochen Heinze, and John-Dylan Haynes. "Unconscious determinants of free decisions in the human brain." *Nature Neuroscience* 11 (2008): 543–545. DOI: https://doi.org/10.1038/nn.2112

Turner, Robert, and Daniel de Haan. "Bridging the gap between system and cell: the role of ultra-high field MRI in human neuroscience". *Progress in Brain Research* 233 (2018): 179–220. DOI: https://doi.org/10.1016/bs.pbr.2017.05.005

Uttal, William R. *The new phrenology: the limits of localizing cognitive processes in the brain*. Cambridge, MA: MIT Press, 2001.

Varela, Francisco J. "Neurophenomenology: a methodological remedy for the hard problem." *Journal of Consciousness Studies* 3 (1996): 330–350.

Varela, Francisco J., Evan Thompson, and Eleanor Rosch. *The embodied mind: Cognitive science and human experience*. Cambridge: MIT Press, 1992. DOI: https://doi.org/10.7551/mitpress/6730.001.0001

Vidal, Fernando and Francisco Ortega. *Being Brains. Making the Cerebral Subject*. New York, NY: Fordham University Press, 2017. DOI: https://doi.org/10.5422/fordham/9780823276073.001.0001

Weng, Helen Y., Andrew S. Fox, Alexander J. Shackman, Diane E. Stodola, Jessica Z. K. Caldwell, Matthew C. Olson, Gregory M. Rogers, and Richard J. Davidson. "Compassion training alters altruism and neural responses to

suffering." *Psychological Science* 24 (2013): 1171–1180. DOI: https://doi.org/10.1177/0956797612469537

Wu, Harry Yi-Jui, and Wen-Ji Wang. "Making and Mapping Psy Sciences in East and Southeast Asia". *East Asian Science, Technology and Society* 10 (2016): 109–120. DOI: https://doi.org/10.1215/18752160-3494245

Zhu, Ying, and Shihui Han. "Cultural differences in the self: from philosophy to psychology and neuroscience." *Social and Personality Psychology Compass* 2 (2008): 1799–1811. DOI: https://doi.org/10.1111/j.1751-9004.2008.00133.x

**How to cite this article:** Borck, Cornelius. "Cooperation and Critique in Neuroscience: Loops of Feedback Between Philosophy, the Psy Sciences and Neurophenomenology." *Le foucaldien* 5, no. 1 (2019): 8, 1–36. DOI: https://doi.org/10.16995/lefou.57

**Submitted:** 03 January 2019 **Accepted:** 23 October 2019 **Published:** 16 December 2019



*Le foucaldien* is a peer-reviewed open access journal published by Open Library of Humanities.

OPEN ACCESS