

Steps towards a *Critical Neuroscience*

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Abstract This paper introduces the motivation and idea behind the recently founded interdisciplinary initiative *Critical Neuroscience* (<http://www.critical-neuroscience.org>). *Critical Neuroscience* is an approach that strives to understand, explain, contextualize, and, where called for, critique developments in and around the social, affective, and cognitive neurosciences with the aim to create the competencies needed to responsibly deal with new challenges and concerns emerging in relation to the brain sciences. It addresses scholars in the humanities as well as, importantly, neuroscientific practitioners, policy makers, and the public at large. Does neuroscience indeed have such wide-ranging effects or are we collectively overestimating its impacts at the expense of other important drivers of social and cultural change? Via what channels is neuroscience interacting with contemporary conceptions of selfhood, identity, and well-being? Importantly, *Critical Neuroscience* strives to make the results of these assessments relevant to scientific practice itself. It aspires to motivate neuroscientists to be involved in the analysis of contextual factors, historical trajectories, conceptual difficulties, and potential consequences in connection to their empirical work. This paper begins to spell out a philosophical foundation for the project by outlining examples of the interaction taking place between the neurosciences and the social and cultural contexts in which they are embedded and by exposing some of the assumptions and argumentative patterns underlying dominant approaches. Recent anthropological work will be discussed to convey a sense of the de facto interactions between neuroscientific knowledge, its promissory projections, and the self-understandings of laypeople. This can be seen as a first step towards a phenomenology of the “seductive allure” that the neurosciences are exerting upon both the academic and the popular imagination. The concept of “critique” relevant to the project's overall orientation is outlined in the final section.

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Why we need a critical neuroscience

Talk of revolution is in the air. This time, we are told, it is a technoscientific revolution of our understanding of man: the Neuro Revolution (Lynch 2009). The cognitive, affective, and social neurosciences and the rapidly emerging hyphenated “neurocultural” disciplines (neuroeducation, neurolaw, or neurotheology, to name just a few) are increasingly amassing resources and attention.¹ In the academic and popular literature, we often find the conviction that quite soon scientific approaches to the human brain will transform or even supersede cultural, philosophical, literary, or “folk” explanations of human phenomena.² The neurosciences are bringing upon the horizon new technologies that are mobilized in the name of educational improvement, treatment, illness prevention, and security: new pharmaceutical drugs, brain-based methods to boost intelligence, attention and happiness as well as screening devices with potentially wide-ranging medical, civil, and military uses (cf. Nagel 2010, Chapters 4 and 5). New programs designed to screen for neuroscientifically identifiable *biomarkers* in the areas of mental health, the law, and education are founded upon the hope that neuroscience will soon enable reliable early detection of problematic traits and conditions (Singh and Rose 2009).

This trend raises several concerns. Vivid depictions of the new brain sciences in the media and popular writing, often in the form of a futuristic discourse of promise and progress, increasingly lead to the incorporation of neuroscientific claims and language into laypeople's self-understanding. There seems to be a readiness and even “hunger” for self-objectification that is not easy to explain. These trends are strengthened by the tendency that neuroscientific claims and explanatory patterns are often treated as authoritative—likely because of their alleged “hard” scientific validity—, even with regard to important normative questions in the domains of morality, ethics, and social policy. This happens despite the fact that many of the experimental results and their theoretical articulations are unstable and provisional at the current stage of development in brain research. A related concern is the increasing push towards early and potentially premature application of brain-based technologies, especially when these might affect important aspects of the personality—examples are fMRI-based lie detection, deep brain stimulation, brain

¹ I use “cognitive neuroscience” in a broad way to denote all those neuroscientific approaches and subfields that deal more or less directly with higher-level mental and behavioral phenomena *in humans*. Thus, “cognitive neuroscience” as understood here encompasses fields such as social, affective, and also the newly emerging cultural neuroscience. If not explicitly stated otherwise, unqualified uses of the term “neuroscience” in this paper are meant to refer to cognitive neuroscience in this broad sense.

² Besides the recent manifesto by Lynch (2009), one can point to the following selection of publications that make some noise about an alleged “neuroscientific revolution”: Edelman (1992), Crick (1994), Churchland (2002), Zeki (2008), Metzinger (2009). Much more material from surprisingly diverse areas can be obtained by typing “neuroscientific revolution” into an Internet search engine.

“fingerprinting,” or other forms of neuronal screening or new drugs that enhance or alter mental capacities.³

Critical Neuroscience is an approach that attempts to raise awareness of and to better understand, explain, contextualize, and, where called for, critique these developments with the aim to create the competencies needed to responsibly deal with the concerns hinted at above.⁴ It addresses scholars in the humanities as well as, importantly, neuroscientific practitioners, policy makers, and the public at large. What is going on in and around contemporary neuroscience that potentially affects society in significant ways? Does it indeed have these wide-ranging effects or are we collectively overestimating its impacts at the expense of other important drivers of social and cultural change, such as, for example, developments in the capitalist economy? How and via what channels is neuroscience interacting with contemporary conceptions of selfhood, identity, and well-being?⁵ What are the predominant “styles of thought” that have emerged in and around the neurosciences and in the new hyphenated “neuro-”disciplines?⁶ And not least: how is neuroscience institutionally and politically entangled with powerful agents such as pharmaceutical companies, funding agencies, policy makers, etc.⁷

As a further step, *Critical Neuroscience* strives to make the results of these assessments relevant to the practice of cognitive neuroscience itself. What difference would it make to scientific practice if neuroscientists themselves were involved, from the outset, in the analysis of contextual factors, historical trajectories, conceptual difficulties, and potential consequences in connection to their work? The hope is to engage in collaborations focused on specific themes of societal relevance: for example, inclusive studies of mental illnesses such as depression, the investigation of social pathologies of various kinds (such as alienation in work and life environments, violence, attention problems), or ideas and popular conceptions of well-being, to name just a few. These phenomena call for neuroscientific approaches, but they have to be investigated from much more inclusive, multilevel perspectives.⁸

In this paper, I begin to lay a philosophical foundation for the project by outlining a few examples of analyses of interaction taking place between the cognitive neurosciences and the social and cultural contexts in which they are embedded and try to hint at some of the assumptions and argumentative patterns underlying the dominant approaches. To set the stage, I briefly introduce Ian Hacking's account of how scientific classifications have the power to “make up people” and suggest that, today, the neurosciences and brain-oriented approaches importantly contribute to this often complex and opaque process. This makes today's neurosciences in their

³ In a recent resourceful study, Saskia K. Nagel has provided a state-of-the-art account of new developments in several areas of neurotechnologies and discussed the most pressing ethical and social concerns that are raised by them (see Nagel 2010, especially Sections 4.2 and 5.5).

⁴ For an initial outline of the project's aims and structure, see Choudhury et al. (2009). A collection of essays on *Critical Neuroscience* is scheduled to come out in early 2011 at Wiley-Blackwell, see Choudhury and Slaby (2010). The project is in full swing as an independent research and project group operating from Berlin, Germany. See <http://www.critical-neuroscience.org>.

⁵ On this, see Dumit (2004), Rose (2006), and Joyce (2008).

⁶ That it is no longer a style of blatant neuronal reductionism and methodological individualism is persuasively argued by Pickersgill (2009). See also Abi-Rached and Rose (2010).

⁷ More on this in Choudhury et al. (2009).

⁸ A promising early example of *Critical Neuroscience* research is outlined in Campbell (2010).

various institutional settings and social contexts an important object of inquiry. In the “**Real responses**” section, I then go on to describe anthropological work that conveys a sense of the de facto interactions that take place between neuroscientific knowledge, its practices and promissory projections, and the self-understandings of common people. This can be seen as, among other things, a first step towards a phenomenology of the appeal or even “seductive allure” (Skolnik-Weisberg et al. 2008) that the neurosciences are exerting upon both the academic and the popular imagination. The paper concludes with a section that outlines an approach to “critique” relevant to *Critical Neuroscience* (the “**On the notion of “critique”**” section).

“**Making up people**” and the hidden anthropology of the neurosciences

According to Ian Hacking, science, medicine, education, and other areas of social practice and policy have, to some extent, the capacity to “create” kinds of people. Not by magic, but by establishing classifications that interact with the people so classified and their respective surroundings. *Interactive kinds* are classifications taken up into the self-understanding of those subject to these classifications. These processes can lead to the emergence of new practices, new alliances, and new institutions that interact in various ways with the persons in question. Hacking’s term for this is “classificatory looping.” Upon being classified in a certain way, a person, by enacting the classification, can turn into a proper instance of the category in question. But it can also work in the other direction and falsify an initially adequate classification, in case the people so classified respond by changing their behavior in relevant ways. In the middle between these extremes, categories might be substantially modified through the responses of those classified. The process is complex and involves much more than an idea being voiced or a concept applied. What results can be a new type of person in a new “niche”—literally an “ecological niche”—in which a new way of being a person is sustained (Hacking 1998, 13).⁹ Among the most prominent examples are many concepts of mental illness: nineteenth century hysteria, multiple personality disorder, mad traveling, anorexia, attention deficit hyperactivity disorder (ADHD), depression, and so on. But also social categories such as “homosexual,” “hyperactive child,” or “juvenile delinquent” are examples of interactive kinds. Importantly, the interaction in question occurs within the framework of institutions and practices surrounding the people so classified. Classifications, when they stick, are richly situated materially and institutionally—they come packaged with practices, regulations, tools, and policies.

From this, it should be clear that scientific classifications could have significant social and policy implications. Take ADHD. Since this category has been established, we have witnessed specific treatments being administered, behavioral regimes being imposed, and environmental conditions manipulated so as to detect,

⁹ “I argue that one fruitful idea for understanding transient mental illness is the ecological niche, not just social, not just medical, not just coming from the patient, not just from the doctors, but from the concatenation of an extraordinarily large number of diverse types of elements which for a moment provide a stable home for certain types of manifestation of illness” (Hacking 1998, 13).

monitor, and treat the condition in the children affected (see Singh 2006, 2008). As a consequence, the children's self-understanding very likely changes too, as they find themselves in the focus of new practices directed specifically at them.¹⁰ Today, there is an “ecological niche” for being a hyperactive child, a specific environment that sustains this condition.¹¹

One should not underestimate the ontological impact of these classifications and the practices and regulations that accompany them. Hacking even considers the possibility that a diagnosis—such as that of depression—interacts directly with the *biology* related to the condition diagnosed. His example goes like this: “Upon being diagnosed, a depressed person might adopt a specific behavioural regime, change certain hazardous routines, avoid stress etc. and as a consequence the neurological condition underwriting her depressive symptoms might change. Classificatory looping would have turned into *biolooping*” (Hacking 1999, 123). Of course, more often this seems to work in the other direction: The semantic and social weight of a diagnosis, voiced with legitimate medical authority, reinforces a behavior pattern and a way of thinking that in turn stabilizes the condition in question. This might be part of the processes that sustain mental illnesses that suddenly emerge and become fashionable at a specific time and place such as “hysteria” or “multiple personality” (Hacking 1995).

It is important to see that Hacking's position does not amount to an extreme form of social constructivism. His discussion of interactive kinds creates a space in which both the idea of biochemical or neurological conditions underlying many of our concepts of mental illness *and* the idea of these conditions being subject to transformative social and interpretive dynamics can be developed. To see how this is possible consider the distinction, in the semantic theory of kind terms, between *stereotype* and *referent* (extension). On the classical Kripke/Putnam style accounts, the meaning of a kind term is seen as a vector consisting of two components.¹² First, the stereotype: a commonly shared idea that approximates agreed-upon characteristics and that may very well be subject to change in response to historically situated social dynamics, learning processes, and cultural change. Second, the extension or referent that could be a robust natural kind, a specifiable neurological condition, and that in many cases of mental illnesses or human traits might as of yet be still unknown. Thus, the paradox of a category of mental illness being both an interactive *and* an indifferent kind is resolved.¹³

¹⁰ The highly innovate VOICES project at the London School of Economics, led by Iliana Singh, tries to bring the children's perspective into the debates surrounding ADHD. See <http://www.addingvoices.com>.

¹¹ To this ecological niche of ADHD most probably belongs the heightened systematic attention being paid to children's behavior and development, virtually from the cradle onward. Another aspect is the new informational environment with which today's children are inevitably confronted, with television, computers, video games, and mobile phones providing constant, albeit highly discontinuous informational input. Not to forget changed practices and expectations on the side of teachers, parents, and caregivers that leave less and less room for what once was considered quite normal “boyhood behavior” (see Shorter 1997, 289/290).

¹² For more on this, see Putnam (1975).

¹³ A good example might be schizophrenia. On one hand, it seems uncontroversial that schizophrenia has a robust neurological foundation, but on the other hand, it seems equally clear that schizophrenia is and has been subject to significant historical changes, in terms of symptoms and prevalence (see Boyle 1990 and Hacking 1999, 116/117). For a more detailed analysis of Hacking's conception of making up people, see Brinkmann (2005).

However, the phenomenon of *biolooping* shows that mental illnesses—and, by analogy, also many nonpathological mental capacities—are likely much more interesting than the less controversial natural kinds: The commonly shared idea of an illness might interact with the neurological condition so that our understanding of the illness and our practices surrounding it may change its neurological foundations. In this case, the distinction of stereotype and referent collapses and it would be literally true that *biological* illness conditions are themselves (in part) socially constructed. Obviously, this moves us way beyond the tired nature/nurture distinction.

Critical Neuroscience draws upon this conceptual background because it shows how inadequate the stark alternative “either biologically based *or* socially constructed” really is. The most interesting cases of human traits and phenomena are in fact both, and therefore, we have to approach them from both sides and make sure that we grasp the relevant dynamics of interaction. That is Hacking's message.

Against this stands the assumption, implicit or explicit in the thinking of many neuroscientists and “neurophilosophers,” that the neuronal level of description has to be prioritized when it comes to determining “what we really are.” Several assumptions and preconceptions, often unacknowledged, are in play here—amounting to what can be called the “hidden anthropology” of the neurosciences.¹⁴ It is an important task for *Critical Neuroscience* to make these assumptions explicit and assess their validity.

Here, I can only address one of the anthropological assumptions; however, one that has a claim to be at the very core of the hidden anthropology of the neurosciences: Historian of Science Fernando Vidal has captured it nicely by claiming that increasingly, these days, “brainhood”¹⁵ is taking the place of personhood. Most radically put, this assumption holds that “we are our brains.” Since our neural makeup fully determines our mental processes, our mental life and thus our sense of self and ultimately what we are as persons and individuals—it is claimed to be solely a matter of processes in the brain.¹⁶ However, what is thereby neuralized, and, as it were, *essentialized* as stable, pregiven, and authoritative, is a quite contingent, historically developed idea of subjectivity and selfhood. Claims to the effect that the “self” is a neuronal structure of course presuppose a conception of the self, some idea of subjectivity. This conception is invested into the science beforehand. As a particularly striking example, take Thomas Metzinger's theory: In his *Being No One* (2003) and the subsequent popular *The Ego-Tunnel* (2009), Metzinger makes much noise about his grand claim that the “self” is an illusion, a product of neurocomputational processes that in the end is no more than a “user

¹⁴ Thanks to Max Stadler for suggesting the term “hidden anthropology.”

¹⁵ The term “brainhood” has been coined by historian of science Fernando Vidal (see Vidal 2009. Vidal and his collaborators have analyzed this trend extensively; see for instance the project website <http://www.brainhood.net> that provides plenty of resources and further references.

¹⁶ There are several stark statements in the literature that express this persuasion. For instance, neuroscientists Francis Crick (1994) writes: “you, your joys and your sorrows, your memories and your ambitions, your sense of personal identity and free-will, are in fact no more than the behavior of a vast assembly of nerve cells and their associated molecules.” Or take this one by Patricia Churchland (2002): “The weight of evidence now implies that it is the *brain*, [...], that feels, thinks, decides.”

illusion” while what is really robustly there is just the complex computational machinery realized in the neural *wetware*. However, Metzinger goes on to outline how this alleged illusion called “the self” does a surprisingly important job in our mental architecture. For all intents and purposes, Metzinger’s “phenomenal self model” simply *is* a self—the old fashioned conscious subject, with all its philosophical excess baggage such as radical representationalism, content and vehicle internalism, skepticism with regard to knowledge of the world and of other minds, etc., just this time all fancily dressed up in neurocomputational language. *Plus ça change, plus c'est la meme chose...*¹⁷

This “brainhood” or “neuralized subjectivity” assumption forms the core of the hidden anthropology of much of current cognitive neuroscience and neurophilosophy, the metaphysical foundation from which its assumed relevance to human affairs at large is mostly drawn. Hacking’s perspective leads us to challenge the brainhood and other reductionist assumptions without thereby throwing out the baby with the bathwater. What Hacking calls interactive kinds, classificatory looping, and the dynamics of changing conceptions of what it is to be a person, embedded in the right social and institutional environments, provide a more valuable background for approaches to human reality—it can pave the way for a nonreductive human science (that includes what we could call a broad “hermeneutics of subjectification”). Importantly, this approach can also be applied directly to neuroscience itself and to its institutional settings, cultural context, and political and economic situatedness. In fact, neuroscience itself—viewed sufficiently broadly and “in context”—is an important influence on human self-understanding; it is itself contributing to “making up people”. All those new brain-oriented depictions, discourses, forms of knowledge, tools, institutions, and practices create a secondary objective structure, a kind of “second nature” that contributes to the constitution of personhood, to the way we understand ourselves, and it begins to create the practices and institutional environments in which these new kinds of person can thrive.

One key task for *Critical Neuroscience* is to bring into view and critically reflect these processes—with a focus on the “ontological impacts” of the practice, institutionalization, application, and public dissemination of the findings and aspirations of the scientific approaches under study. In what follows, I will highlight the beginnings of interpretive studies directed at some of these developments.

Normative first nature

A growing number of neuroscientists and neurophilosophers seem to subscribe to the following assumption: Our theorizing and our practical decisions in areas such as morality, ethics, and social policy should be guided by knowledge about neural mechanisms. Increasingly, *normative conclusions* about how to conduct one’s life or

¹⁷ For a refreshing, sharply argued and scientifically well-grounded rebuttal of the ideology of “brainhood,” see Noë (2009)—a book that can very well be read as a direct counter to Metzinger’s *The Ego-Tunnel*.

how to organize society are drawn from insights into natural processes that supposedly underwrite human functioning (Hartmann 2010).

Apparently, nature itself as it is revealed by the natural sciences is treated as possessing a specific authority that warrants normative conclusions and recommendations for social reforms in line with particular scientific findings (however provisional and contested these may be). Frankfurt-based philosopher Martin Hartmann has called this tendency to attention, calling the argumentative pattern at work here *normative first nature arguments*.¹⁸ These arguments rest on the—unacknowledged—conviction that whatever is true about the portion of nature under discussion can (and should) guide our conduct with regard to that part of nature. A key notion here is that of “functional demands” that, for instance, a part of an organism’s biological architecture imposes upon the organism as a whole:

In this sense, findings about the brain are not just treated as findings about the natural preconditions of mental life, but as powerful guides to the way this life should function. This may not in all cases amount to a naturalistic reduction of the mental categories at hand, but it certainly amounts to the thesis that whatever purposes they serve for human organisms, they ought to pay attention to the “demands” of the brain and the specific requirements of its functioning (Hartmann 2010).

Biological teleology functions as the hidden source of normativity. This normativity is then projected out from specific biological mechanisms to the conduct of the person and from there even to the functioning principles of social institutions such as the penal system, education, medical prevention, or the makeup of modern companies (see next section below). Thus, a specific form of ethical naturalism is reappearing in a new guise, fashionably dressed up in the terms and representations of a new science.¹⁹ The position faces obvious problems. There is no justification for inferring from “is” to “ought,” and thus we are faced with an instance of the naturalistic fallacy. Moreover, the position importantly presupposes a successful access to a first nature entirely free of human values and interests—an access that is dubious in face of interest-specific constraints and value-ladenness of perspectives on the world, scientific or otherwise. Acknowledging these constraints should rather lead in the other direction, i.e., to the attempt to open up science somewhat more towards controlled forms of democratic participation (see Kitcher 2001) or at the very least to reaffirm the importance of an inclusive and open dimension of discursive critique to any scientific perspective on the world. In any case, the result of the normative-first-nature argumentative pattern is clear enough: The autonomous subject of ethical and sociopolitical decision making is increasingly disempowered. Instead, the power to decide important normative issues is gradually ceded to the experts of brain function—they become the true experts of all human

¹⁸ As an academic disciple of Axel Honneth and a member of the Frankfurt Institute of Social Research, Hartmann can probably be seen as a new-generation representative of Frankfurt School critical theory.

¹⁹ It is a new science whose shiny machinery and highly visual results create the image of eminent clarity, objectivity, and ultimately, authority. I come back to the imaginative appeal of current neuroscience and its relation to the alleged authority of its findings in the “[Real responses](#)” section. See also Dumit (2004) and Joyce (2008, especially chapter 3).

affairs. We witness the rise of what Nikolas Rose has called “the new pastors of the soma”—technomedical experts of human bodily functioning that claim for themselves the decisive biopolitical authority (see Rose 2006).²⁰

This provides an important methodological directive for *Critical Neuroscience*. We need to pay specific attention to what is brought forth as allegedly natural, as natural facts, in and around contemporary neuroscience (and of course also in other areas of the sciences, where applicable), especially where it is relevant to human conduct and human affairs more broadly. What does our very nature—especially, of course, the nature of our brain—tell us about human reality and about the possibilities that may slumber under our skulls, both on an individual and on a social level? What stories are being told, who tells them and why, and what is ultimately informing and driving these stories?

Cognitive neuroscience and the discourse of flexible capitalism

It has often been observed that scientific concept and theory formation is subject to influences from the surrounding culture. Just take the historical succession of prominent metaphors of the mind: calculating machine, central telephone exchange, system of hydraulic forces, digital computer/information processing engine, etc. (see, e.g., Borck 2005). The newest entry in this list is the metaphor of the self-organizing and nonhierarchical network—a network that is highly adaptive, displaying various kinds of plasticity and generative capacities.

In line with a number of other authors, I want to point to a surprising parallel between cutting-edge neuroscience and the now fashionable discourse in organizational and management literature and in neoliberal politics.²¹ Both discourses are centered on networks, nonhierarchical organization, flexibility, and the capacity to adapt to ever-changing circumstances and demands. The human brain as a self-organizing, adaptive nonhierarchical network exhibiting developmental and regenerative plasticity seems to resemble the modern company. Moreover, it is organized such as to enable just those characteristics and capacities demanded of the modern employee. One can be tempted to think that social structure—in this case, the organization of work in flexible capitalism—has finally caught up with neuronal organization so as to promise a harmonious relation between individual capacities and economic requirements. “It is as if the brain is made for flexible capitalism, as if it has a more or less natural response to the demands of the present.” (Hartmann 2010)

²⁰ One example for the trend towards normative first nature arguments, explicitly stated by Hartmann, is William Casebeer's book *Natural Ethical Facts* (2003). In it, Casebeer attempts to ground ethics on evolutionary biology and connectionist cognitive science plus recent brain imaging studies with moral judgment tasks. Casebeer's “natural ethical facts” are exactly what Hartmann points to in his critique of the normative first nature argumentative pattern. A somewhat related, although more carefully articulated, tendency is to be found in the work of Joshua Greene, a philosopher who has done empirical work (using fMRI) on ethical decision making (see, e.g., Greene 2003).

²¹ See Malabou (2008), Hartmann (2010), and the articles collected in Karafyllis and Ulshöfer (2008). Many of these authors are inspired by Boltanski and Chiapello (2007); a helpful critical perspective on developments in contemporary capitalism is sketched in Hartmann and Honneth (2006).

Is neuroscience unwittingly contributing to the justification of structural reforms in the capitalist economy? Does it help to naturalize and stabilize these tendencies by claiming that our brains are specifically enabling several of the very capacities prized by the new economical status quo? In this way, neuroscience would openly or tacitly work in favor of those who try to promote and establish economic imperatives as “natural” requirements. It would become ideological.

Catherine Malabou (2008) has explicitly drawn this consequence when she talks about the ideological drift that neuroscience is subject to. On one hand, scientists might remain unaware of these broader developments and thus may unconsciously contribute to these processes. On the other hand, many practitioners today play an active role in contributing to a neoliberal management discourse that is mapped upon a specific image of neuronal organization. As soon as such a discourse is dressed up as science—referring to robust facts about our neuronal organization and functional architecture—it is effectively removed from political discussion. In this context, Malabou diagnoses a paradoxical conjunction, in neuroscientific discourse, of the traditional stress on hard-wired connections and rigid mechanisms in the brain that seemingly exclude personal responsibility and, on the other hand, a new stress on plasticity, self-organization, and adaptability to changing circumstances that seem to lead back to quite specific forms of personal responsibility, namely, the responsibility of the modern employee to adapt flexibly to changing requirements in the work place. Paradoxically, then, although one might think that new discoveries of the brain's generative and regenerative capacities would lead to a new sense of freedom, of possibilities for an active and conscious shaping of individuals and social arrangements, what happens is the exact opposite: The “new world order” of flexible capitalism is inscribed as an inevitable condition, as the unrelenting reality of neuronal organization. A truly disappointing story, as Malabou concludes:

[I]t seems that the neuronal revolution has revolutionized nothing *for us*, if it is true that our new brains serve only to displace ourselves better, work better, feel better, or obey better. The synthesis of the neuronal and the psychical thus fails to live up to its task: we are neither freer, nor smarter, nor happier (Malabou 2008, 68).

Of course, all of this requires a more detailed treatment which I cannot provide here. Instead, I want to add another example of the tendency under discussion. The UK government recently sponsored a massive interdisciplinary initiative called the *Foresight Mental Capital and Wellbeing Project*. A summary version of its final report is titled “The Mental Wealth of Nations” (Beddington et al. 2008). As these titles indicate, what we see here is the framing of concepts referring to personhood, human experience, and the “good life” in a way that makes them a perfect fit to the neoliberal market orientation. The mind is seen as an economic resource, as a form of capital that has to be invested in the ubiquitous marketplace. This is clearly evident in the definition of the term “mental capital” as stated in the project's final report:

[Mental Capital] encompasses a person's cognitive and emotional resources. It includes their cognitive ability, how flexible and efficient they are at learning,

and their “emotional intelligence”, such as their social skills and resilience in the face of stress. It therefore conditions how well an individual is able to contribute effectively to society, and also to experience a high personal quality of life. The idea of “capital” naturally sparks association with ideas of financial capital and it is both challenging and natural to think of the mind in this way (Foresight Mental Capital and Wellbeing Project 2008, 2).

In the same vein, the concept of “well-being” is introduced without much ado as a capacity to work well and function economically under present-day circumstances: “Mental well-being, [...], is a dynamic state that refers to individual's ability to develop their potential, work productively and creatively, build strong and positive relationships with others and contribute to their community” (Beddington et al. 2008, 1057).

Given that this grand-scale project is bringing together high-level research from fields such as neuroscience, developmental and social psychology, economics, education, psychiatry, and sociology, one can hardly overestimate the consequences of this choice of core concepts. Within the Foresight Project, knowledge in these fields is organized such that it is oriented from the outset towards a particular image of life, work, and human development. This orientation is simply assumed as given; it becomes the unquestioned foundation of all the research in this initiative. This image is clearly dominated by the logic of contemporary capitalism, by ideas of all-encompassing resource exploitation, investing and maximizing one's capital (in a broad sense of the term), and economically “functioning” individuals, and moreover, this market logic extends in full to the private and emotional aspects of human existence. What is particularly notable is the project's “from the cradle to the grave” perspective when it comes to monitoring and intervention policies. In effect, it recommends a lifelong regime of control, regulation, and intervention to assure the maximizing of mental capital and of the equally capital-like resource of mental well-being over the life course of individuals.

One need not be a social constructivist to notice how political tendencies, economic interests, and policy agendas take part in shaping what will come to count as the “results” of these scientific endeavors.

Current neuroscience and neuroscience-dominated research programs like *Foresight* participate in “making up people”—and at the same time systematically hide this very fact. By creating the impression that it is on the verge of uncovering the complex neural underpinnings of human traits, capacities, and pathologies, neuroscience discourages the view that a person's traits are importantly shaped by ecological conditions. At the same time, the assumption that the knowledge generated has a specific (even normative) authority inspires ambitious reform initiatives—in areas such as mental health, the law, education, child rearing, etc. Thereby, neuroscience actively participates in the creation and stabilizing of the practices, institutions, and classifications that form the condition of existence of specific person types and behavior patterns. While it promises to get straight at first nature, it in fact participates in the construction of “second nature” and is thereby potentially (and unwittingly) subject to ideological drift. This shows why we need not only a *Critical Neuroscience*, but precisely something like a *critical theory* of the

neurosciences—an approach that makes these entanglements and the construction processes explicit and has theoretical tools that are adequate to the task (Hartmann 2010).²² What is especially relevant is a broader understanding of current developments in society at large, for instance, in the economy and at the workplace, so as to be able to grasp the interactions, often intricate and subtle, that are taking place between scientific theorizing and social and political discourse and practice.

Real responses

What is so far missing is a view on what actually goes on in individual experience, on the microsociological level where brain science enters the lives of common people. In order to understand the neuroscientific challenge, we need to penetrate some more into the details of interaction between the science and real people. To this end, I will conclude with a brief discussion of the work of medical anthropologist Simon Cohn.

Cohn conducted field interviews with psychiatric patients who had their brains scanned in nontreatment-related fMRI studies. All patients were truthfully told that the scans had no medical purpose and all were given copies of their brain scan to take home afterwards. The results are quite remarkable. Here are examples taken from Cohn's interviews:

This picture. This is the most accurate portrait you can ever get. It's a picture of who you really are. On the inside. I tell people its my self-portrait (Cohn 2010a).

For me, I just can't tell you how important it is. All these years, and now they can finally prove it. I'm sure that this will make a huge difference. I feel different already. Almost like new (Cohn 2010b).

What is striking is that these interviews show emotionally charged and narratively rich encounters of patients with depictions of their brains. The first thing that is notable in these encounters is that the brain seems to figure in them as a cultural object, as a kind of “center of discursive gravity” that is invested with significance. Its representations are readily incorporated into self-fashioning. Take this quotation from one of the interviews:

I have bi-polar, and I have done for years. It's who I am, and I can't imagine not suffering from it. So, you see, I don't want to suddenly wake up and not be a bi-polar... What I want is to be able to say to people, ‘Look. This bit of my brain, that's why I am bi-polar. But I am bi-polar, so if I have to live with it, why can't you?’ (Cohn 2010b)

Here, we see a part of the process described by Hacking unfolding in situ—the brain scan assumes the role of a stabilizer of a classification that defines the identity

²² For more on a possible approach to critique relevant to *Critical Neuroscience*, see the “On the notion of “critique”” section.

of this patient. The quotation nicely shows that the scan fulfills a paradoxical double role, at once changing and stabilizing the image of the mental illness. It changes the illness by providing a physical base for the formerly diffuse and stigmatized condition—and it thereby solidifies it as something real, which then serves to sustain a part of the identity of the patient as a sufferer from this particular illness.

This result is somewhat unexpected, as one might have thought that patients would seize the possibility to refute the stigma associated with their illness and readily embrace a physical description. Instead, the patients hang on to the original diagnostic category that they indeed cherish as a part of their identity.²³ The scan provides a new framing for the condition, at once a legitimization for it as something real, out there for everyone to see, and as something now endowed with a new future-directed perspective. Thereby, the brain image functions as a powerful disrupter of existing narratives of mental illness and as an anchor of new ones, still centered on the same old psychiatric conditions but oriented towards a different future. Some of this is vivid in the following exclamation of another patient:

The scan is important because it shows just what has been wrong with me all these years... you don't have to listen to descriptions or anything, you can see it there before your very eyes... (Cohn 2010b)

As Cohn points out in this context, Ludwik Fleck characterized a “fact” as that which is able to resist alternative explanations (Fleck 1935/1979). This is what the brain scans, in all their vivid materiality and backed by a system of technomedical promise, can do—they intrude into the circulation of ideas and beliefs about psychiatric conditions. The brain scan has the power to reorient the patient's self-understanding, and in this, it conspires with the powerful image of objectivity and progress that present-day neuroscience is so good at conveying. Study participants frequently cherish the pictures, proudly showing them to friends and loved ones. Apparently, to them, the scans become objects invested with optimism and change, even though patients are aware that there are no concrete prospects for effective treatment.

It is not easy to understand the implications of these findings. Surely, it is not a story of reduction or complete transformation of the self-understanding of these patients. The neuroscientific intrusions into the lifeworld are a welcome material for self-fashioning and self-interpretation. Neuroscience seems to carry its messages into an environment that, to some extent, plays its own game and imposes its own “rules.” But this does not mean that the fears of the “neuroskeptics” are unwarranted. The flip side of these developments is the readiness with which objectivist claims are integrated into these patients' self-understanding, even in the absence of a tangible medical advantage. Being useless, premature, or false seem to be no reason

²³ Cohn elaborates upon this in the following manner: “Interestingly, the patients repeatedly insist that their enthusiasm is not driven by a crude desire to refute social stigma associated with their particular condition, since many actually don't want to lose this aspect of their identity. This frequently left me confused: on the one hand, they would willingly volunteer to participate in imaging studies, enduring all the inconvenience that it entailed and aware it would not have any clinical consequence for them, yet, in the act of looking at their own brain on a screen, or taking a copy home with them, they would say that making their illness physical was largely not about wanting to completely divorce themselves from their condition” (Cohn 2010b).

whatsoever not to incorporate an alleged piece of neuroscientific knowledge (an alleged “brain fact”) into one’s self-fashioning.²⁴ Instead, the physical appearance and esthetic quality of the shiny new and clean technology seems to work as a “placebo space”—a dream factory that fuels the imagination to fantasies of healing and unlimited possibilities of medical intervention. One could thus be led to assume that through processes of the kind described by Cohn, neuroscience might in the end succeed in achieving a naturalization of subjectivity—not by proving successful scientifically, but by offering the most attractive, most persuasive images and narratives of self-objectification. While it aspires to be a “hard” science delivering new facts about humans, it might in the end be more of a generator of technoscientific dreams and fantasies, constructing ideas and images that offer a new self-understanding. Thus, while the objectivism with regard to the human mind is delusional as a scientific stance, it might still come true as a self-fulfilling prophecy, enabled and sustained by the well-arranged promises and representations of the new science and, paradoxically, implemented and enacted by the very process whose existence alone seems to belie any kind of objectivism of human existence: By our very human capacity to change what we are through interpreting ourselves anew.²⁵

On the notion of “critique”

In order to implement a critical approach to developments in and around the neurosciences, one will have to develop a workable notion of what is meant by “critical” in the project’s title. The challenge is to render “critique” meaningful again in a time when this notion has fallen into disrepute in mainstream thought and theory. This is not the place to speculate why it is that critique might have “run out of steam” (Latour 2004). Suffice it to say that, in recent history, ideas of critique too often seemed to be heavily invested with conceptual and ideological baggage and too readily linked to antiscientific, neoromantic attitudes hostile to productive engagement of the natural sciences.

In this section, I will give a few hints as to what a constructive reappropriation of “critique” might look like.²⁶ I will take some inspiration both from a broadly Frankfurt School approach and from a Foucauldian perspective.²⁷ However, neither affiliation is worked out to any degree of theoretical sophistication—what matters is

²⁴ On the difficult notion of a “brain fact,” meant as an application to neuroscience of Ludwik Fleck’s highly nontrivial concept of a scientific fact, see Choudhury et al. (2009).

²⁵ Obviously, I implicitly draw on Charles Taylor’s conception of human being as “self-interpreting animals”. See Taylor (1985); see also Brinkmann (2005) for a helpful discussion of Taylor’s notion in relation to Hacking’s conception of “making up people.”

²⁶ The following is not without alternatives—there are different ways to be critical that are equally relevant to *Critical Neuroscience*. A related but slightly different approach has been sketched in Choudhury et al. (2009).

²⁷ For the Frankfurt School perspective, I mostly draw on recent work by Axel Honneth (2009) and Martin Hartmann (2010); see also Hartmann and Honneth (2006). A broadly Foucauldian approach to science studies is developed by Rouse (1987, 1996), while an application to trends in and around today’s biomedical science is provided by Rose (2006) and some of his collaborators at the LSE’s *Bioscience and Society* program.

practice. As a starting point, I take a hint from Bruno Latour's helpful contrasting, in an essay about perspectives of critique, of *matters of fact* and *matters of concern* (Latour 2004). To show that science is not about value-free matters of fact but rather about ontologically robust but intrinsically contested *matters of concern* can lead to an understanding of critique as constructive, even creative and encouraging in its seeking, describing, highlighting, and enriching issues of human interest, while at the same time losing none of its bite in the struggle against abuses of power in the name of “the facts” or of science as such (or, for that matter, in the name of dubious political projects).²⁸ Latour speaks of the “assembling” of themes, threads, and issues grouped around a matter of concern. Besides the constructive and enriching orientation that runs directly counter to the destructive “debunking tendencies” associated with most traditional approaches to critique, a key critical impulse in this is the implicit democracy with regard to *who* raises issues and provides descriptions: The assembling matters of concern from multiple perspectives can provide a balancing force against the monopoly of experts and specialist associations in defining terms, identifying problems, and setting scientific and political agendas. This is an issue of increasing relevance in highly developed, bureaucratic, medicalized, and technoscientific societies in which expert cultures assume increasing relevance and authority, potentially at the expense of individual choice and personal responsibility of nonexperts.²⁹

In practice, a critical stance in this direction should involve several steps. First, it requires a given theme or object of inquiry to be studied in the richness of its contexts. In doing this, the critic should not be content with the obvious, but aspire to move beyond “standard” contexts and explore hitherto invisible or unthought-of fields that have some tie to the theme of inquiry. As an example, take the study of addiction. While an increased emphasis is currently placed upon brain-related approaches and some notable findings are reported, addiction is certainly more than (and different from) a mere change in brain chemistry. “Addiction” denotes a family of conditions that variously depend upon social environments (Campbell 2010), collectively developed and sustained habits (Garner and Hardcastle 2004) and also, reflexively, upon social practices that emerge in response to the original phenomenon—classificatory looping as invoked by Hacking (see Raikhel 2010). Contextualizing addiction means to reinscribe the relevant influences and multiple causal factors, point to historical trajectories, and record cultural understandings and differences—taken together, these descriptions yield an explanandum much richer than many of the rather meager construals developed exclusively from a single scientific or medical perspective.³⁰ As especially Garner and Hardcastle point out, it is possible in this way to understand the ineffectiveness of explanatory approaches

²⁸ Something like this is also at the core of Joseph Rouse's impressive manifesto on philosophical naturalism *How Scientific Practices Matter* (Rouse 2002). Note that the ideas sketched in the following are neither a direct elaboration of Latour's nor of Rouses' ideas, but something largely independent of both.

²⁹ Thus, in effect, this is a measure to counter the increasing institutional power and public influence of what Nikolas Rose calls the “new pastors of the soma,” see the “Normative first nature” section and Rose (2006). A valuable discussion of this problem area, albeit in the context of research in human genetics, is provided by Kerr and Cunningham-Burley (2000).

³⁰ Phenomenological description can play an important role in these enriching constructions of relevant phenomena—probably even in the case of addiction but certainly with regard to many other objects of neuroscientific inquiry. See, for example, Ratcliffe (2009) and Gallagher (2010).

that seem feasible from the narrow perspective of a specific discipline. Given likely processes of *biolooping* discussed by Hacking (see the ““[Making up people](#)” and the [hidden anthropology of the neurosciences](#)” section above), one can assume that this enriching procedure is an indispensable step even en route to identify the more narrowly neurobiological factors relevant to a condition or phenomenon of interest.

Second, critique should be committed to identify and analyze “stakeholders” and their perspectives and robust interests that often have ramifications in the vicinity of a theme under investigation. Importantly, this has to include exploring how stakeholders are *produced as stakeholders* in and through a given technoscientific assemblage. Some of the difficulty in applying a critical perspective to matters of concern lies here, i.e., in the problem that, sometimes at least, there are no clearly identifiable stakeholders already out there, whose views and perspectives one could then simply track and scrutinize. Inevitably, a procedure like this will help reveal conflicts and sources of dissonance that might tacitly or openly influence concepts and methods employed and interpretive perspectives chosen. Without the need to invoke outworn contrasts such as the one between “positivistic” and “emancipatory” research, the contextualization and identification of interests in play can help sideline narrow, biased, unenlightened, scientific orientations towards “the facts alone.” It sensitizes towards significant influences without already assuming the falsification of results. In the case of addiction, one might come to reckon with diverging perspectives from medical professionals, pharmaceutical companies, health administrators, social workers, governments and political parties, the education sector and community planners, newly constituted “risk populations,” and certainly “the addicts” themselves. “Addict,” however, must be seen as a category that is to some extent coproduced through dominant classifications and forms of thought and action in the relevant domains of practice (thus returning again to Hacking’s ideas detailed above).

Third, in some areas of inquiry at least, contextual knowledge gained through steps 1 and 2 allows the critic to identify something in the direction of what Axel Honneth has called “social pathologies of reason” (Honneth 2009, Chapter 2)³¹: Such pathologies are defects or malfunctions in social systems, practices, and institutions—malfunctions that come into view against the background of some normative ideal of society and properly functioning institutions. Ignoring these pathological factors can render neuroscientific research (unknowingly) complicit with them in often hardly noticed ways and even despite the best intentions of practitioners—be it because of the complexity of modern administrative systems and/or as unanticipated side effects of policy measures or features of institutional organization. Continuing our example, a narrowly neuroscientific understanding of substance addiction might lead to the neglect of relevant social enabling conditions and stabilizing factors of addictive behavior and thus encourage forms of practice and treatment less effective than those potentially called forth by a more complex understanding of the condition.

As social pathologies or “system malfunctions” are relative to normative standards of social organization and might even depend on nontrivial ideas of the

³¹ I take up Honneth’s notion in a rather loose manner, divorcing it from the specific context of a theory of rationality implicit in approaches to “critique” from a Frankfurt School perspective. This point needs further elaboration and discussion on another occasion.

“good life,” a specific analytical perspective is required to deal with them. This is an intricate issue that I can only vaguely touch upon here, as it highlights the need for worked-out justifications of one's normative commitments and points to the requirement of placing one's stance as a critic under constant scrutiny. What justification is there for one's critical perspective as one from which some developments, processes, and practices come to be seen as pathological? In response, and as a fourth step in the procedure of critique, *Critical Neuroscience*, in its explicitly interdisciplinary and cooperative orientation, invites practitioners and potential stakeholders to join into organized discussion about these normative issues. What should be the goals, concerns, and normative standards that society wants its science to pursue or live up to? In this way, the project aims at creating a participatory perspective instead of simply assuming an unwarranted, elitist normative authority as many earlier approaches to social critique. Unfortunately, organized debates about directions, implications, and normative standards are largely absent from the practice of science and its institutional contexts. Our project aims at initiating and facilitating exchange about these matters. It is in these contestations where specific normative issues surrounding scientific matters of concern emerge and take concrete shape.

The fifth and final stage, as suggested in the introduction, lies in actually employing the insights gained in stages 1 to 4 within neuroscientific practice, leading to inclusive and balanced approaches to matters of concern from multidisciplinary perspectives. To create forms of practical application of *Critical Neuroscience* and implement them in laboratory practice have to be the next steps in developing the project.³²

Outlook

My aim was to make plausible that the various dynamics surrounding the brain sciences might run deep—in affecting social practice and institutions and individual and collective self-understanding, and through this, ultimately, even the makeup of what we are as human beings. In an important sense, it is here, in the dynamics of ideas, practices, and material interaction surrounding the sciences in their social context, where the subject matter of the human sciences is constituted. This idea might serve to correct the misleading impression that it is possible to descriptively capture “human nature” in a straightforward way through empirical approaches that neglect the significance of self-interpretation and the social contexts in which it takes place. One consequence resulting from this might be a blurring of the boundaries between scientific and interpretive approaches to human reality, paving the way to what Joseph Rouse has called “cultural studies of science” (Rouse 1996, 2002). Importantly, this should not just be another area of expertise *outside* of the scientific domain under study, but has to be a form of critical self-reflection of a given scientific field from within. “Critique” then takes the form of a stepwise procedure that is constructively oriented, aimed at capturing relevant phenomena in their full

³² Unfortunately, though important, this outline of what is meant by “critique” in the context of our project has to remain sketchy. For the full treatment, see the introduction to Choudhury and Slaby (2010).

concretion as matters of concern, and embedded in complex dynamics and struggles of interest between various stakeholders and institutional powers that need to be negotiated with regard to normative ideas of social functioning and individual flourishing. My hope is that this initial outline of the problem space and suggested mode of operation for *Critical Neuroscience* invites constructive responses that share our aim to deal responsibly with the advances of the neurosciences and their impact on individuals and society.

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References

- Abi-Rached, J. M., & Rose, N. (2010). The birth of the neuromolecular gaze. *History of the Human Sciences*, 23(1), 1–26.
- Beddington, J., Cooper, C. L., Field, J., Goswami, U., et al. (2008). The mental wealth of nations. *Nature*, 455, 1057–1060.
- Boltanski, L., & Chiapello, E. (2007). *The new spirit of capitalism*. London: Verso. Translated from French by Gregory Elliot.
- Borck, C. (2005). *Hirnströme. Eine Kulturgeschichte der Elektroenzephalographie*. Göttingen: Wallstein.
- Boyle, M. (1990). *Schizophrenia: a scientific delusion?* London: Routledge.
- Brinkmann, S. (2005). Human kinds and looping effects in psychology: Foucauldian and hermeneutic perspectives. *Theory & Psychology*, 15(6), 769–791.
- Campbell, N. (2010). Towards a critical neuroscience of ‘addiction’. *BioSocieties*, 5(1), 89–104.
- Casebeer, W. D. (2003). *Natural ethical facts. Evolution, connectionism, and moral cognition*. Cambridge: MIT.
- Choudhury, S., Nagel, S. K., & Slaby, J. (2009). Critical neuroscience: linking neuroscience and society through critical practice. *BioSocieties*, 4(1), 61–77.
- Choudhury, S., & Slaby, J. (Eds.) (2010). *Critical neuroscience* (forthcoming). Oxford: Wiley-Blackwell.
- Churchland, P. (2002). *Brain-wise: studies in neurophilosophy*. Cambridge: MIT.
- Cohn, S. (2010a). Picturing the brain inside, revealing the illness outside: a comparison of the different meanings attributed to brain scans by scientists and patients. In J. Edwards, P. Harvey, & P. Wade (Eds.), *Technologized images, technologized bodies: anthropological approaches to a new politics of vision*. Oxford: Berghahn.
- tslb -.09pt Cohn, S. (2010b). Disrupting images: neuroscientific representations in the lives of psychiatric patients. In S. Choudhury, & J. Slaby (Eds.), *Critical neuroscience* (forthcoming). Oxford: Wiley-Blackwell.
- Crick, F. (1994). *The astonishing hypothesis: the scientific search for the soul*. New York: Touchstone.
- Dumit, J. (2004). *Picturing personhood. Brain scans and biomedical identity*. Princeton: Princeton University Press.
- Edelman, G. M. (1992). *Bright air, brilliant fire: on the matter of the mind*. New York: Basic Books.
- Fleck, L. (1935/1979). *Genesis and development of a scientific fact*. Chicago: University of Chicago Press.
- Foresight Mental Capital and Wellbeing Project (2008). *Final Project report*. London: The Government Office for Science.
- Gallagher, S. (2010). Scanning the lifeworld. In S. Choudhury, J., & Slaby, (Eds.), *Critical neuroscience* (forthcoming). Oxford: Wiley-Blackwell.

- Garner, A., & Hardcastle, V. G. (2004). Neurobiological models: an unnecessary divide—neural models in psychiatry. In J. Radden (Ed.), *The philosophy of psychiatry. A companion* (pp. 364–380). Oxford: Oxford University Press.
- Greene, J. D. (2003). From neural "is" to moral "ought": what are the moral implications of neuroscientific moral psychology? *Nature Reviews. Neuroscience*, 4, 847–850.
- Hacking, I. (1995). *Rewriting the soul. Multiple personality and the sciences of memory*. Princeton: Princeton University Press.
- Hacking, I. (1998). *Mad travellers. Reflections on the reality of transient mental illnesses*. Cambridge: Harvard University Press.
- Hacking, I. (1999). *The social construction of what?* Cambridge: Harvard University Press.
- Hartmann, M. (2010). Against first nature: critical theory and neuroscience. S. Choudhury, & J. Slaby (Eds.), *Critical neuroscience* (forthcoming). Oxford: Wiley-Blackwell.
- Hartmann, M., & Honneth, A. (2006). Paradoxes of capitalism. *Constellations*, 13(1), 41–58.
- Honneth, A. (2009). *Pathologies of reason. On the legacy of critical theory*. New York: Columbia University Press. Translated from German by J. Ingram.
- Joyce, K. A. (2008). *Magnetic appeal. MRI and the myth of transparency*. Ithaca: Cornell University Press.
- Karafyllis, N. C., & Ulshöfer, G. (Eds.). (2008). *Sexualized brains: scientific modeling of emotional intelligence from a cultural perspective*. Cambridge: MIT.
- Kerr, A., & Cunningham-Burley, S. (2000). On ambivalence and risk: reflexive modernity and the new human genetics. *Sociology*, 34(2), 283–304.
- Kitcher, P. (2001). *Science, truth, and democracy*. New York: Oxford University Press.
- Latour, B. (2004). Why critique has run out of steam. From matters of fact to matters of concern. *Critical Inquiry*, 30, 225–248.
- Lynch, Z. (2009). *The neuro revolution: how brain science is changing our world*. New York: St. Martin's Press.
- Malabou, C. (2008). *What should we do with our brain?* New York: Fordham University Press.
- Metzinger, T. (2003). *Being no-one. The self-model theory of subjectivity*. Cambridge: MIT.
- Metzinger, T. (2009). *The ego-tunnel. The science of the mind and the myth of the self*. New York: Basic Books.
- Nagel, S. K. (2010). *Ethics and the neurosciences. Ethical and social consequences of neuroscientific progress*. Paderborn: Mentis.
- Noë, A. (2009). *Out of our heads. Why you are not your brain and other lessons from the biology of consciousness*. New York: Hill and Wang.
- Pickersgill, M. (2009). Between soma and society. Neuroscience and the ontology of psychiatry. *BioSocieties*, 4, 45–60.
- Putnam, H. (1975). The meaning of meaning. In H. Putnam (Ed.), *Mind, language and reality: philosophical papers* (Vol. 2, pp. 215–271). Cambridge: Cambridge University Press.
- Raikhel, E. (2010). Radical reductions: neurophysiology, politics and personhood in Russian addiction medicine. In S. Choudhury, & J. Slaby (Eds.), *Critical neuroscience* (forthcoming). Oxford: Wiley-Blackwell.
- Ratcliffe, M. (2009). Understanding existential changes in psychiatric illness: the indispensability of phenomenology. In M. Broome & L. Bortolotti (Eds.), *Psychiatry as cognitive neuroscience. Philosophical perspectives* (pp. 223–244). Oxford: Oxford University Press.
- Rose, N. (2006). *The politics of life itself: biomedicine, power, and subjectivity in the twenty-first century*. Princeton: Princeton University Press.
- Rouse, J. (1987). *Knowledge and power. Toward a political philosophy of science*. Ithaca: Cornell University Press.
- Rouse, J. (1996). *Engaging science. How to understand its practices philosophically*. Ithaca: Cornell University Press.
- Rouse, J. (2002). *How scientific practices matter*. Chicago: Chicago University Press.
- Shorter, E. (1997). *A history of psychiatry. From the era of the asylum to the age of Prozac*. London: Wiley.
- Singh, I. (2006). A framework for understanding trends in ADHD diagnosis and stimulant drug treatment: schools and schooling as a case study. *BioSocieties*, 1(4), 439–452.
- Singh, I. (2008). Culture, education, and ADHD. *Early Child Development and Care*, 178(4), 347–361.
- Singh, I., & Rose, N. (2009). Biomarkers in psychiatry. *Nature*, 460(9), 202–207.
- Skolnik-Weisberg, D., Keil, F. C., Goodstein, J., Rawson, E., & Gray, J. R. (2008). The seductive allure of neuroscience explanations. *Journal of Cognitive Neuroscience*, 20(3), 470–477.

- Taylor, C. (1985/1977). Self-interpreting animals. In *Philosophical papers* (vol. 1, pp. 45–76). Cambridge: Cambridge University Press.
- Vidal, F. (2009). Brainhood. Anthropological figure of modernity. *History of the Human Sciences*, 22(1), 6–35.
- Zeki, Z. (2008). *Splendors and miseries of the brain: love, creativity, and the quest for human happiness*. Oxford: Wiley.