Culture Unbound:

Journal of Current Cultural Research

Thematic Section:

The Unbound Brain

Edited by

Kristofer Hansson & Peter Bengtsen

Extraction from Volume 10, Issue 1 2018

Linköping University Electronic Press
Culture Unbound: ISSN 2000-1525 (online)
URL: http://www.cultureunbound.ep.liu.se/

Culture Unbound, Extraction from Volume 10, 2018

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Culture Unbound Vol. 10 Editorial

By Eva Hemmungs Wirtén, Johanna Dahlin, James Meese & Kristin Wagrell

In the 1930s, H.G. Wells famously spoke of a "World Brain." Inspired by ideas that had been circulating for decades, Wells envisioned something like a giant information network, an encyclopedia that would assist mankind in the constant quest for improvement and betterment. Such lofty goals, however, could not be attained without the knowledge and information that would flow through this abstracted Brain. Wells' utopian ideas would be cut short by World War Two, but had he been able to look into the future, he would have been gratified to see that the World Brain did become a reality. It was called Google. But still.

The topic of Volume 10, Issue 1 of *Culture Unbound* is not a World Brain, but (to borrow from contributing author Markus Idvall) that of a new "brain world", something very different from what Wells had in mind. Entering the "brain world," which constitutes the overall frame for the interdisciplinary collections of articles in this thematic issue, is to enter a research landscape that shows remarkable breadth. You will meet the brain in a number of guises, some of which might be new to you (fusing neuroscience and political science in order to understand behaviour) and some of which might seem more familiar (the "mad scientist" of popular culture), but all of which form an exciting collection of texts which span across the natural sciences and the traditional humanities.

The "brain world" is a creative topic approached from a number of different perspectives and disciplinary leanings. Historical events and processes are given new interpretative life when reinterpreted through the lens of new imaging technologies. Patients with Parkinson's disease and those who have lived through the experience of stroke provide another insight into the sometimes very painful life of the brain. The different contributions work with different "sciences," that to some extent seem easily identified and classified, but that, in fact, have less stable connotations and often overlap. Ethnographic work, interviews, readings of text

Wirtén Hemmungs, Eva, Johanna Dahlin, James Meese & Kristin Wagrell: "*Culture Unbound* vol. 10 Editorial", *Culture Unbound*, Volume 10, issue 1, 2018: 1–3. Published by Linköping University Electronic Press: http://www.cultureunbound.ep.liu.se

and images: from popular culture to the body politic, the creative and productive interdisciplinary potential of the brain seems encyclopedic in scope.

Issue 2 of 2018 contains the thematic section *This Season of Discontent: Understanding Student Movements in Neoliberal Times*, which aims at bringing together contributions from countries currently in the throes of student movements the world over; from Brazil to South Africa and India. Increasing repression of institutions of higher learning and the commercialisation of higher education has led to numerous student protests. This thematic issue is an attempt to tackle the larger question of how scholars and educators can engage with and elucidate these student movements.

Issue 3 is entitled *Critical Explorations of Media Modernities in South Asia* and will will critically explore how conflicting meanings of modernity are played out in the wake of Indian “media revolutions”. In postcolonial contexts media and communication technologies are often conceptualized as particularly powerful tropes of social and cultural change and South Asia is a telling example. From the latter half of the twentieth century India has witnessed consecutive “media revolutions” promising to deliver modernity, development and emancipation. First with the tremendous growth of vernacular newspapers since the 1980, then the introduction of satellite television during 1990s and, most conspicuously, the rapid penetration of mobile and smart phones from the turn of the millennium. New technologies, genres and applications have opened up opportunities for popular participation, interaction and protest which are clearly, albeit variedly, perceptible across different sections of society.

We will close the volume with looking into the future. Issue 4 will contain a thematic section on *Critical Future Studies*, introduced by Luke Goode & Michael Godhe in Culture Unbound 2017: 1. *Critical Future Studies* investigates the scope and constraints within public culture for imagining and debating different potential futures. It interrogates imagined futures founded—often surreptitiously—upon values and assumptions from the past and present, as well as those representing a departure from current social trajectories. In the thematic section, visions of the future (or “futurescapes”) from popular science to science fiction will be examined. The thematic sections aims to contribute constructively to vigorous and imaginative public debate about the future—a futural public sphere—and to challenge a prevalent contemporary cynicism about our capacity to imagine alternative futures while trapped in a parlous present.

In late 2017 we learned that Culture Unbound would receive funding from the Swedish Research Council as well as the Joint Committee for Nordic Research Councils in the Humanities and Social Sciences for 2018-2020. We are enormously grateful for these grants, as they secure the journal’s Gold Open Access profile and ensures the absence of any author fees for the next few years. With this support, we can continue working for an open, inclusive and truly interdisciplinary journal.

Publishing a journal entails a lot of work. Most of this work is unpaid, and a lot of it is also unacknowledged. Therefore, we would like to open this volume by expressing our gratitude to the people who are never recognised for the crucial work that they do for the journal: the anonymous reviewers. The referees are the core of any academic publication. They are an indispensable voice of expertise for the editor and a source of support and constructive critique for the authors. While they often contribute greatly to the outcome of the final publication they are per definition always left out when credits are distributed.

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The Unbound Brain–A Thematic Introduction

By Peter Bengtsen and Kristofer Hansson

The brain has long been an object of curiosity and fascination. Partly as a result of technological advances, issues related to the brain have become ubiquitous points of discussion in our culture. Along with neurological disease and neuroscience, it is frequently featured in Hollywood block buster movies, self-help books, popular science documentaries and fictional TV-series.[1] Once cast as grey and stable matter, the brain is now commonly represented as a glowing and colourful entity through the use of new imaging technologies. Further, it is often likened to a complex and adaptable machine that can be enhanced continuously through dedication and deliberate effort.

Neuroscience is an interdisciplinary research field that involves sciences like medicine, genetics and chemistry. While it can be traced back to the 1960s, it has expanded significantly and received increasing funding in recent years. In their book *Neuro. The new brain sciences and the management of the mind* (2013), sociologist Nikolas Rose and historian Joelle M. Abi-Rached present a brief trajectory of the emergence of neuroscience. They point out that it was not until the 1980s that the international organisation Society for Neuroscience began to see a greater number of participants at their conferences.[2] The growing interest continued in the 1990s.

Neuroscience has changed our understanding of, and relationship with, the brain in a number of ways. One example is that the perceived boundaries between the pathological and normal have shifted. This has implications e.g. when considering issues of madness and of moral responsibility. As sociologists Martyn Pickersgill and Ira van Keulen point out:

> Just as the pervasive talks of genetics once indicated "a new style of enchantment with nature" (Rosenberg, 2007, p. 97), wherein DNA was understood to be a code that could be cracked to reveal 'life's innermost

Bengtsen, Peter & Kristofer Hansson: "The Unbound Brain–A Thematic Introduction", *Culture Unbound*, Volume 10, issue 1, 2018: 4–10. Published by Linköping University Electronic Press: http://www.cultureunbound.ep.liu.se

> secrets' (*ibid.*), so now is knowledge of the neurological frequently portrayed as key to properly appreciating the subtle complexities of humanity. As various scholars have now shown, the 'new brain sciences' have emerged and come to be consolidated as important entry points into classical questions such as where the origins of madness lie, how moral responsibility should be adjudicated, and what demarcates normality from pathology (Lock, in press; Vidal, 2009; Walsh, 2011). (Pickersgill & Van Keulen 2011: xiii)

In Western society, the brain has increasingly become a central node around which our understanding of "the human" and "society" revolves. The knowledge produced by neuroscience circulates into society and provides new perspectives on the brain and the meaning of being human (cf. Rose 2007, Gottweis 2008). The central position of the brain in research and culture is likely also a result of the many neurological afflictions—e.g. stroke, Alzheimer's disease, neuropsychiatric disorders, burnout—that affect inhabitants in the modern Western world. Neuroscience offers medical narratives for understanding neurological conditions. Therefore a critical perspective is needed (Cf. Choudhury & Slaby 2012, Schimtz & Höppner 2014, Slaby & Gallagher 2014) to provide other understandings—other narratives—of the medically-based hope that neuroscience to some extent offers people with neurological afflictions (Cf. Brown 2003).

The contemporary fascination with the brain and aspects of neuroscience is in part contingent on, and demonstrated by, products of popular culture. One recent example of a popular-cultural representation of the brain's functions and adaptability is the 3D computer-animated film *Inside Out* (2015). The film takes us inside the mind of a child, 11-year-old Riley Andersen. We follow her basic emotions, personified as five characters (Joy, Sadness, Anger, Fear and Disgust) that live and work in the headquarters of Riley's mind. From there they control the emotional impulses that determine Riley's actions. They are also responsible for sending her memories—represented as glowing, colourful spheres—into long-term storage. The main plot of the film revolves around Riley's emotional crisis after moving with her family from Minnesota to San Francisco. As the film progresses, we see how the personified emotions collaborate in an attempt to stabilise Riley and preserve her core positive memories.[3] *Inside Out* uses anthropomorphisation in its depiction of emotions, and visualises memories as concrete objects. It also represents the spatial metaphor of the brain as an actual environment that consists of different locations—e.g. the Headquarters, the Islands of Personality and the Memory Dump. The film is a window into higher brain functions and the relationship between memory, personality and behaviour. It is just one recent example of how representations of the brain and neurological phenomena have made their way into popular culture and mainstream discourse.

To understand how increasing knowledge about the brain is influencing contemporary culture, the representations of this knowledge should be explored from a broad cultural-studies perspective. In this special issue of *Culture Unbound*, scholars from a number of disciplines within the humanities and social sciences address the pervasiveness and influence of neuroscience and representations of the brain in everyday contexts. A common thread in the articles is the idea that knowledge and narratives about, and visualisations of, the brain change practices and processes in daily life. In addition, the articles, in different ways, explore the brain as something that is perceived and portrayed as constantly transforming; an unbound brain.

The notion of the unbound brain raises a number of classic cultural-studies questions and also opens up new areas of inquiry. Novel contemporary neurological research is producing knowledge that changes how we regard the brain (Beaulieu 2000, Pickersgill 2013), and cultural artefacts—e.g. films, TV-series, games, fiction books—can be important vehicles for communicating these scientific findings to the public (Ortega & Vidal 2013, Vidal 2016). At the same time, popular culture narratives, as well as our cultural practices in a broader sense, influence the production of scientific knowledge in a variety of ways. Questions like the following can be raised in relation to the reciprocal influence between, on the one hand, cultural products and practices and, on the other hand, neuroscience: How is the brain and neurological research represented in popular culture and what are the social and political implications of such popular-cultural portrayals? How do neurological research and popular-cultural representations of the brain affect other scientific practices? How do people use knowledge about neuroscience and the brain to frame their life experiences? These are some of the questions considered in this issue of *Culture Unbound*.

About this Special Issue

This issue contains six articles that investigate a variety of cultural and scientific discourses and practices that in different ways are related to neuroscience and the brain. In "The Sci-Fi Brain: Narratives in Neuroscience and Popular Culture", Åsa Alftberg and Peter Bengtsen examine how narratives about technology, the malleable brain and the mad scientist are presented and used in popular culture and how neuroscientists relate to the narratives when describing their work. Niklas Altermark and Linda Nyberg's article "Neuro-Problems: Knowing Politics Through the Brain" discusses the recent turn of political scientists towards contemporary brain science. The authors demonstrate how scholars working within the field of "neuropolitics" frame political problems as located in the brain. One implication of this framing is that e.g. difficulties with implementing democratic processes in a specific society can seemingly be explained neurologically. In “Vulnerable Normality: Popular Neuroimaging and the Discursive Logic of the (Dis)able(d) Brain”, Kristofer Hansson and Ellen Suneson analyse popular neuroimaging of the (dis)able(d) brain as a cultural phenomenon. By discussing a number of popular science documentaries from a critical disability perspective, the article argues that the position of normality and able-bodiedness has changed with the development of brain scanning techniques. The field of neuroscientific imaging is also central to Paula Muhr’s article “Visualising the Hypnotised Brain: Hysteria Research from Charcot to Functional Brain Scans”. Muhr shows that the advent of new brain imaging technologies has reignited scientific research into the age-old and contentious disorder hysteria. While some current research attempts to link hysteria to hypnosis, a clear analogy between these two phenomena has so far not been established. Instead, Muhr argues, despite huge technological advances in imaging technologies, contemporary researchers grapple with conceptual problems comparable to those that plagued their 19th century predecessors. Michael Andersen’s “Everyday Imaginaries, Narratives and Strokes: An Ethnographic Exploration of Narratives among Stroke Patients and their Spouses” considers the way stroke can affect the communal narratives of couples. The article suggests that the communal narratives are sometimes taken over by the partner not directly afflicted by the stroke, and that the narratives may be used to monitor both the relationship and the brain functions of the spouse afflicted by the stroke. The last article, Markus Idvall’s “The Phenomenon of Brain World: Neuroculture in the Making by Patients with Parkinson’s Disease”, presents *Brain World* as a central term. The notion of brain world is presented as a possible indication of an emerging neuroculture, and Idvall explores how the brain world is perceived and enacted by patients with Parkinson’s disease, who are subjected to different forms of neuroscience (cell transplants, genetics, growth factor, etc.).

In addition to the above-mentioned research articles, the issue contains an interview and a book review. The starting point of Kristofer Hansson and Karolina Lindh’s interview “The Hamburgers in the Fridge: an Interview with Professor Nikolas Rose about Interdisciplinary Collaboration, Neuroscience and Critical Friendship” is Rose’s observation that a new relationship is required between neuroscience and the cultural sciences (2013, cf. Fitzgerald & Callard 2014). Rose calls for a critical friendship between the disciplines and asserts that “we must move beyond description, commentary and critique, beyond the study of downstream ‘implications’ of biology and biomedicine, to develop an affirmative relation” (Rose 2013: 23). Such a relationship would bring new understandings of contemporary society and the human beings who inhabit it. The importance of interdisciplinary collaboration is also emphasised in Rachel Irwin’s thematic review of the book *Rethinking Interdisciplinarity Across the Social Sciences and*

Neurosciences by Felicity Callard and Des Fitzgerald (2015). Irwin highlights two points in particular. First, that there is a need to think more creatively about the forms and modes of interdisciplinary research. Second, that it is necessary to embrace and learn from the barriers and challenges of interdisciplinary research rather than allowing these to hinder collaboration.

The Background of this Special Issue of *Culture Unbound*

Neuroscientific findings and methods not only serve as valuable resources when providing medical diagnoses, they are also used to explain social and societal phenomena. As such, neuroscience and the dissemination of knowledge about the brain impact numerous areas of contemporary life and society. Many of the issues that are increasingly being framed as influenced or dictated by neurological processes have historically also been of interest to disciplines within the cultural and social sciences. As can be seen from the descriptions of the individual articles above, this special issue brings together researchers who explore the intersection of neuroscience, culture and society from a range of disciplinary standpoints. The articles show that ideas about the brain, be they based in factual biomedical knowledge or in fictitious imaginaries, are central not only to the practices of neurological researchers, but also to patients and lay people.

This issue is edited by Peter Bengtsen and Kristofer Hansson, who are conducting research within The Cultural Studies Group of Neuroscience at the Department of Arts and Cultural Sciences, Lund University.[4] The group's main focus is on the expressions and practices in society that are derived from or otherwise related to neuroscience.

The Cultural Studies Group of Neuroscience has previously published the anthology *The Atomized Body* (2012) edited by Max Liljefors, Susanne Lundin, and Andréa Wiszmeg, the doctoral thesis *Modern Genes* by Niclas Hagen (2013) and the anthology *Interpreting the Brain in Society: Cultural Reflections on Neuroscientific Practices* (2017) edited by Kristofer Hansson and Markus Idvall.

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Notes

[1] Examples include the films *Eternal Sunshine of the Spotless Mind* (2004) and *RoboCop* (2014), books like *Thinking, Fast and Slow* (Kahneman 2011) and *Grain Brain* (Perlmutter & Loberg 2014), the documentary *My Beautiful Broken Brain* (2016) and series like *Black Box* (2014). For more examples, see Ortega & Vidal 2013, Vidal 2016, Bengtsen & Suneson 2017, Hansson 2017, Liljefors 2017.

[2] For more on Society for Neuroscience, see https://www.sfn.org/ (retrieved 2018-03-28).

[3] The memory spheres bring to mind glass marbles. This visual representation, as well as the importance given in the film to protecting the spheres, can be seen as a reference to the idiom “losing one’s marbles”, i.e. going crazy.

[4] The Cultural Studies Group of Neuroscience is part of the Linnaeus environment Basal Ganglia Disorders Linnaeus Consortium (Bagadilico) at Lund University. Bagadilico ran from 2008 to 2018 and was financed by The Swedish Research Council.

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The Sci-Fi Brain: Narratives in Neuroscience and Popular Culture

By Åsa Alftberg & Peter Bengtsen

Abstract

The connection between neuroscience, popular media and lay perceptions of the brain involves the framing of complex scientific processes and results through familiar cultural narratives and metaphors. Such narratives are often built on the premise that neuroscience, with the help of powerful new technologies, will finally solve the mysteries of brain and mind, consciousness and morality. At the same time, popular culture—especially the science fiction genre—tends to focus on worst case scenarios of the implementation of technology. This article explores cultural narratives of what the brain is and how it functions in two different contexts—among neuroscientists and within popular culture. In particular, narratives about technology and the malleable brain as well as the notion of the mad scientist are studied. The article explores how these narratives are presented and used in popular culture and how neuroscientists relate to the narratives when describing their work. There is a contrast, but also a blurring of boundaries, between actual research carried out and the fictional portrayals of scientists constructing, or altering, fully functional brains. To some extent, the narratives serve as a background for the public's understanding of, and attitude towards, neuroscience—something that must be taken into consideration when dealing with the therapeutic treatment of patients. The narratives of neuroscience in popular culture are to a certain degree shaped by actual scientific practices and findings, but neuroscience is also influenced by laypeople's perceptions, which often have their roots in the narratives of popular culture.

Keywords: Medical humanities, cultural analysis, narratives, technology, science fiction, neuroscience, popular culture, Dollhouse.

Alftberg, Åsa & Peter Bengtsen: "The Sci-Fi Brain: Narratives in Neuroscience and Popular Culture", *Culture Unbound*, Volume 10, issue 1, 2018: 11-30. Published by Linköping University Electronic Press: http://www.cultureunbound.ep.liu.se

Introduction

What is the brain, and what does it do? While there are many ways to answer these questions, any vision of the human brain is necessarily shaped by our historical background and social and cultural context. For example, the brain is often envisioned as a machine, a command centre governing the body, even though this metaphor has changed over time from likening the brain to a central telephone exchange to seeing it as a computer (Malabou 2008). No doubt inspired by the contemporary ubiquity of the Internet, the brain is commonly described in neuroscience today as a dynamic and decentralised network with multiple and adaptable structures that extend between different brain centres (Altermark 2014). Partly as a consequence of this, in contrast to the idea of the brain being stable and immutable, plasticity has emerged as the distinctive characteristic, highlighting that the brain remains malleable during the entire adult life (Rubin 2009). Simultaneously, in the public discourse the brain and neurological processes are commonly cast as the origin of human behaviour.

The impact of neuroscience on popular media and on lay perceptions of the brain has been explored in the humanities and social sciences since the 1990s, the so-called *decade of the brain* (Dumit 1997, 2004; Beaulieu 2000, 2002; Rose & Abi-Rached 2013). One frequent area of focus in such studies of popular culture involves the simplified portrayals of complex scientific processes and results, and the framing of these through familiar cultural narratives and metaphors (Nisbet & Fahy 2013). These narratives are often built on the premise that neuroscience and the new biology of the brain, with the help of powerful new technologies, will finally solve the mysteries of brain and mind, consciousness and morality (Pickersgill, Martin & Cunningham-Burley 2015). It is a challenge to reconcile the notion of being an individual who has an identity and a personality, on the one hand, with the idea of the brain as a biological organ that is regarded as “a source of truth”, on the other hand (Altermark 2014: 1467). The current developments in biomedicine and neuroscience, with new technological and therapeutic possibilities, have transformed the view of the self from personhood to brainhood, i.e. the quality or condition of “being a brain” or a cerebral subject (Vidal 2009). As a concept, the cerebral subject draws on normative conclusions about human beings as moral, social and political subjects, who are dependent on their brains. These subjects, these “neuro-chemical selves” (Johnson Thornton 2011: 2), are underpinned by neuroscientific vocabulary and techniques, especially the colourful images of brain scans, as well as by the common sense notion that being human is something more or less exclusively physical and reliant on the brain (Zivkovic 2015). As Susan Leigh Star articulated in 1992, “none of us really come as strangers to the brain, since the foundational metaphors of brain science pervade popular culture, and have for some time” (Leigh Star 1992: 205).

Media help to shape our understanding of the brain and our relation to it, and this relationship generates countless plots in films and television series. Culture and brain infuse each other with meaning through media—words, sounds and images (Connolly 2002). This reciprocity is also described by Joseph Dumit:

> From one perspective, science produces facts that define who our selves objectively are, and which we then accept. From another perspective, our selves are fashioned by us out of the facts available to us through the media, and (…) are, in turn, the cultural basis from which new theories of human nature are constructed (2004: 164).

Understandings of the brain are thus to some extent built on scientific facts that are disseminated through the narratives of media and popular culture. These cultural narratives, in turn, influence scientific theories of the human brain and being human. And these theories help determine what is to be considered scientific fact. This interdependent relationship is discussed by Louise Emma Whiteley (2012), who argues that media are sites for negotiation of both meaning and practical action. Media, or media practices, have the power to shape society and the public. At the same time, they can influence the development of science itself. It is from this perspective on cultural narratives that we will address our research questions.

In this article, we aim to explore cultural narratives of what the brain is and how it functions in two different contexts—among neuroscientists and within popular culture. For the purpose of this article, we define popular culture as a collection of constantly-evolving ideas and attitudes that occur and are disseminated through and around different types of media and that potentially affect everyday life (for more on the relationship between neuroscience and popular culture, see Bengtsen & Suneson 2017). The cultural narratives in question are (1) technology and the malleable brain and (2) the notion of the mad scientist. We will look at how these narratives are presented and used in popular culture and in neuroscience when scientists describe their work. Of particular interest is the contrast, but also the blurring of boundaries, between actual research carried out in two neuroscience projects and the fictional portrayals of scientists constructing, or altering, complete and fully functional brains. In relation to the malleability of the brain, a central point is that whereas actual neuroscientists regard the brain as malleable a priori, in popular culture products, the brain is typically depicted as malleable mainly in the sense that it can be manipulated by technology. In relation to the notion of the mad scientist, our findings show that this common trope in popular culture to some extent influences how real-life neuroscientists are perceived by the public, and also has some bearing on how they act as researchers. We are aware of the simplification we present when clustering different scientific practices into the category of "neuroscience".[1] It is important to note, however, that it is precisely through narratives based on these types of conflating categorisations that a broader public are introduced to what are actually diverse neuroscientific practices.

Method and Empirical Material

This article is based on the qualitative analysis of two types of empirical material. First, we draw on a series of qualitative focus group interviews with neuroscientists, conducted between November 2015 and May 2016. Focus group interviews are particularly useful when the everyday attitudes, feelings and beliefs of a particular group are of interest. These are more likely to be revealed in the social interaction of a group discussion. Focus group interviews, then, allow researchers to gain insights into previously unarticulated beliefs that emerge in conversation (Krueger & Casey 2014). In the interviews, knowledge is co-produced by the participants and the moderating researchers, creating specific meanings and interpretations of reality (Gray 2003). Four focus group interviews with 3-5 participants were conducted, each occasion lasting between one and one and a half hours.

The participants were part of two different neuroscience research groups. During the focus group interviews, the participants were asked to describe their work and the laboratory procedures. From these descriptions, different aspects of neuroscientific work were discussed, often through comparisons between the researchers' actual practice and the depiction of neurological research in popular media. Quotes from the interviews are presented with fictitious names. Second, we relate topics from the focus group interview excerpts to the depictions of neuroscience in Joss Whedon's television show *Dollhouse* (2009-2010). The show centres on the Los Angeles branch of a corporate-run range of so-called Dollhouses—establishments around the world that erase the memories and personalities of (supposed) volunteers, known as Dolls or Actives, who are then repeatedly imprinted with new, temporary memories, skills and personalities. The Actives are used to cater to rich clients, with tasks spanning from being sex partners, hostage negotiators or forensics experts to assassins. After each engagement, the Actives' brains are wiped clean, returning them to a so-called doll state, where they retain only a minimal skill set while waiting for their next assignment. The use of mind-altering neurological procedures is common in Whedon's work. In his most famous television show, *Buffy the Vampire Slayer* (1997-2003), a secret government agency, The Initiative, traps and surgically implants chips in test subjects' brains in order to modify their behaviour. Likewise, in the series *Firefly* (2002-2003), an organisation known as The Academy conducts experiments on the brain of one of the protagonists in order to turn her into a powerful, but also highly unstable, psychic weapon. In all cases, these experiments end up having catastrophic, unforeseen consequences for those conducting them. We have chosen *Dollhouse* as a case because the show exemplifies in a very clear manner the popular culture depiction of neurological research, including ideas about the malleability of the brain as well as the nefarious motives often attributed to neuroscientists, and the moral implications of altering people's brains and—by extension—their identities. It should be noted that presenting practitioners within neuroscience as "mad scientists" is a common trope in products of popular culture more generally. The present article will show that this portrayal to some extent influences the way scientists in real life believe they and their work are being perceived by the public.

Technology and the Malleable Brain

Technologies are always *socio*-technologies. As sociologists Nik Brown and Andrew Webster state, "technology should be seen to mediate social relations, while these too are inscribed by technologies, instruments and machines that surround us and shape our everyday life" (2004: 11). Medical technologies in particular, being linked to individualisation and commodification of health, have turned human beings and their bodies into a site for scientific intervention and have reshaped the human course of life (Brown & Webster 2004). Neuroscientific technologies act as therapeutic instruments for optimising the cerebral subject so it becomes more efficient, concentrated, flexible and self-confident. In order for this to be effective, however, the brain has to be plastic and malleable, ready for the impact of neurotechnological apparatuses (Schmitz 2012).

According to Sigrid Schmitz (2012), the cerebral subject has become a bio-techno-social subject since neurotechnologies fragment the boundary between brain and technology. For example, brain-computer interfaces (BCI) are designed to catch signals from the brain, to decode them and to convert them into signals that control connected technological devices:

> The communicative network requires the plastic and learning brain on the one side and learnable algorithms as a counterpart in the computer. Both, brain and computer have to 'harmonize' their codes for communication. Consequently, brain, computer and technical devices intra-act and change each other permanently (Schmitz 2012: 265).

The intersection of brain and technology evokes the notion of the hybrid. As Schmitz writes, "technologically upgraded brains become hybrids between nature, culture and technology, mutually intra-acting, influencing and changing each other" (2012: 263). This type of transgression of the borders between nature, culture and technology is captured in Donna Haraway's (1991) well-known term *cyborg*. The idea of the cyborg is used to highlight how nature and culture, the organic and technological, matter and information are inextricably linked. Sci-fi cultural narratives relating to technologies and the brain often make use of the cyborg concept. For example, in the show *Dollhouse*, the neurological treatment involves manipulating the brain and, by extension, a person's consciousness and personality.

In the first scene from *Dollhouse* that depicts the neurological treatment of an Active, a woman, previously introduced in the show's opening scene as Caroline, is enthusiastically talking about a man (named Matt) she has recently met. Earlier in the episode, they have been shown racing on motorcycles through the streets of Los Angeles and arriving at a club where a group of the man's friends waits to celebrate his birthday. As the couple talks at the party, it becomes apparent that they have not known each other long, but that the party is the conclusion to a romantic weekend. Shortly thereafter, the woman is picked up by a black van and driven back to the dollhouse.

At the treatment facility, the woman talks to a young man about her feelings for Matt. The man, named Topher Brink, does not really seem to be paying attention to her or the story, focusing instead on the preparation of some type of technical equipment. While she talks, the woman is fondly toying with a small golden heart pendant and a necklace that were given to her by Matt in a previous scene. She proceeds to sit down on what looks like a high-tech dentist chair. When the back of the chair begins to recline, she looks at the necklace and says "I think I found something real", to which Topher responds "I'm glad. This is gonna pinch a bit" (Figure 1). He then initiates the treatment and blue light emerges from an arch that crowns the chair's headrest (Figure 2).

As the treatment process begins, a series of blurred and short cuts of scenes from earlier in the episode are displayed. In addition, we see clips not previously shown that seem to depict events that have taken place long before. In the clips, people are at times moving backwards, and the scenes and events are shown in reverse order. During the treatment, the necklace drops from the woman's hand onto the floor. At the end of the treatment, the chair is brought back to an upright position and the woman looks around with a blank expression on her face:

> Topher: "Hello Echo, how are you feeling?"
>
> Woman (Echo): "Did I fall asleep?"
>
> Topher: "For a little while."

> Echo: "Shall I go now?"
>
> Topher: "If you like."[2]

After this brief conversation, the woman walks out of the room, leaving the necklace behind.

The scene described above establishes a central premise of *Dollhouse*: that it is possible to wipe a human brain clean (not unlike a computer hard drive) and later imprint it with new memories, abilities, and personalities. The reverse playback of memories is a visual representation of the extraction process, which leaves the female Active in what the show calls a doll state. This is a state of immense vulnerability, as all critical sense and personality is stripped from the individual, leaving the Active with only a basic set of skills that allows them to function and interact with staff and other Actives until they are imprinted again for a new task. It becomes clear later in the series that while Actives at the Los Angeles Dollhouse are in a doll state, they—like Echo—are all named after letters in the NATO alphabet.

Figure 1: Female Active looking fondly at a necklace she received during an assignment, moments before her mind is wiped and she returns to her doll state. See *Dollhouse*, Season 1, Episode 1: 'Ghost". First broadcast 13 February 2009.

As neuroscientists Sandra Aamodt and Sam Wang point out in their book *Welcome to Your Brain* (2008), the idea that memories can be erased is a relatively common trope in popular culture products (e.g. films and television programmes). Further, the process is often visually depicted by playing back the memories on-screen. They also note that,

> the idea that one can locate an offending memory, play it back, then erase it like an unwanted computer file [is less fantastic than it may sound]. Research in the past few years suggests that recollection of a memory also reinforces the memory. There is good evidence that we "erase" and "rewrite" our memories every time we recall them, suggesting that if it were ever possible to erase specific content, playing it back first might be an essential component (13).

Aamodt and Wang cite the 2004 feature film *Eternal Sunshine of the Spotless Mind* as an example of a fictional narrative that, like *Dollhouse*, works with the premise that scientists are able to remove specific memories. Other examples of popular media products that operate with the trope of removing and/or implanting memories include *Total Recall* (1990), *Men in Black* (1997) and *Dark City* (1998). In real life, selective memory alteration might be useful in treating afflictions like Post-Traumatic Stress Disorder (PTSD).[3] However, work in this field currently involves cognitive therapy and/or medicinal treatment rather than the type of outright electronic mindwipes common to fictional narratives.

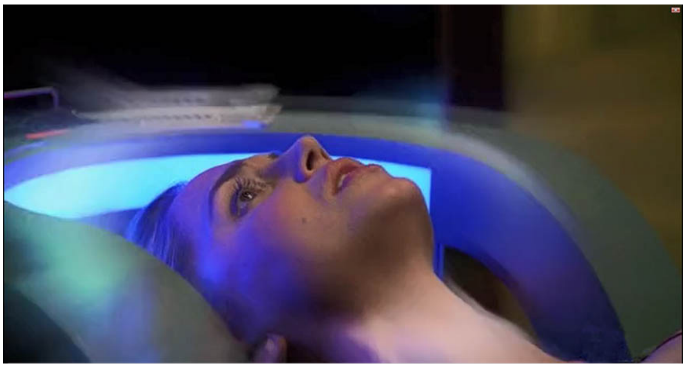

Figure 2: The mind wipe is underway: the technology used to wipe minds in Dollhouse is wireless and physically non-invasive. This becomes an important plot point later in the series, as the technology is weaponized. See *Dollhouse*, Season 1, Episode 1: 'Ghost". First broadcast 13 February 2009.

The scientists who participated in the focus group interviews also consider neurological technologies as a therapeutic alternative, for instance in treatment that involves DBS (Deep Brain Stimulation, a surgical procedure used to treat a variety of neurological symptoms). For them, it is a natural way of dealing with severe neurological symptoms. However, it is also clear from their description that they feel that laypeople or patients often are unwilling to engage with such technology. As one focus group interviewee puts it:

> People start thinking about 'how will my brain function' and how these…like if I get implants, I have electrical signals in my brain. Lots of people don't like the DBS because they think that 'who's going to signal and what are they going to read'... you know, they get... It's like they're paranoid about technologies in their brain (Sarah).

The above interview excerpt highlights the scientists' awareness that the use of available technology has different meanings for different people. For the interviewed researchers, the implantation of a thin, insulated wire in the brain (as in DBS) is a rather ordinary intervention. For patients and people with no first-hand knowledge of the procedure and its possible effects, however, the insertion of such technological equipment in the brain may be seen in a very different light. One reason for this could be that laypeople's understanding of such neurological procedures in real life is framed by their, often, nefarious use in books, films and television shows. In these popular culture products, implants and other types of technology are commonly used to monitor, manipulate and even kill those exposed to it.

Dollhouse walks a fine line where the actions of the depicted researchers are cast as neither entirely good nor evil. Rather, the viewer's perception of those working for the Dollhouse constantly changes. However, as the storyline progresses, the Rossum Corporation (the private medicinal conglomerate behind the Dollhouse) uses the knowledge derived from the Dollhouse project to develop ranged weapons and ultimately a mass-dispersal mechanism for wiping people's brains without consent.[4] At this point, a clear message about the potential dangers of neuroscientific research emerges in the show. This common trope within fictional narratives may be a contributing cause to the scepticism towards brain implants and other procedures involving the brain that real-life neuroscientists experience.

Within neuroscience there are also debates about whether therapies like DBS may influence some patients' mental states to such an extent that it affects the individual's personal identity (Klaming & Haselager 2013). One example highlights how the individual's experience of psychological continuity is disturbed when the patient becomes overwhelmed by bad childhood memories during treatment with DBS (Goethals et al. 2008). The effects on behaviour and memory in this specific case seem to be in line with the cultural narratives that link brain, technology and memory together, with a focus on what happens when the brain is overwhelmed by a flood of memories. In *Dollhouse*, the real-life anxiety of this type of loss of control is represented by a so-called "composite event", when Topher accidentally dumps 48 imprinted personalities into an Active called Alpha. This causes Alpha to go insane and kill several people at the Dollhouse before escaping.[5]

Popular culture narratives related to technology and the brain often come in the form of sci-fi, which to some extent is disconnected from actual clinical therapeutic interventions. One difference between these narratives and actual current neurological research and treatment is that neuroscientists regard the brain as a priori malleable. In popular culture, conversely, the brain is commonly depicted as malleable mainly in the sense that it can be manipulated by technology. The scientists who participated in the focus group interviews are aware of the influence of popular culture when it comes to the public's view of technology and the brain, as well as the necessity of taking the popular culture narratives into consideration when dealing with therapeutic treatments for patients. In other words, the narratives of popular culture challenge neuroscience because they create a blurred line between fiction and reality in terms of laypeople's perceptions.

The Imagined Mad Scientist

The trope of "the mad scientist", an ingenious person with a faulty moral centre, is a familiar staple in popular culture narratives. It has its roots in the clinical association between genius and insanity that developed in the mid-nineteenth century (Stiles 2009). The stereotypical mad scientist has several central characteristics:

> He is a hard and very diligent worker; he emanates an aura of absent-mindedness, extreme confusion or even madness. He is an outsider in terms of social contacts. He is inattentive to the people around him and is uninterested in social trends and fads. He seems socially displaced. He is not a particularly attractive hero, with glasses, a work apron, ruffled hair, etc. His enthusiasm for his work could almost be called an obsession. His work attitude can sometimes be completely apolitical. In the eagerness of his scientific curiosity, in some cases he even takes the risk of causing immense damage to humanity (Avraamidou 2013: 90).[6]

The trope of the mad scientist represents the "colonised" view of science (Haynes 2016: 32); that is to say, the dominance of presupposed scientific legitimacy that permeates modern society. It implies a cultural critique of science, including moral narratives concerning knowledge, technology and personality (Toumey 1992). The mad scientist is consistently presented as a dangerous overreacher, whose determination to transcend human limitations causes a wave of retributive events. He is obsessively seeking knowledge, but fails to foresee the attendant consequences of achieving his goal (Haynes 2016). More recently, this classic representation of the mad scientist has come to be problematised. According to Roslynn Haynes, the stereotype is eroding, in part due to growing public familiarity with science and scientists. In contemporary popular culture, scientist characters are often modelled on ordinary people whose human traits and emotions—such as love, joy or grief—are emphasised. This change to a more empathic depiction may reflect a reduced fear of science and an increased acceptance of scientists as professional members of society who make contributions that are important for the future of the planet (Haynes 2016, see also Orthia 2011). Nevertheless, even initially "good" scientists are frequently portrayed as being vulnerable to manipulation by powerful, malicious stakeholders or to corruption in virtue of their ambition (Weingart, Muhl & Pansegrau 2003). The mad scientist is thus a powerful trope that lingers on. In the following, we will discuss its implications specifically in relation to the image of the *neuro*scientist in fiction and in reality.

The first episode of *Dollhouse* not only establishes the technology that exists within its fictional universe. It also begins to draw up the moral dilemmas of developing and using such technology. Topher Brink is the head scientist at the Los Angeles Dollhouse and the main architect behind a lot of the equipment and processes that are used to wipe and imprint the Actives. At the beginning of the show, he is painted as a borderline sociopath, who seems to mainly consider the Actives as a resource for his experiments. This comes out in an adversarial conversation with Echo's personal handler, Boyd Langton, right after the first on-screen brain wipe on the show:

> Boyd: "Everything go alright with the wipe?"
>
> Topher [inserting into a computer a cassette previously removed from the wiping chair]: "Why don't you just ask Echo? Oh that's right – because she can't remember [fake-laughs sarcastically at Boyd, then turns his attention to the computer monitor]. 'Course it went alright. Imprint's gone, the new moon has made her a virgin again. Is there some reason it shouldn't have? Something happen during the engagement?"
>
> Boyd: [sardonically] "I think she finally met the right guy."
>
> Topher: "Haha, you're so jaded. That's such a middle-age... She had fun, right?"
>
> Boyd: "She thought so."
>
> Topher: "There's nothing good or bad, but thinking makes it so,

> man-friend. We gave two people a perfect weekend together. We're great humanitarians."
>
> Boyd: "Who'd spend their lives in jail if anyone ever found this place."
>
> Topher: "We're all so misunderstood. Which great humanitarians often are. Look at Echo; not a care in the world. She's living the dream."
>
> Boyd: "Whose dream?"
>
> Topher: "Who's next?"[7]

The above exchange establishes a few central traits of Topher as a character. First, his megalomaniac tendencies are reflected in the fact that he does not hesitate to cast himself in the role of a great humanitarian, despite working for a private company in a secret research project that involves taking away people's free will and identity. Second, Topher's final quip at the end of the conversation shows his disregard for the moral and ethical grey area in which he finds himself as a researcher. This is a characteristic that is underlined throughout much of the show. For example, when missions go wrong, Topher is often more concerned with the anomaly and the technical knowledge that can be derived from it than with the immediate wellbeing of the Actives.

In real-life neuroscience, researchers seem to be quite aware of the dubious moral compass their fictional counterparts are commonly fitted with. In the focus group interviews, the participants at times try to distance themselves from the public view and associations informed by such sci-fi depictions. A researcher working on a project that focuses on growing neurons from embryonic stem cells states:

> I know that this is what people first associate it with when they hear about the project, you know they see it like a big brain and they imagine tubes going in and out and maybe it can talk or whatever [laughing]. But to me that's never the kind of thoughts that I have had, because we just know that technologically it's never ever going to be possible to make that. So, the aim that we have with the project is really just a fetal brain, so the very, very early part of the brain, probably even before it starts to think. […] For us it's never been an aim to make a full size adult human brain [laughing]. But I know that's the kind of association people would get, when you say that you're growing a brain in the lab. […] It's not a

> huge leap forward but it can look like that for a non-scientist. That's why they normally react stronger. I mean, I think people imagine that we can build a whole functioning brain that can think and... Which is not at all our... well it's not at all where we are and it's not at all where we're going to be because that's not possible (Laura).

In popular culture and—by extension—in the public's eyes, even a brain that has been grown in a tube is expected to possess cognitive abilities like thinking and talking. Conversely, the researchers describe the neurons they are growing as the very early stages of a brain and they strongly emphasise the impossibility of artificially creating a full-size—and fully functioning—human brain. The above interview excerpt demonstrates a significant contrast between the research that is actually carried out and the popular culture perceptions of neuroscience. According to the latter, it is possible to build a whole, functioning human brain or—as in *Dollhouse*—completely reconfigure an existing brain. Real-life experiments often take place on a cellular level, and the researchers draw a distinct line between what the brain and scientists can do in real life versus portrayals in popular culture. However, the popular imaginings of neuroscience also seem to influence the scientists at times. This is seen in an excerpt from an interview, where one of the research team members describes his initial excitement at being part of the project:

> Paul: But just the idea, when I heard very briefly about the idea of making an artificial brain and keeping it alive, then I felt like this is, this is very interesting and I really want to work with this.
>
> Laura: Kind of sci-fi maybe?
>
> Paul: Yeah, maybe! [scattered laughter in the group].

The line between science and popular culture is constantly challenged, and the interviewed researchers are aware of how easy it is to (seemingly) cross it. One of the interviewees, Tom, says: "We're building this brain and it comes completely under the radar or it can just spin out something crazy... and we end up in a movie". The researcher seems to refer here to the power of the media to frame scientific work via established narratives and tropes. The blurred line between fiction and reality may lead scientists to be self-reflective, imaging how they and their colleagues might be portrayed in films and other media products. The researchers agree that scientists in popular culture are mostly depicted as crazy and dangerous. This is exemplified in the following exchange:

> Sarah: I watched...have you seen the show *Law and Order*? [...] It was a woman that…she was like brain dead, or she was on life-support completely...She'd been for a long time, and she was in this nursing home when she got sick so they had to take her to the hospital and at the hospital they discovered that she was pregnant. And this unrolled a whole story of... how they solved it in the end was that there was a doctor, that was financed by a rich person with Parkinson's disease, and he wanted a cell transplant with fetal cells...[...] He funded the whole research clinic and they impregnated these women in vegetative states with sperm from this man with Parkinson's disease…
>
> Laura: That makes us look bad [laughing].
>
> Sarah: And then they harvested the embryos at the correct week and collected the cells for a cell transplant. [...] and I'm thinking like, this is awful... [scattered laughter].
>
> Paul: I think science fiction movies can also scare people... Like there is a new interesting technique and they take like the worst case scenario of how you could use this technique...
>
> Laura: Doomsday…
>
> Ilse: But researchers always have a negative role in movies.
>
> Tom: Yeah, the crazy ones.

The mad scientist, who misuses therapeutic technology (whether deliberately or inadvertently), is a popular culture stereotype that the interviewed researchers clearly try to distance themselves from. The tendency for popular culture narratives to focus on worst case scenarios of the application of technology certainly applies to *Dollhouse*. The show actually explicitly expresses the assumption that technology ultimately will be misused in an episode entitled "Man on the Street". The episode includes what seem to be interspersed interviews for an in-story news programme about the rumoured existence of the Dollhouse. In the final of these interviews, towards the end of the episode, a man in a suit is speaking in front of a blackboard with a partial view of a chalk drawing of a brain and the words "temporal cortex" (Figure 3). In response to the hypothesis of the existence of the Dollhouse, he states:

> Forget morality. Imagine it's true, alright? Imagine this technology being used. Now imagine it being used on you. Everything you believe, gone. Everyone you love, strangers—maybe enemies. Every part of you that makes you more than a walking cluster of neurons, dissolved. At someone else's whim. If that technology exists, it'll be used. It'll be abused. It'll be global. And we will be over, as a species. We will cease to matter. I don't know—maybe we should.[8]

It is worth noting that the predictions of the interviewee actually come to fruition later in the show. As mentioned previously, Topher Brink is manipulated into creating a ranged weapon for wiping brains, which is then further developed into a mass-dispersal mechanism that wreaks havoc globally.

Figure 3: Expert being interviewed about the implications of the rumoured brain wiping technology of the Dollhouse. See *Dollhouse*, Season 1, Episode 6: 'Man on the Street". First broadcast 20 March 2009.

While Topher is portrayed as self-important and amoral for much of the show, his personality gradually changes. At the end of the series he has actually developed a strong moral centre, in part as a result of realising that his actions have been instrumental in throwing the world into chaos. In the final episode of the show, Topher ends up sacrificing himself in order to deploy a new invention that can destroy the mass mind-wiping technology and restore those afflicted to their former selves.

In the focus group interviews, the sci-fi association and connection to popular culture is constantly present. When talking about their work to non-scientists, the researchers find themselves confronted with the difficulties of explaining what they do:

> Laura: You might think it's easy to understand... to explain, but the pictures that a person will get in their head, it might be completely different from what you would want when you're explaining, right?
>
> Ilse: You try to simplify it, but it's hard.
>
> Laura: The most difficult thing, I think, talking to non-scientists, is that they assume that you know everything about the brain. […] There is this discrepancy between what they think we're doing and what we... what we are doing.
>
> Ilse: Mm. And then they are also very impressed when you tell that you... that it's possible to convert a glial cell into a neuron and that that could potentially become dopaminergic neurons bla, bla, bla. Then they're really… It's like 'oh it's science fiction!' [Scattered laughter]. Well, they just think it's cool.

While the researchers see their work as only one small component in mapping and understanding the brain, non-scientists tend to make the interpretation that what is going on in the lab really is like science fiction. In other words, there is a tendency for non-scientists to draw on images from popular culture sci-fi narratives as a frame of reference in order to understand the work of real-life neuroscientists. Interestingly, the recounted reaction in this excerpt that non-scientists find the neuroscientists' work to be "cool" seems to contradict the previous assertion that scientists are considered by the public as malevolent, and new technology as potentially threatening.

Conclusion

The malleable brain is a common feature in neuroscience and popular culture. Nevertheless, in popular culture this perceived malleability often results in the (mis)use of technology to manipulate individuals. The brain's memory functions are of particular interest in sci-fi narratives. This interest seems to be contingent on the understanding of how individual identity is tied to cognition and memory.

The latter are considered two essential attributes of humanness and are often equated with selfhood in contemporary western culture (Basting 2003). The selfhood of the individual is thus placed in the brain, which is cast as a place of personal interiority where true personality, thoughts, feelings and wishes reside (Rose & Abi-Rached 2013).

In fiction, scientists have greater power to manipulate the brain than they do in real life. This tends to lead to quite extreme scenarios which actualise poignant ethical concerns. In popular culture, there is often a specific moral agenda which is clearly communicated to the viewer. While *Dollhouse* ultimately casts the use of the mind-wiping technology as bad, it also presents a rather nuanced narrative about the different consequences of the use of such technology, which manages to blur the lines between good and evil. Nonetheless, there tends to be a focus in popular culture narratives on worst case scenarios for the implementation of technology, which may foster a sense of technological apprehension in the viewer.

The researchers who participated in the focus group interviews clearly feel that it is important to distinguish between their actual practice and the narratives about neuroscience presented in popular media. However, they also express that they experience an ongoing blurring of the lines between real-life brain research and its portrayal in popular culture, and that the latter to some extent serves as a background for the public's understanding of—and attitude towards—neuroscience.

The narratives of the brain that exist in society today incorporate elements of both hard science and popular culture. Media products like sci-fi shows and films draw on neuroscience to build imagined, but still somewhat realistic, depictions of what new technology can do to the plastic and malleable brain. By relating the use of technology to the common trope of the mad scientist and the potential for misuse, depictions in popular culture products of the implementation of technology may in turn negatively impact people's attitude towards real-life neuroscience. Images of neuroscience found in popular culture are thus entangled with actual neuroscience. Scientists are routinely confronted with these representations when meeting patients, watching TV, or describing their work to friends or the general public. Through the narratives of popular culture, they are exposed to a distorted view of their own work. The narratives seem to cause self-reflection, which at times influences the scientific work as well as the researchers' communication of it to the public. At the same time, using popular culture depictions of neuroscience to frame actual neuroscientific practices—whether by way of similarity or contrast—affords members of the general public a chance to better understand the important work taking place within real-life neuroscience.

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Notes

[1] For example, Martyn Pickersgill refers to neuroscience as "an umbrella term for a range of traditions encompassing studies of the chemistry, development, structure and function of the nervous system" (Pickersgill 2011:449).

[2] "Ghost". *Dollhouse*, Season 1, Episode 1. First broadcast 13 February 2009.

[3] Indeed, the alteration of memories is a principle currently employed in the physically non-intrusive treatment of PTSD through cognitive processing therapy (CPT). In brief, "cognitive processing therapy helps people examine their maladaptive patterns in thinking and find more effective ways of making sense of the trauma. This is achieved through homework assignments involving patients writing out their trauma narrative, and engaging in cognitive restructuring of maladaptive or problematic thinking patterns."—Excerpt from http://cogbtherapy.com/trauma-focused-cognitive-behavioral-therapy (retrieved 2 May 2017).

[4] The name Rossum is a reference to the 1920 science fiction play R.U.R. or Rossumovi Univerzální Roboti (Rossum's Universal Robots) by Karel Čapek—see "Getting Closer". *Dollhouse*, Season 2, Episode 11. First broadcast 8 January 2010. In the play, artificial humans (named "robots", but they are actually biological beings, rather than mechanical) take over the earth and destroy the human race.

[5] Alpha is a main antagonist in season one of the show. Due to harbouring a multitude of personalities, he is an unpredictable enemy. As Topher explains: "You can't profile Alpha. He's not a person. He's…he's like Soylent Green—he's people. He experienced a composite event. 48 personalities—not split personalities, full, total, complete personalities—got dumped into his coconut all at once. He snapped."—See "Omega". *Dollhouse*, Season 1, Episode 12. First broadcast 8 May 2009.

[6] Note that Avraamidou designates the mad scientist as male. One reason for this is that the female fictional scientist is a more recent construct and that, far from being mad or evil, she is usually cast in the role of resolving problems, despite attacks on her work and integrity (Haynes 2016:41).

[7] "Ghost". *Dollhouse*, Season 1, Episode 1. First broadcast 13 February 2009.

[8] "Man on the Street". *Dollhouse*, Season 1, Episode 6. First broadcast 20 March 2009.

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Culture Unbound
Journal of Current Cultural Research

Neuro-Problems

Knowing Politics Through the Brain

By Niklas Altermark & Linda Nyberg

Abstract

In recent years, neuroscientific knowledge has been applied far beyond its context of emergence to explain human behaviour in general and to address a host of specific societal problems. In this article, we discuss the emerging research field of ‘neuropolitics’ that seeks to bring neuroscientific methods and findings to political science. Neuropolitics is investigated as a particular way of approaching political problems as located in the brain. We argue that neuropolitics research gives expression to a rationality of government that allows researchers to put forward policy prescriptions based on neuroscientific knowledge. Neuropolitics thus run the risk of leading to what we call a ‘pathologisation of politics’, that turns political problems into biological deviations.

Keywords: Neuroscience, neuropolitics, political rationality.

Altermark, Niklas & Linda Nyberg: “Neuro-Problems: Knowing Politics Through the Brain”, *Culture Unbound*, Volume 10, issue 1, 2018: 31–48. Published by Linköping University Electronic Press: http://www.cultureunbound.ep.liu.se

Introduction

On the 26th of June, 2016, a few weeks after the Brexit referendum, an article with a unique take on the result appeared in *Psychology Today* (Fields 2016a). Unlike the majority of analyses that sought to explain the outcome in terms of social and economic factors, this article claimed that the explanation could be found in recent neuroscience research showing our brains to be ‘hard wired’ to react with fear to social groups other than our own. Hence, the ostensible reason why a majority of voters had opted to leave the European Union was seen as a cerebral matter. When political commentators, social scientists, and party strategists failed to offer satisfying explanations, ‘the brain’ was mobilised as a source of evidence. About six months later, similar analyses of Trump’s successful presidential campaign began to appear, using neuroscience as a source of explanation of an election outcome that more or less all political pundits and scientists had failed to predict. To understand the election result it was suggested that we must understand how the human brain reacts to fear (Paterson 2016) or rage (Fields 2016b), or how it can reveal the “true” feelings of voters toward a particular candidate (Azarian 2017).

This drive to understand political phenomena by locating its causes in the grey and white matter in our skulls is not restricted to speculative popular science. Several disciplines within the social sciences have turned to neuroscience in search for new explanations. For example, ‘neuro-law’ and ‘neuro-economics’ have offered new ways of tackling the traditional problems of the respective disciplines. In this text, we will look at *neuropolitics*, a field of research that brings together neuroscience and political science in the study of political behaviour (Schreiber 2017). It developed in parallel with cognitive neuroscience, which had seen an exponential growth in activity after the introduction of functional magnetic resonance imaging (fMRI) technology in the 1990s (Ibid.). The field of neuropolitics remains relatively small, but there is a growing literature drawing on fMRI brain scans and other neuroscientific technologies to understand political behaviour, decisions, or attitudes. For example, neuroscientific evidence has been used to address traditional political science questions such as why democratisation takes time, why it is so difficult for governments to change the behavioural patterns of its citizens, and why some politicians fail to reach good decisions (Sardamov 2007, Grasso 2013, Fisher et al. 2014).

The turn to neuroscience is significant, as it gives rise to new ways of understanding political problems and how they can be solved. Furthermore, as we shall discuss throughout the text, the turn to neuroscience is far from neutral and objective, but affects how we think about and understand social reality. Hence, there are two motives for our focus on neuropolitics. (1) It is establishing itself as a subfield of political science, as evidenced by an increasing number of publications, conference panels, and a journal dedicated to political science research building on biological knowledge (*Politics and the Life Sciences*). (2) It is an exemplary case of how neuroscience is deployed to make sense of social or cultural phenomena more generally.

To clarify our ambitions: our purpose is not to judge whether neuropolitics research is right or wrong. Attempts to understand social phenomena through neuroscientific research have previously been criticised for their reductionist nature and logical flaws (see Wilson 1999, Beaulieu 2003, Pitts-Taylor 2014, Rose 2013). While we believe these concerns to be valid, our idea here is not to assess what contribution neuropolitics can make to political science. Instead, we wish to raise some crucial questions about the founding assumptions of this field of research. Following Foucault, we start from the assumption that knowledge production is never objective or innocent, but always involved in giving shape to, and being shaped by, practices of government. In addition, as was stressed in the work of Georges Canguilhem (1991), how we see and understand human biology is always entangled with normative questions. Hence, history is full of examples of how social and biological knowledge has made possible forceful technologies of population management, such as eugenics, phrenology, or state confinement of the mentally deficient (Foucault 1990, Altermark 2018). At the same time, Urla and Terry (1995) have argued that social anxieties—concerning race, poverty, illness or disability—throughout history have been met with attempts to locate their origins in the human body. As we shall see, this kind of linkage between the biological and the problems of government reappears in neuropolitical models of explanation.

We will argue that neuropolitics gives rise to a pathologisation of politics, by which we mean a tendency to locate what is perceived as problematic political behaviour in the brains of individuals. To substantiate this argument we start by providing a brief history of biology within political science, before presenting three examples of neuropolitics research. Thereafter, borrowing from the literature on governmentality, we use the concept of *governmental rationality* to investigate the ontological, epistemological and moral dimensions of neuropolitical research. In the conclusion, we discuss the wider implications of neuropolitics.

Politics as a Matter of Brains

Our analysis of neuropolitics is based on a comprehensive reading of political science research that draws on neuroscience, published in political science journals and edited collections. As is evidenced by our reference list, the top ranked political psychology journal *Political Psychology* and the specialist journal *Politics and the Life Sciences* are the outlets that most frequently publish neuropolitics papers, but articles have appeared in a number of other journals as well. Although we do not claim to present a complete view of the research field here, we do believe that the assumptions we will discuss are recurrent and central to neuropolitics research in general.

A sub-stream of political science has been arguing for the need to account for human biology to understand politics at least since the 1960s. In the opening chapter of their 2001 book on biopolitics (not to be conflated with Foucault's concept), Blank and Hines (2001) describe the analytical and organisational efforts made since the 1970s to establish biologically informed analysis as a legitimate subfield of the discipline, to the continuing disapproval of, and neglect from, the rest of the political science community. A breakthrough came with a number of studies on the voting behaviour of twins which showed that much of the variation in voter preferences could be explained by hereditary factors (Alford et al. 2005). Despite some rather forceful criticism (see Charney 2008), this research agenda has continued to grow with the elaboration of more sophisticated research designs.

Political science research drawing specifically on the findings and methodologies of neuroscience started to appear around the turn of the century, boosted by the development of functional magnetic resonance imaging (fMRI) that made it possible to visualise changes in brain activity over time (Schreiber 2017). Although neuropolitics is not a particularly large or dominant branch of political science, it has been described as a field that is growing in importance and influence. For example, Hatemi and McDermott write that the 'neurobiological revolution is upon us' and that political psychology should not only join it, but also take a leading role (Hatemi & McDermott 2012: 11). The hitherto underwhelming response of the political science community has caused some bewilderment amongst neuropolitics researchers. For example, Holmes (2014) addresses the "puzzle" of why political science in general, and international relations in particular, have been so reluctant to adopt neuroscientific methods and findings, compared to the field of economics. He argues:

> ...both [political science and international relations] have borrowed other approaches from economics, such as comparative statistics, though neuroscience has largely not been one of them. Not only do we not have journals and PhD programs in "neuro-IR," there are relatively few researchers actively doing work in the field. This creates something of a puzzle. Why have other disciplines, which tackle many of the same types of questions as we do, including the nature of decision making, development of trust, and so forth, taken the brain seriously as a source of study while IR has not? (Holmes 2014: 210).

In this and similar accounts, the value of neuroscience for the study of politics is taken for granted and the reluctance of the political science community to engage with biology thus becomes a mystery that advocates of neuropolitics set out to solve. At the same time, proponents appear strongly convinced that the future is bright and that neuroscience has the potential to 'fundamentally change the way we understand human nature' (Schreiber 2017: 126).

In order to make sense of the founding assumptions of this emerging field, our next step is to present three articles that all draw on neuroscientific findings in order to explain political phenomena. Each article has been chosen because it represents a key line of reasoning in neuropolitics research: that features of our brains can explain politics. Under the subsequent headings, we shall see how this assumption plays out in other examples of neuropolitics research as well.

The first example is a 2007 article by Ivelin Sardamov, published in the journal *Democratization*, which uses neuroscience to critically evaluate the cornerstone objective of US foreign policy: improving political and economic freedom in other parts of the world. This topic relates to central issues in comparative studies of democratisation, dealing with questions like why democracy takes time to consolidate, what pre-conditions must be in place for democratisation to take-off, and to what extent there are cultural factors that may hamper processes of democratisation. The central line of reasoning in Sardamov's contribution to these debates is formulated as follows:

> If we combine a few basic premises—that the functioning of political institutions depends on the spread of key attitudes, beliefs, and values; that those ideational forms are produced by the functioning of human brains; and that the wiring of human brains depends on social contexts—we can reach a bold conclusion: that an understanding of the wiring and operation of people's brains in different societies can provide clues about their likely aptitude as democratic citizens and operatives (Sardamov 2007: 408).

In other words, the persistence of authoritarian rule is, at least partly, a question of neuronal organisation. Sardamov states that neuroscience has shown that, although the human brain is characterised by plasticity (the ability to change throughout the life of an individual), its fundamental workings have been shaped over generations in a constant dialogue with its external milieu. Therefore, he goes on to claim, the brains of people living in democracies are likely to look different in significant respects from the brains of people living in parts of the world that have yet to democratise. Based on this assumption Sardamov concludes that the notion of a universal drive for liberty and democracy is not properly backed up by neuroscientific findings, which rather suggests that the 'aptitude' for democracy requires neuronal 'rewiring' over long stretches of time. He goes on to argue that:

> (I)t seems the functioning of modern social institutions still depends on the emergence of a particular variety of 'modern' individuals with novel patterns of brain wiring, or on particular neurocultural preconditions. These preconditions can, in their turn be partially seen as a product of experiences under changing political institutions, but are also affected by the totality of human existence that far surpasses political life per se. In this sense, neurocultural developments can be seen as broader than and prior to narrowly conceived political processes, that is to say, as their preconditions (Sardamov 2007: 417).

In this way, rather than as correlations on the individual level, Sardamov urges us to see the neurocultural conditions of democracy as broad social tendencies, suggesting that democratisation can be stalled due to the developmental state of the brains of people in certain parts of the world. Along these lines, Sardamov also speaks of 'a new breed of individuals' characterised by brain wirings that make them capable of the sort of impartial reasoning that is necessary in order for democratic institutions to function (Sardamov 2007: 415-6). The aptitude for democracy is associated with qualities such as detachment and self-restraint, qualities that have not yet developed in some parts of the world. Consequently, Sardamov's analysis suggests that the policy ambition of spreading democracy is premature in important respects. Although Sardamov warns against notions of 'inferiority', one is hard pressed not to read his argument as a judgement concerning the underdevelopment of the brains of non-western people. Throughout the paper, Sardamov links his argument to canonical social scientists, such as Max Weber, Norbert Elias, and Karl Polanyi, who have argued that societal changes are likely to be slow. However, while these authors based their conclusions on observations of how people interact with each other and how institutions evolve, Sardamov localises the cause in the materiality of the brain, which is presumed to run parallel to people's social consciousness. We shall return to the implications of this line of reasoning in our extended discussion on the rationality of neuropolitics below.

A similar argumentative structure to that of the article presented above can be found in Marco Grasso's (2013) analysis of why people fail to act in ways that reduce carbon emissions. Although much more thoughtful than Sardamov, Grasso also starts by picking up a familiar problem of social science: how come people fail to change their behaviour in order to combat climate change? Grasso argues that part of the explanation can be found in the fact that the morals of environmental problems are most often discussed in deontological rather than consequentialist terms. Hence, moral debates tend to focus on how to fairly distribute the burden of carbon offsetting, rather than how to prevent fellow beings and future generations from suffering harm by climate change. The crux of the matter, according to Grasso, is that neuroscientific evidence suggests that the human brain is hardwired to act on consequentialist reasoning rather than on abstract principles of justice. Thus, we are more inclined to act in ways that prevent us from causing harm to others, than in ways that correspond to our abstract beliefs about just distribution. In Grasso's interpretation, the human brain is not properly organised to respond to the problem of climate change since the persons responsible for the change and the persons suffering from its effects are separated in space and time. Therefore, if we want people to change their behaviour to reduce carbon emissions, we must shift the debate towards consequentialist arguments about harm in order to match the kind of reasoning that our neuronal organisation is predisposed to react to. Grasso (2013: 380) suggests that this is about linking the moral dimensions of environmental politics to 'our inner nature', which he presumes that neuroscience has access to. The actual neuroscientific evidence that is mobilised to support his argument consist of fMRI-scans that measure brain activity in order to estimate what kind of reasoning incites people to act (primarily as conducted by Greene et al.'s research team [2001, 2004]). Grasso concludes that there is a need for more neurocognitive experiments that are specifically designed to study moral judgement in relation to climate-related harm.

The third and last publication we want to review here has a slightly different structure. In their article in *Politics and the Life Sciences*, Fisher et al. (2014) do not use neuroscience to address an old problem in a new way, but to identify a previously overlooked one. The authors draw on 'neuroanatomic localisation studies' that have located the executive functions of the brain in areas that risk deteriorating with old age. More precisely, the authors claim that 'executive function has been observed to substantially deteriorate after the age of 60' (Fisher et al. 2014: 93). Provided the assumption that executive functions are crucial for decision making, Fisher et al. go on to argue that there are good reasons to question the decision making capacity of political leaders of an older age. Especially since reduced executive function is difficult to spot because it can deteriorate without having an impact on other brain functions such as verbal fluency and memory. They write:

> (W)hile an individual may appear to be normal from the perspective of overall cognitive function, that same individual may have an impaired ability to integrate basic cognitive skills such as language and memory, in order to achieve normal decision-making capacity (Fisher et al. 2014: 97).

In other words, neuroscientific findings imply that older political leaders may be bad decision-makers due to deteriorating cognitive capacity. Provided this insight, the authors speculate on whether Ariel Sharon's 'sudden' decision to withdraw from the Gaza Strip in 2002 could have been a result of 'executive dysfunction', considering the fact that Sharon was known to have a degenerative brain disease. The authors thus seem to suggest that it is not only the ability to *make* decisions that deteriorates with old age, but the ability to reach *good* or *rational* decisions. They move on to reflect on the possible policy implications based on this argument, reaching the conclusion that the most practical solution to this problem is to educate the electorate about the dangers of voting for an elderly leader:

> The practical implications of executive dysfunction in older political leaders are difficult to assess at this point. It is unlikely that political leaders and candidates for high office will routinely submit to neuropsychological testing or subject themselves to brain imaging any time soon. Perhaps the most workable near-term solution is to educate the electorate about this phenomenon, and let the public evaluate candidates accordingly (Fisher et al. 2014: 100).

This line of reasoning corresponds to a more general reductionist register that is often found in popularisations of neuroscience, where fMRI and other scanning technologies are seen as providing direct access to subjectivity (see Pitts-Taylor 2010, Rose 2013, Altermark 2014). The premise is that whatever political aspect we chose to focus on, it will have a biological correlate, which quickly is reinterpreted as an origin or cause. Hence, the truth about our actions and behaviours can always be localised in our brains and, from this perspective, neuroscience will always produce better, more comprehensive, and far deeper explanations of politics.

The articles mentioned above are just three examples of recent applications of neuroscientific research in political science. Other studies have, for example, discussed the relationship between prejudice and a lack of self-control (Jost et al. 2014), the relationship between racism and a need for closure (van Hiel et al. 2004), and how the immediate visceral response to candidate attractiveness influences voters (Schubert et al. 2011). All of these issues have been framed in terms of how our brains are organised and how our neurons fire to produce consciousness. Neuropolitical research thus has in common a way of defining political problems as located in the brain. As seen in the three articles that we have analysed here, when starting from this way of defining political problems, the logical solution is to change policy according to the 'reality' of the brain. The articles suggest that, in order to come to terms with the problems they identify, we need to adapt a more realistic assessment concerning the possibility of spreading democracy, change the discourse in climate politics, and think twice before electing politicians over 60 years of age.

The Rationality of Neuropolitics

Underlying examinations of the neuronal basis of politics is a world of metatheoretical presumptions. Some of these are formulated in the more programmatic neuropolitical texts that seek to sketch a research agenda of the research field (see Jost et al. 2014, Hatemi & McDermott 2012, McDermott 2004, 2009). Under the subsequent subheadings, we will use these texts, together with the three articles presented in the previous section, to delineate the rationality of government expressed in neuropolitics. A rationality of government represents a specific way of problematising social life, delineating what poses a problem and what an adequate solution might be (Dean 2010). The concept of governmental rationalities (or sometimes political rationalities) is commonly used in Foucault-inspired research that investigates the relationship between knowledge and power (see for example Larner & Walters 2001, Fougner 2008, Lövbrand et al. 2009). Although the analytical focus in these studies is typically on government programmes, we argue that it can be used to study academic fields of knowledge production in order to assess what form of governmental reasoning they express. The discussion is structured along the definition of a rationality of government as consisting of an *ontological, epistemological,* and a *moral* dimension (Nyberg 2017, drawing on Rose and Miller 1992). In other words, a rationality of government is seen as a specific way of linking assumptions about how things *are* and how they can be *known* with claims about how things *ought to be.*

Ontological assumptions

Neuropolitics research shares with the wider field of neuroscience two central ontological assumptions about the brain. The first one, as formulated by Mountcastle (2001), is that 'all mind events are brain events'. Neuroscience claims to have brought an end to Cartesian dualism and its strict division between the physical and metaphysical by showing how the mind is a product of the matter of the brain. The second ontological assumption concerns brain plasticity. This is a term used to describe that the brain is not static, but continually shaped and reshaped through interactions with the external world. Hence, the notion of brain plasticity significantly blurs the distinction between body and world, since the brain is both shaped by and giving shape to its milieu.

These two assumptions are not given equal consideration in neuropolitics research. As illustrated by the articles discussed above, the collapsing of the separation between mind and matter is pivotal for political science research inspired by neuroscience. More or less all publications that we have analysed propose to explain a certain political phenomenon by locating its causes in a particular area of the brain. Thus, the assumption that 'all mind events are brain events' gives rise to a ceaseless mapping of the brain. For example Jost et al. (2014) provide a table of how different brain regions are linked to a host of political activities such as agreeing/disagreeing with political statements, or deciding on a preferred political candidate. The same paper also contains pictures of brains where the relevant regions have been highlighted in colour, neatly illustrating the biological origins of various political phenomena (Jost et al., 2014: 7). The ontological assumption that a distinct sort of behaviour can be located in a distinct part of the brain makes it possible to argue, for example, that the propensity of conservative people to be sensitive to feelings of disgust could be explained by an enhanced volume of the left insula (see Inbar et al. 2009), or that partisan bias (preference for in-group members) can be explained by the functioning of the reward and value processing of the ventral striatum (see Tusche et al. 2013). Thus, *where* we think, as described by neuroscience, explains what we believe and how we behave (see Jost et al. 2014: 30).

At the same time, the ontological assumption of brain plasticity amounts to more or less nothing in the publications that we have examined—even though this insight of modern neuroscience could be seen as far more revolutionary than the argument against dualism. Indeed, if one ventures into the psychiatric literature from the early 20th century, one will find ontological statements about how the biological brain produces our minds which are distinctively similar to what neuroscientists are saying on the matter today (see Altermark 2018). Brain plasticity, however, signifies something new; it marks an end to the idea that our brains are limited by predetermined boundaries and that brain injuries are irreparable. Very little of this is seen in neuropolitical research. Often, plasticity is acknowledged as a background fact, but the capacity of the brain to adapt and transform is never examined for its political implications or value. The neuronal level is repeatedly assumed to be the origin and starting point of causal chains—meaning that, in effect, the brain is preconceived as static.

If we are to take the notion of plasticity seriously, however, we must also take into account that attitudes are shaped by social factors, which in turn affect how our brains behave. Rose (2013: 5) has argued that to deem something biological today means to assert opportunity, as our brains and bodies are unbounded by predetermined biological scripts. Some forceful critiques have been levelled against how the notion of plasticity has travelled into popular discourse (see Malabou 1999, Pitts-Taylor 2010). Unfortunately, neuroscience without brain plasticity as a tool for political reasoning produces simplistic maps that relate different behaviours to brain regions, without considering how the brain itself, according to the notion of plasticity, is situated. Thus, as Pitts-Taylor (2010: 636) has noted with respect to adaptations of neuroscience more generally, the assertion that both nature and nurture count tends to mean that nurture is only taken into account after it has been translated into neuronal level depictions. These depictions, in turn, always appear as the starting point of causal explanations, which means that in neuropolitics, knowledge of politics begins and ends with the brain.

Epistemological assumptions

Following from the ontological assumption that all mind events are brain events, and that our political reactions and attitudes therefore can be localised at the neuronal level, the epistemological question becomes: how do we gain knowledge of what happens in the brain? Throughout its history, the 'biopolitical' stream of political science as described by Blank and Hines (2001) has rested on an epistemological model that has been remarkably consistent. It looks something like this: since biologists have shown that human behaviour Y is related to the biological functioning of X, X must be incorporated into political analysis of Y. This means that in order to gain knowledge of a political phenomenon, we need to understand the biological functions that are related to the particular behaviour that we are interested in. As a consequence, brain-scanning technologies are turned into a methodological tool of political science.

In tandem, it is generally presumed that neuroscientific studies of the brain offer more thorough, detailed, and objective knowledge than studies of the messy social world that social scientists are normally preoccupied with. Jost et al. describe the research findings of neuroscience as 'relatively precise, objective measurements that are less subject to social desirability and self-representational bias' (2014: 4), while Zak and Kugler state that 'rather than guess about the mechanisms causing behaviour that must be later verified, neuroscientific studies allow one to directly measure how decisions are being made' (2014: 146). In other words, it is assumed that brain-scanning technologies offer an elevated source of knowledge; a window through which we are allowed to observe what *really* happens, unmediated by the theoretical vocabularies and normative biases of social science.

Critical readers of popularisations of neuroscience have noted that neuroscience derives part of its explanatory strength from the appearance of scientific precision and the fact that findings are visualised, allegedly objectively, depicting what is happening in the brain. For example, Racine et al. (2005) suggest that there is a specific kind of 'neuro-realism' that confirms the 'realness' of social phenomena by using visualisation technologies to picture them as part of the brain (see Barthes 1993 and Sontag 2002 on the epistemological status of photographs as sources of truth). In a similar vein, Weisberg et al. (2008) have shown that 'neuro-talk' adds trustworthiness and legitimacy to popular scientific accounts. This is saying that neuropolitical claims to knowledge draw part of their strength from the impression that they present us with objective scientific evidence. Following from its status as a cutting edge natural science it is clear that the research field of neuropolitics is underpinned by a hierarchy as concerning the kinds of knowledge generated by the natural and the social sciences—a hierarchy in which social scientists are urged to incorporate findings from neuroscientific research rather than the other way around. Thus, when Jost et al. (2014) favourably quote Wilson's (1998: 205) suggestion that the social and the natural sciences are compatible and therefore should be integrated, it is clearly implied that social scientists are the ones who needs to adjust the most.

We argue that the lure of the sciences of the brain is repeatedly used to gloss over significant methodological and logical shortcomings. As is perhaps already evident from the above, neuropolitics can be seen as a linking game, where the challenge is to draw a tangible line between a political phenomenon (say, the failure to democratise) and some knowledge produced in neuroscience research labs (say, the fact that it takes a long time for people's pattern of reasoning to change). This is evident in all of the three articles we presented above. Lavazza and De Caro have attributed this tendency to simplify to the fact that neuroscience is in a 'pre-paradigmatic phase', which means that there is yet to emerge a consensus about the kind of theoretical and methodological framework that can make cumulative knowledge possible. Lavazza and De Caro's general description of social scientific applications of neuroscience aptly illustrates the state of the field of neuropolitics in particular:

> (I)n this area of investigation it is common to encounter methodologically defective projects, excessively broad or philosophically unfounded interpretations of recent discoveries, generalizations based on research that still lacks sufficient empirical proof, as well as biased understandings of observational and experimental results (Lavazza & De Caro 2010: 24).

According to Lavazza and De Caro, this description is most pertinent for social scientific applications of neuroscience that only acknowledge the causal chain running from neurons to agency, whilst ignoring social context and feedback-loops, that is, precisely the kind of application that all of the three articles discussed above exemplifies. In a similar way, Rose (2013: 18) has criticised the habit of presenting neuroscientific research findings as overly straightforward, whilst the main findings of modern biology all point to the depths of complexity of the human organism, which of course should make us cautious of drawing straight lines between biological features and political behaviour.

As a consequence of these epistemological assumptions, this style of knowing politics sidesteps the social causes and history of the problems identified. In the neuropolitical explanations of racism, for example, histories of repression and ideological justifications of subordination and dehumanisation are traded for knowledge about the activity in the amygdala when people are faced with pictures of people of other ethnicities than oneself (see Lavazza & De Caro 2010: 38). Furthermore, since the brain itself stands as origin in this research, we have reached an epistemological endpoint: the problem is not to be found in the organisation of social life, the argument goes, but in the materiality of the brain. This way of reasoning has consequences for how the political problem in focus should be tackled. For example, on prejudice, Jost et al. (2014: 11) discuss how neuroscience research has helped unpack specific mechanisms of self-control as concerning intergroup relations, highlighting the points at which self-control fails. They state that these findings are opening up possibilities of targeting individuals with specific interventions that may reduce their individual level of prejudice. In this way, instead of addressing prejudice as an issue of inequality or culturally held norms that are continuously re-produced, we are faced with individual interventions specifically targeting what is understood to be the relevant cognitive mechanism considered in isolation.

Moral dimension: Neuropolitics as Epidemiology

The moral dimension of neuropolitics contains claims about what is right and wrong; how things *should be,* based on the ontological and epistemological assumptions previously described. As has been shown throughout this text, researchers tend to focus on behaviour or attitudes that are understood as problematic; on political leaders with deteriorating brain functions, lay people refusing to tune into a more environmentally friendly lifestyle, or the inability of some to function as democratic citizens. Thus, the articles we have read often take as their point of departure a political problem that stems from a gap between how people *ought to behave* and how they *actually behave*. This discrepancy is, in turn, explained in neuronal terms. In this way, the failure of certain individuals to meet preconceived yardsticks of appropriate or desirable behaviour is explained by biology.

As a result of this, neuropolitics to a large extent reproduces a research agenda that is all too familiar to anyone with an interest in the history of science. What this research tells us is that political behaviour, especially of the non-normative variety, is produced by certain biological features. As a model of knowing the social world, this is not distinctly different from how early psychology and psychiatry explained criminality with references to mental deficiencies that were thought to result from smaller brains (see Urla & Terry 1995). Then as now, the undesired behaviour is projected onto the bodies of groups which cause concern, whether they be Trump-voters, the populations of the Global South that do not conform to Anglo-European standards of democracy, or some segments of the poor of early 20th century Europe. Thus, it is not how neuropolitics research makes sense of politics that is new but the scale on which these explanations operate. It is still a case of projecting social anxieties onto the biology of certain individuals and groups.

To substantiate this, consider Hatemi and McDermott's (2014) suggestion that neuropolitics should embrace an *epidemiological* approach. They state:

> Much like political psychology, epidemiology focuses on probable causes and has a normative focus geared toward intervention. Political psychologists often focus on large-scale social ills such as racism and genocide. So too does traditional epidemiology pursue knowledge that strives to reduce or prevent the numbers of people adversely affected by negative health risks (Hatemi & McDermott 2014: 13).

Through the analogy with epidemiology, Hatemi and McDermott are implying that neuropolitics research should concentrate on 'social ills' that can be known, and possibly prevented, by neuroscientific knowledge. We noted above how neuropolitics research takes a certain political problem as a starting point, thus declaring that people's political behaviour is problematic for one reason or another, which in turn takes for granted assumptions concerning how people should behave. The epidemiological approach explains why it becomes meaningful to expose the neuronal basis of e.g. bad leadership, racism, or a lack of democracy; it is about 'intervention', ultimately, which reduces the role of social science to function as a problem-solver of governments. Hatemi and McDermott talk of this in terms of 'political phenotypes', further strengthening the conceptual linkages to medical science, and explicitly drawing on the parallel between 'health risks' and 'political liability' (2010: 13). This is an example of how neuropolitics leads to a pathologisation of politics, where social ills are made features of our biology and the task of the researcher is to provide knowledge that might make possible their removal. Although this is rarely as explicitly stated as in Hatemi and McDermott's article, the general search for the biological origins of political problems is largely congruent with this way of thinking. In parallel to our argument here, Lavazza and De Caro (2010: 24) criticise the inclination of social scientific applications of neuroscience to detect and offer solutions to deviant personal traits and social phenomena. We would like to add that political knowledge as epidemiology ultimately implies government—the reason why the human brain needs to be scanned for the origins of various political anomalies is that these should be ameliorated.

Conclusions: Neuropolitics and the Pathologisation of Politics

The use of neuroscience makes explanations of political behaviour possible that would have appeared deterministic, and therefore rather problematic, in other contexts. For example, stating that democratisation of certain parts of the world has stalled due to the 'different' brains of the inhabitants would appear to border on racism of a biological variety. But when backed up by neuroscience, it turns into a paper in the field-leading journal *Democratization.* This is remarkable in two respects. First, it testifies to the power of neuroscience to sometimes suspend critical perspectives normally applied. Secondly, it raises the question about the alleged objectivity of neuropolitical research. As we have noted, one of the main arguments in favour of neuropolitics is the promise of objective and unbiased observation of the fundamental building blocks of political behaviour. Pointing out how these observations are in fact ideologically imbued and have political consequences can thus serve as an important reminder.

Rather than seeing the brain as a determinant of politics, we have turned our analytical focus to the politics of how the brain is used to explain social organisation. The concept of a governmental rationality has helped us understand the governmental functions of this mode of knowledge production. Following Foucault (1990), Butler (1993), and Rose (2007), among others, the question we have sought to raise in this text is not how the truths of biology should urge us to rethink politics, but how these truths are made and can be understood as political in themselves. Against the naturalisation of the biological brain, we urge political analysts to consider the ideological functions that neuropolitics serves and how it is embedded in pervasive structures of power. The most significant aspect of how political scientists turn to neuroscience concerns how this field of research enables a repertoire of new problematisations, where the perceived problems of how humans behave are rooted in the materiality of their brains. This is what we have called 'the pathologisation of politics'.

In the introduction, we mentioned Urla and Terry's (1995) argument that, throughout history, a recurring way of securing the normal subject, characterised by reason and independence, has been to anchor its otherness in the materiality of certain bodies. Thus, in the early twentieth century, poverty was figured as a hereditary trait that eugenics could eliminate, vanguard behaviour was linked to biological mental deficiencies, and criminality examined by means of phrenology. Although neuropolitics research builds on much more sophisticated technologies of biological scrutiny, focusing on the cellular or molecular level, its epistemology is disturbingly similar. The general structure, where the origin of some certain political phenomenon is found in the materiality of the body, recurs throughout history as a way of handling what cannot be fitted into hegemonic discourses and taken-for-granted knowledge systems. In this sense, neuropolitics draws on the status of the body as an incontestable source of proof that is prior to politics. This is why correlations between the brain activity of certain regions and certain political behaviours come to exercise such appeal; they are taken to signify that things have been thoroughly analysed, that no other perspectives can alter these facts, and that the explanatory power of neuropolitics is superior to rivalling approaches.

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Culture Unbound
Journal of Current Cultural Research

Vulnerable Normality: Popular Neuroimaging and the Discursive Logic of the (Dis)able(d) Brain

By Kristofer Hansson & Ellen Suneson

Abstract

The aim of this article is to analyse popular neuroimaging of (dis)able(d) brains as a cultural phenomenon, as well as to explore how there has been, during the last decades, a subtle but important change in the way "normal" brains are depicted in popular science. Popular neuroimaging is introduced and used as an empirical basis to analyse what Fiona Kumari Campbell sees as a critique against ableism. The empirical material consists of two British popular science documentaries (both produced by the BBC) on the topic of the brain: *Human Brain* (1983), and *Brain Story* (2004). The article argues that the position of normality and able-bodiedness has changed as the development of brain scanning techniques has emerged. In particular, there seems to have been a change in how the brain is visualized and talked about. New frameworks for understanding normality, disability and vulnerability have appeared. Furthermore, we claim that this shift needs to be studied from a theoretical perspective that analyses the discursive logic of the (dis)able(d) brain where an indistinctness transpires and creates a form of vulnerable normality.

Keywords: Ableism, brain, (dis)able(d), indistinctness, neuroscience, popular neuroimaging, popular science, vulnerable normality.

Hansson, Kristofer & Ellen Suneson: "Vulnerable Normality: Popular Neuroimaging and the Discursive Logic of the (Dis)able(d) Brain", *Culture Unbound*, Volume 10, issue 1, 2018: 49–64. Published by Linköping University Electronic Press: http://www.cultureunbound.ep.liu.se

Introduction

> "It's damage to the brain that reveals how the normal brain functions".

In the British popular science documentary series *Brain Story* from 2004, the female host, Professor of Pharmacology Susan Greenfield, uses neuroimaging—pictures of the brain—to reveal hidden secrets about "the normal brain". Through different images of brain activity, the viewers are introduced to what is categorised as "disabled" brains. In this way the documentary visualises, by extension, what is categorised as normally functioning brains. *Brain Story* can be seen as a cultural expression of a visual turn that has occurred during the last decades within neuroscience, where images of brain activity have gained increasing influence (e.g. Dumit 2004, Dussauge 2008, Bengtsen & Suneson 2017). As a part of this visual turn, neuroimaging has become a widespread phenomenon in various media such as fiction television series with a medical focus, popular science documentaries, journals and news reports. Through these media products, the general public are not only provided with visual depictions of brain activity but also with images of neurologists and neuroscientists looking at these visualisations. Furthermore, a common additional element is the deceptive narrative that medical experts are able to distinguish a "normal" brain from a disabled one based solely on the information they gain from looking at a brain scan. This plethora of visual imagery combined with specific narratives, ultimately has a considerable influence on what in this article will be called the discursive logic of the (dis)able(d) brain (cf. Davis 1995, Phillips 2001).

A recurrent discursive logic when brain scans are portrayed in popular media is that they are presented as a kind of photograph that visualises what is happening in the brain in relation to such characteristics as the human mind, personality and consciousness. This exemplifies how neuroscience has become a field of knowledge wherein it is widely imagined that the most complex and enigmatic questions of human characteristics can be answered. Theorists in the social and human sciences have pointed out how new brain-imaging technology is influencing our understanding of human behaviour (Dumit 2004, Dussauge 2008, Joyce 2008, Choudhury & Slaby 2011, Rose & Abi-Rached 2013, Liljefors 2012, 2017). This new visual technology has emerged in the field of what we call *popular neuroimaging* (e.g. Beaulieu 2004, Dumit 2004, Vidal 2009, Hoel 2017). Here, the images do not only function as illustrations of scientific results but have also become central to the way neuroscientific knowledge is framed when presented to the general public (cf. Carusi & Hoel 2014, Hoel & Lindseth 2014). But it is also a field where discursive distinctions between the disabled brain and the "normal" brain are imagined (e.g. Jordan 2014, Adams & Erevelles 2017). In this article, we bring together these cultural perspectives on neuroscience with a more critical disability perspective (e.g. Campbell 2008, Jordan 2014, Altermark 2018), by analysing popular science documentary series from the 1980s along with more recent series. In doing so, we want to add another layer to the discussion concerning cultural perspectives on neuroscience and popular neuroimaging. The aim is to analyse popular neuroimaging of the (dis)able(d) brain as a cultural phenomenon, as well as to explore how there has been, during the last decades, a subtle but important change in the way the “normal” brain is depicted in popular science.

A Method for Studying Popular Neuroimaging

Figure 1 & 2: The vignette to *Human Brain* (1983) and *Brain Story* (2004) produced by British Broadcasting Corporation in London. Looking at the background we can see that there are some differences’. In *Human Brain* the background is a silhouette of a head, but in *Brain Story* this has changed to a scanning image of a brain in an aesthetically appealing yellow colour. This latter figure is an example of popular neuroimaging and how scanning imagery is used to capture viewers’ attention.

Popular neuroimaging is nothing new. There is a long tradition of presenting visually complicated biomedical knowledge in popular form with the purpose of disseminating knowledge to the public (e.g. Hansson 2005). Even though brain scan imagery can be described as visual diagrams that should be interpreted as illustrations, popular media often presents these kinds of images as colourful photographs or snapshots that can be read in the same direct way as other photographic images (cf. Dumit 2004, Bengtsen & Suneson 2017). This, however, is a simplification of the nature of brain scan imagery, which contributes to establishing an erroneous idea of scanning methods as a way of providing a visualisation of what is not otherwise available to the human eye. This can be compared with what Marita Sturken and Lisa Cartwright (2001) have noted about the camera commonly being framed in scientific research as an objective device that provides the capacity to see "truths" that are not available to the human eye. Images, we argue, have therefore become a form of *actors* that frame biomedical knowledge in specific ways (cf. Latour 2005, Carusi & Hoel 2014). The use of the term popular neuroimaging highlights an emerging field where lay knowledge of the brain can be found almost everywhere in our daily life (Hansson & Idvall 2017).

The empirical material of our study consists of two British popular science documentaries (both produced by the BBC) on the topic of the brain: *Human Brain* (1983), and *Brain Story* (2004). *Human Brain* consists of seven episodes and *Brain Story* of six episodes. Even though there are two decades between them, the series are similarly constructed, with each episode focusing on a specific human trait or feeling. The viewers are presented to the subject by means of different cases; they are introduced to people who are challenged in their everyday lives due to the impairment of various functions in their brains. One example that describes this perspective is the sentence cited in the beginning of this article by Susan Greenfield, the host of *Brain Story*. Throughout the two documentary series, there is a tendency towards *ableism*; persons are characterized, firstly, by their disabilities, and second, in relation to non-disabled (e.g. Linton 1998, Thomas 2007, Campbell 2008). By applying a critical disability perspective we want to question these forms of cultural categorizations by following Fiona Kumari Campbell´s thoughts on criticizing and even refusing this ableism:

> Refusing Able(ness) necessitates a letting go of the strategy of using the sameness for equality arguments as the basis of liberal freedom. Instead of wasting time on the violence of normalization, theoretical and cultural producers could more meaningfully concentrate on developing a semiotics of exchange, an ontological decoder to recover and apprehend the lifeworlds of humans living peripherally. Ontological

> differences, be that on the basis of problematical signifiers of race, sex, sexuality and dis/ability, need to be unhinged from evaluative ranking and be re-cognised in their various nuances and complexities without being re-presented in fixed absolute terms. It is only then, in this release that we can find possibilities in ambiguity and resistance in marginality (Campbell 2008).[1]

Following Campbell's reasoning, we want to stress that critical methods and theories are needed to culturally understand how popular neuroimaging is used as a tool within the cultural processes of normalization. Or, to put it differently, how popular neuroimaging visualizes the (dis)able(d) brain and defines it in evaluative ranking terms.

Based on close readings, we have analysed selected narratives and visual depictions in our collected material. Visual depictions and narratives are in this analysis seen as part of the discursive logic of the (dis)able(d) brain (cf. Davis 1995, Phillips 2001), a theoretical perspective that is further developed below. For this article, we have used a small sample of documentaries in order to enable close readings where we have emphasized the deployment of specific visual and rhetorical narratives (Baldick 2015).

Examples from the series *Human Brain* and *Brain Story* analysed in this article substantiate many of the points that have been highlighted by researchers such as Joseph Dumit (2004), Nikolas Rose and Joelle M. Abi-Rached (2013). These thinkers discuss how the focus of neuroimaging has become increasingly influential in popular depictions of neuroscience over the last few decades, but also how pathology is the core of distinguishing disability from "normality". In this article we take this reasoning further by relating the more critical perspectives of neuroimaging to fields such as ethnology, visual culture and sociology, and adding perspectives from the field of disability studies. This combination of viewpoints involves focusing on the discursive logic of ableism, rather than on the disabilities themselves (e.g. McRuer 2006, Campbell 2008, Rydström 2012, Jordan 2014, Altermark 2018). Central to our thesis is the notion that the logic of ability is a cultural process, and that distinctions between inclusion and exclusion become blurred in the context of popular neuroimaging (cf. Jordan 2014). In the following section we will look at an example of popular neuroimaging and how the brain is framed and visualized in one of the episodes of the documentary series *Brain Story*.

The Brain as a Story in a Popular Science Documentary

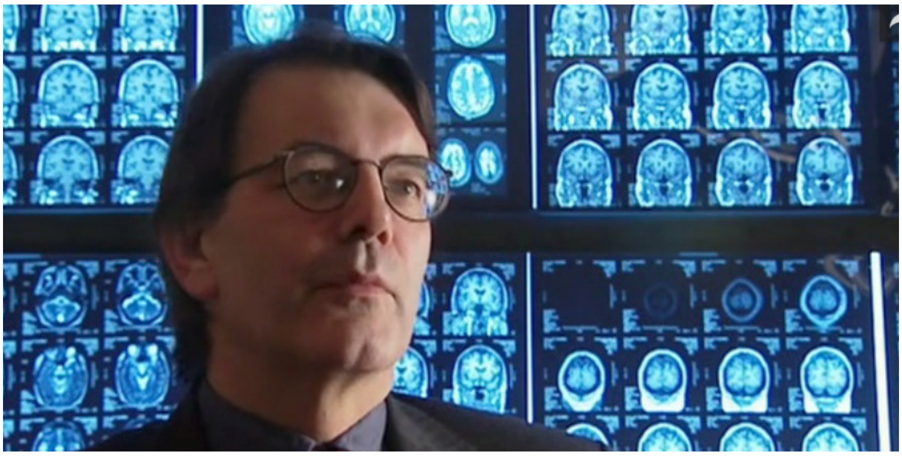

Figure 3: A screenshot from *Brain Story* (2004, BBC) and the first episode "All in the Mind", where the neurologist John Hodges is interviewed in front of a large amount of brain scanning images. This background is supposed to give the viewers a contextualisation of the milieu Hodges works in.

In the first episode of *Brain Story* (2004), the viewers are introduced to Denis Sines —a Vietnam veteran who was traumatised during the war. Sines describes during an interview how his PTSD (Post Traumatic Stress Disorder) prevents him from performing daily chores and maintaining his close relationships. Furthermore, Sines explains how his disorder makes him suicidal at times. In one scene Sines is slid into a MRI (Magnetic Resonance Imaging)[2] scanner while the host of the documentary, Professor Greenfield, explains that neuroscientists are studying Sines' brain while exposing him to pictures and sounds designed to frighten him. Greenfield goes on to describe how scientists, by studying the brain circuits involved in Sines' fear response, want to examine how his brain has changed due to his traumatic experiences. The documentary is in this way connected with the growing discussion about neuroplasticity (Doidge 2007). As opposed to previous assertions that the brain does not change after infancy, neuroplasticity implies the understanding of the brain as "plastic". From the point of view of neuroplasticity, then, the brain constantly changes as a result of one's experiences (cf. Rose & Abi-Rached 2013). As we will argue, this has implications for making discursive distinctions between "deviant" and "normal" brains.

In the next scene in the sequence about Sines, we are introduced to neurologist John Hodges who is standing in a hospital milieu in front of a variety of MRI scans (Figure 3). Hodges points with a pen at one of the images while explaining that the fear Sines experienced during the war has changed the very structure of his brain.

> We did an MRI scan on Denis and this is his hippocampus here, this grey area there, and it's visibly… I can just look at the scan and tell you that it's smaller in volume compared to a normal individual where the hippocampus is much larger.

As Hodges mentions the "normal individual", he points to another of the MRI scans on display behind him and uses his pen to show how the hippocampus of that particular brain image is larger in size. Who the brain he defines as "normal" belongs to and what criteria he uses to determine it as normal is never explained.

As mentioned, previous research has pointed out how this manner of presenting brain scans as a kind of photographic snapshot provides the general public with an inaccurate impression of the capacity of scanning techniques (cf. Dumit 2004, Abi-Rached & Rose 2010). While the framing of brain scanning techniques as a way of "seeing" an individual's feelings, experiences or characteristics may be an intriguing narrative within popular media, it also has problematic consequences for the discursive logic of the (dis)able(d) brain. In *Brain Story*, Sines' brain is visualized and narratively defined as different. In this way, the brain becomes an object of ontological difference, placed in an evaluative ranking of other (dis) able(d) brains. This is an example of the strategy Fiona Kumari Campbell (2008) calls sameness, and that leads us to a form of "violence of normalization" where popular neuroimaging claims to enable a distinction between different "kinds of brains" (Dumit 2004).

Brain Images and the Human Brain in the 1980s

Figure 4: This is a common illustration of the brain in the popular science documentary series *Human Brain* (1983, BBC). Compared to representations of scanning techniques in the more recent documentary series *Brain Story*, this illustration does not have the same scientific authority, since it cannot be used by medical expertise to reveal "secrets" within the visualisation.

Brain scanning images mainly started to appear in popular media during the 1980s (Dumit 2004). From the very beginning these images were used to visualise different "kinds of brains", such as "normal", "schizophrenic", "depressed" or "psychopathic". This mode of equating the visual appearance of the human brain with different personality types has since grown steadily stronger.[3] In contrast, the popular science documentary series *Human Brain* (1983) visualises the brain by using anatomical illustrations of the brain as an organ (Figure 4). Here, there are no visual depictions of brain activity nor are there any images of neurologists and neuroscientists looking at these visualisations. For this reason, the series' verbal accounts seem to become more central than in *Brain Story* (2004). In the following examples we will discuss how these verbal accounts are used as a presentation of a certain perspective about the brain's fear responses.

The sixth episode *Human Brain* deals with the phenomenon of fear. In the first feature of the episode the viewers are introduced to Peter—a man in his twenties who is going to make a solo appearance in connection with a concert with his orchestra. The documentary's voiceover explains that Peter's anxiety before concerts often ruins his performance, but that Peter can resolve the situation by taking drugs that reduce his stress symptoms. Later in the sequence, an experiment is depicted where all of the members of the orchestra are given drugs before a concert. Without knowing in advance what kind of pills they received, half of the members were given a sedative drug while the other half were given ineffective sugar pills. The objective of the experiment was to investigate if sedatives really work and whether the sugar pills had any placebo effects on the members of the orchestra. Despite the fact that none of the members knew what kind of pills they received, the surveys carried out in connection with the experiment showed that the members who were given the real sedative drug felt less stress than those who received sugar pills. However, the episode does not present an exclusively favourable account of this use of medicine. In order to nuance the abilities of sedative drugs, a later sequence in the episode deals with the fear of spiders. In this sequence, we are introduced to two people who suffer from fear of spiders (arachnophobia)—the well-known journalist Bernard Levin and a young woman named Beverly. The sequence features therapy sessions where Beverly is confronted with spiders in order to overcome her fear. This feature seems to serve as a follow-up to the section with Peter, and the documentary's voiceover explains that therapy cannot be replaced by sedative drugs in the long run. The programme underscores that sedative drugs such as Valium may suppress anxiety for a short period of time. However, in order to alter the chemistry of the brain permanently so that the effect persists, one also needs psychotherapy.

The documentary has an outspoken objective of using different examples of brains in order to illustrate how the "normal" brain functions. In this way it shares many common narrative elements with *Brain Story* (2004). However, what is interesting is *who* these brains belong to: whose brains are used in the various examples and how are these persons portrayed? *Brain Story* almost exclusively uses brains that belong to people that are defined as "disabled" in order to visualize neurological functions, while *Human Brain* uses a greater variety of examples in its depictions of brain activity. Looking at this disparity between the two series, it therefore seems that the distinctions between able brains and disabled brains have changed (cf. Jordan 2014). It's as if the discursive logic of the (dis)able(d) brain intertwines with normalization processes in new ways.

Vulnerable Normality in Popular Neuroimaging

Brain Story (2004) almost exclusively equates brain damage with disability. The portrayal of the brain in this documentary series exemplifies a shift in popular neuroscience where the brain is predominantly illustrated as either "deviant" or "normal". We argue here that this is not as prominent in older examples of popular neuroscience such as the documentary series *Human Brain* (1983). This shift over time may illustrate a change in the discursive logic of the (dis)able(d) brain, something that can be discussed with a starting point in the concept of plasticity. Plasticity within neuroscience is intertwined with the focus on brain scanning techniques; within both fields, emphasis has shifted from identifying various parts and structures of the brain to the study of brain *activity*. In this way, the contemporary visual field of brain imaging is strongly interlinked with the idea of plasticity. Plasticity has also brought along an idea that individuals should take care of their malleable brain, to keep it vital (cf. Alftberg & Hansson 2012). In this way, the discursive logic of the (dis)able(d) brain intertwines with what can be called *scientific authority.*[4] So, we argue that this distinction between *the care of the brain* and scientific authority is central if we want to understand popular neuroscience today, but we need to develop and problematize this theoretically as an *indistinctness* (Jordan 2014, e.g. Agamben 1998, Žižek 2010) between the able brain and the (dis)able(d) brain.

Throughout nearly all of the sequences in the episodes of Brain Story, the brain is used to illustrate people that are categorized as disabled. In the case of Sines, he is introduced to the viewer through a description of how his PTSD (a disorder that is later in the episode explained as physical brain damage) makes it hard for him to participate in everyday life. He shuts out his family emotionally, which erodes his relationship with them, he cannot work, and he suffers from depression. The episode also illustrates Sines' impairments through visual and audio effects. While Sines himself talks about his experience of being unable to perform daily chores, his description is further reinforced through a visual example depicting a chaotic urban environment. Here, rapid visual elements appear suddenly in an unpleasant way and horrible sounds from a war zone are applied as an audio track in order to illustrate Sines' experience of fear in public environments. The viewers are thus made to experience by proxy how Sines' brain damage hinders him from functioning properly in situations such as at work, in family life and in public life. There is no specific situation or place that illustrates when or how Sines experiences that his disability limits his life. Instead, his disability is rendered as comprehensive. It seemingly affects him all the time, in everything he does.

A matter that particularly captured our attention when conducting close readings of the documentaries, was that as brain scanning imagery has consolidated the assumption of neuroscience's ability to visualise personality types, a notion of the brain's vulnerability has received growing attention. The discursive logic of able-bodiedness does not try to eliminate the disabled body. Instead, as is evident in *Brain Story*, impairment and disability is often presented as a permanent threat towards the "normal" brain (Jordan 2014). Psychologist Thomas Jordan discusses this logic based on e.g. Michel Foucault and Giorgio Agamben (1979 & 1990):

> What Foucault's work seems to intuit but never makes explicit is that the discourse of able-bodiedness, far from trying to eliminate the disabled body, requires it as a permanent threat and an imminent possibility for its very operation. In other words, disability and able-bodiedness name two sides of the same biopolitical coin (Jordan 2014: 31).

Based on the theories of Agamben, Jordan argues that political subjects are constructed through the relationship between the rule and the exception.[5] The latter is necessary to enforce the former. To understand the meaning of being included, of being a citizen or of belonging to a nation, excluded subjects—non-citizens, persons that do not belong to the specific nation-state—are needed (Agamben 1998). Agamben argues that the moment we exclude something, we will include it in the form of the exception that proves the rule.

According to Agamben, we are all exposed to the vulnerability of potentially being relegated to this excluded position (Agamben 1998). So, to fight merely for the inclusion of the excluded is—according to Jordan's argument, based on Agamben—to misunderstand the vulnerable position all human beings find themselves in (Jordan 2014, cf. Butler 2004). All humans face the threat of not passing as "normal", either by congenital conditions or by contextual definitions. This ultimately means that one's status as a political subject is constantly under the threat of being downgraded or impeded.[6] Similarly to Jordan's description of how the disabled or excluded body is needed to define the functional or included body, the excluded body is used in *Brain Story* to define ableism. When the documentary is describing function by non-function, this is used to make a distinction between the “normal” brain and the “deviant” brain. What we wish to highlight here is that this distinction becomes a reminder of the vulnerability of the human brain.

But there is also a parallel narrative in *Brain Story* that counteracts this reading: the positioning of disability and normality as binary opposites. Many of the narratives tell us how the disability of various people restrains them and affects their lives negatively. We learn how the people presented in the shows cannot work, perform simple tasks or behave in a socially acceptable manner—something a person who is characterized as “normal” is able to. Here, the disabled body becomes an object of fear. What defines a normal person is never specified. Therefore, cultural assumptions play a vital role in the mediation of scientific images between e.g. the scientific community, popular magazines and television documentaries. The framing of neuroimagery affects public understanding of neuroscience, and ultimately informs discourses of vulnerability.

This establishes the disabled body as the excluded object in relation to the included able-bodied subject. The threat of exclusion—constantly present but never defined—is central in attracting us to, and putting our faith in, modern neuromedicine (cf. Brown 2003). In the last episode of Brain Story, the host of the documentary reveals this hope in relation to brain imaging techniques when the diagnosis for depression is discussed:

> This new century will bring great advances in our understanding of the brain. As imaging techniques improve, we’ll be able to monitor the brain’s activity in all its complexity as it flits from thought to thought (…) and as we gain insights into the brain processes that are necessary for happiness, then we may have powerful new ways to treat depression.

Here, the individual is described as an autonomous and independent entity. Disability and depression are something that happens in you and not something that happens to you in particular situations. Instead of seeing depression as a symptom of something being wrong with your relationship with the surrounding environment, the cause is to be found (and remedied) in the brain. As is clear from the above quote, this rhetoric is closely intertwined with narratives about the progress of medicine—if neuro research continues to evolve, it may in the future fix your brain if it is damaged or not functioning optimally. Returning to our previous reasoning, the scientific authority of modern neuromedicine can theoretically be seen, not only as a distinction between the abled brain and the disabled brain, but also as an *indistinctness* (Jordan 2014, e.g. Agamben 1998, Žižek 2010) where the (dis)able(d) brain is a potential part of all people.

Concluding Remarks: What about the (Dis)able(d) Brain?

Although both *Human Brain* (1983) and *Brain Story* (2004) contain similarities, there are important differences between them. These differences lie in the description of the position of normality and able-bodiedness and are strongly linked to popular neuroimaging and the discourses of social or medical impairment that are formed in parallel with the development of brain scanning techniques. There seems to have been a change in how neurological processes are visualized and talked about (cf. Davis 1995, Phillips 2001). As neuroscience evolves and moves towards a more detailed division of brains into different categories, new frameworks for understanding normality, disability and vulnerability have appeared. The recent shift within neuroscience towards ideas of neuroplasticity and the development of visualization technologies, has hampered the general public's access to the processes that lead to new definitions of normality. The criteria that determine whether someone passes as "able-brained" are therefore not necessarily visible or noticeable to lay people (cf. Beck 1992). Instead, it is the scientists and the doctors who possess the knowledge and ability to decipher brain activity (cf. Wynne 1996, Pellizzoni 1999 & 2001).

Having studied British popular science documentaries, we argue that there seems to be a shift in popular media's visualisations of the "normal" brain over the past few decades. Furthermore, we claim that this shift needs to be studied from a theoretical perspective that analyses the discursive logic of the (dis)able(d) brain where an indistinctness transpires and creates a form of vulnerable normality. During recent decades, the circulation of scanning images, showing cross sections of brains, has increased drastically. In popular media products, these images are commonly presented as visual evidence—or scientific authority—that makes it possible to distinguish the "normal" from the "deviant", injured or disabled. But the way visual technology within neuroscience, such as MRI, is depicted within popular neuroimaging ultimately also presents a form of indistinctness. From this perspective it is not only an accident or illness that threaten the status of an able-bodied subject. Instead, as Jordan (2014) also points out, a new threat of vulnerability is formulated: *anyone* can be defined as "abnormal", "deviant" or disabled at *any time*.

Notes

[1] Here, Fiona Kumari Campbell's reasoning is inspired by the theories of e.g. bell hooks (1990) and Simone de Beauvoir (1948).

[2] In a previous chapter, Hansson has described the MRI process as follows: "to produce images from a MRI scanner, the machine must for a brief space of time make the hydrogen atoms of the body send out faint radio waves. The waves are detected by the machine and after computer processing, a section image of, for example, the brain is produced. The image is thus not just created in the traditional way by a camera registering objects in front of it; the scanner is itself highly involved in producing the image by means of waves and computer processing. Hence, the knowledge does not only exist in the picture, the image depends on the procedure of the machine processing in the computer and on how its information is interpreted by the observer" (Hansson 2017: 22).

[3] Medical science's division of human beings into categories or personality types based on visual differences is nothing new (cf. Foucault 2003). The social and human sciences have pointed out the close connections between brain scanning techniques and the phrenology of the 19th century (cf. Cooter 1984). Phrenology assumed that it is possible to deduce personality and character by the shape of the human head. Contemporary research based on brain scanning techniques aim to identify how functional regions in the brain affect human characteristics such as morale, anxiety, social skills, sexuality, intelligence, learning, language, memory and perception—characteristics similar to those that were studied in phrenology (Dumit 2004).

[4] This is a reliance strongly rooted in Foucault's discussions about biopolitics, a concept that lets us see how the discursive logic of the (dis)able(d) brain intertwines with scientific authority (Foucault 1990, e.g. Agamben 1998, Rose 2007, Gottweis 2008, Žižek 2010, Schimtz & Höppner 2014).

[5] Throughout our analysis we have left Agamben's discussion about sovereign power and bare life from a biopolitical perspective aside (Agamben 1998), and instead focused on how disability and able-bodiedness are interwoven in popular neuroimaging.

[6] Here we are interested in the discursive logic of disability and not the disabilities themselves or the experiences of disabilities in the lifeworld (e.g. McRuer 2006, Rydström 2012).

Acknowledgements

Thanks to Åsa Alftberg, Malmö University, Peter Bengtsen, Lund University, and the two anonymous reviewers for thorough and constructive comments. The research is supported by BAGADILICO—Basal Ganglia Disorders Linnaeus Consortium—at Lund University.

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Culture Unbound
Journal of Current Cultural Research

Visualising the Hypnotised Brain:
Hysteria Research from Charcot to Functional Brain Scans

By Paula Muhr

Abstract

Contrary to the widely held belief in the humanities that hysteria no longer exists, this article shows that the advent of new brain imaging technologies has reignited scientific research into this age-old disorder, once again linking it to hypnosis. Even though humanities scholarship to date has paid no attention to it, image-based research of hysteria via hypnosis has been hailed in specialist circles for holding the potential to finally unravel the mystery of this elusive disorder. Following a succinct overview of how hypnosis was used in the nineteenth century hysteria research, the article details how the relationship between hysteria and hypnosis is currently renegotiated in the context of brain imaging studies. It shows that the current research has so far failed to deliver on its promise of uncovering the link between hysteria and hypnosis. It further argues that despite huge technological advances in imaging technologies, contemporary researchers grapple with conceptual problems comparable to those that plagued their nineteenth century predecessors.

Keywords: Hysteria, conversion disorder, hypnosis, Charcot, functional brain images, PET, fMRI, comparison, similarity.

Muhr, Paula: "Visualising the Hypnotised Brain: Hysteria Research from Charcot to Functional Brain Scans", *Culture Unbound*, Volume 10, issue 1, 2018: 65–82. Published by Linköping University Electronic Press: http://www.cultureunbound.ep.liu.se

Introduction

Hysteria is an age-old disorder that has continued to puzzle medical authorities throughout its history. Whereas theories of its origin, approaches to its diagnosis and attempts at its treatments have varied considerably over the centuries (Micale 1995: 19-29), one aspect of this disorder has remained constant. No undisputed organic cause has ever been established for the morass of its heterogeneous and constantly changing symptoms that include, but are not limited to, paralyses, pseudoepileptic seizures, blindness, contractures, tremors, pain, loss of speech, and anaesthesia. This confusing diversity of symptoms has led many medical authorities throughout hysteria's centuries-long history to doubt the reality of this disorder.

During the last quarter of the nineteenth century, French neurologist Jean-Martin Charcot conducted his (in)famous research aiming to prove that hysteria was a genuine neurological disease caused by an invisible functional brain lesion. Charcot and his collaborators relied heavily on both various visualising technologies—including photography—and the experimental use of hypnotism (Bourneville & Regnard 1877, 1878, 1879-80, Charcot 1889). Yet Charcot's neurophysiological understanding of hysteria fell into disrepute shortly after his death. As a result, both Charcot's image-based approach to investigating hysteria and his use of hypnotism as a research tool were abandoned.

In this article, I will argue that more than a century after the demise of Charcot's model of hysteria some of his long abandoned concepts are currently seeing a revival within the field of imaging neuroscience. As I will show, the use of relatively novel functional neuroimaging technologies that allow scientists to non-invasively visualise local brain activities in living individuals has given rise to new hysteria research. Once again, hysteria research deploys images to conceptualise this disorder as functional brain pathology. Moreover, in a striking parallel to Charcot, several of the contemporary image-based studies have made experimental use of hypnosis to investigate present-day forms of hysterical symptoms (Halligan et al. 2000, Ward et al. 2003, Cojan et al. 2009a, Cojan et al. 2009b, Burgmer et al. 2013). These studies are the principal focus of this article.

My above statements may seem surprising, since in the humanities-bound literature hysteria is commonly viewed as a medical disorder that no longer exists (Micale, 1995, Bronfen 1998). Admittedly, the dominant nosological systems, such as DSM and ICD, officially stopped using the term "hysteria" by the end of the 20th century. They replaced it with new, constantly shifting diagnostic labels, such as conversion disorder, somatisation, hypochondriasis, pain disorder and many more. As opposed to hysteria's highly problematic etymological connection to the uterus, all of these new labels explicitly avoid defining the disorder as a purely female condition. There is currently no clear consensus in the medical community as to which and how many, or if any of the newly defined nosological entities correspond to the nineteenth-century hysteria. Nevertheless, a number of contemporary neurologists converge on the view that conversion disorder represents hysteria's legitimate contemporary successor with symptoms analogous to those exhibited by Charcot's patients (Feinstein 2001). Some of these authors use the terms hysteria and conversion disorders interchangeably (see for example Halligan et al. 2000, Cojan et al. 2009a), presumably to emphasise their belief in the continuity between the conditions to which these two diagnostic labels refer. It is this approach that my article will be informed by.

There is an extensive literature in the humanities that critically discusses how Charcot implemented both images and hypnosis in his hysteria research (see for example Showalter 1985, Harrington 1987, Micale 1995, Bronfen 1998, Showalter 1998, Didi-Huberman 2003). The consensus in this literature is that Charcot unscientifically used both images and hypnosis in order to fabricate his representation of hysteria. As opposed to the wealth of studies on Charcot, humanities scholarship to date has paid no attention to the epistemic effects of the current neuroimaging investigations of hypnotically modelled hysterical symptoms. The aim of this article is to take the first step towards filling this gap by looking at how neuroscientists currently attempt to instrumentalise hypnosis within the framework of image-based hysteria research, as well as how these attempts relate to Charcot's approach. Thus, the main focus of this article is on the use of hypnosis in the current brain imaging research of hysteria. But before turning to the discussion of the current research, I will provide a succinct overview of Charcot's views on the interrelatedness of hysteria and hypnosis. My analysis will circumvent the prevalent overtly critical approaches that frame Charcot's research as an intentional fabrication (Didi-Huberman 2003), and argue instead that it was a scientific endeavour in its own right that was nevertheless plagued by conceptual problems.

It should be noted that the brain imaging studies I analyse in this article are conducted as basic research. Even though they actively contribute to hysteria's new visibility within the current brain imaging research by promising to untangle this age-old disorder's mystery (Ward et al. 2003: 295), their findings remain without any foreseeable clinical applications. To this date, the number of brain imaging studies of hysteria modelled through hypnosis is still small and, as we will see, their conclusions are partly conflicting. Not only are the tentative results of this research distant from everyday medical practice, they are also rarely mentioned in popular press and then only in vague and general terms (see for example Bell 2010). As shown by Joseph Dumit (2004), present brain imaging research into disorders such as schizophrenia and depression has had an impact on wider cultural discourses on mental health, illness and normality. In contrast, the current neuroscientific revival of hysteria and its ongoing refashioning into a neurological disorder has so far been largely confined to specialist circles and has remained removed from the general public. It nevertheless deserves to be closely scrutinised as it partakes in the more general neuroscientific project of focusing on the brain with a view to managing the mind, which has been widely discussed and criticised in the humanities (see for example Beaulieu 2000, Dumit 2004, Vidal 2009, Pickersgill 2013, Rose & Abi-Rached, 2013).

This article contributes to this criticism of neuroscience's apparent ability to once and for all resolve the mysteries of the mind as it questions the promissory discourse of the brain imaging studies that use hypnosis with the hope of providing decisive new insights into the presumed neural underpinnings of hysteria. What kind of knowledge about hysteria do the seemingly straightforward images of the hypnotised brain produce? How do these finding relate to Charcot's concepts of the relationship between hysteria and hypnosis? Do the brain imaging technologies really hold the key to uncovering the relationship between these puzzling phenomena? These are the questions this article will address in detail. It will show that the present conflation of image-based investigation of hysteria with the use of hypnosis not only revives Charcot's long discarded concepts, but also their underlying problems and constraints.

Charcot: Hypnosis as Hysteria's Analogue

The underlying hypothesis that informed Charcot's entire research endeavour was that hysteria is a neurological disorder. In the initial stage of his research he applied to hysteria the same approach he successfully used in relation to other neurological disorders by attempting to establish a specific structural brain lesion as the potential cause of the disorder (Charcot 1877: 294-5). When the dissection of the deceased hysterical patients' brains failed to produce any detectable organic damage, Charcot came to the conclusion that the disorder must be caused by what he termed as the dynamic or functional lesion. He understood this functional lesion as an invisible yet nevertheless physiological disturbance of the brain (Charcot 1889: 14).

Charcot based his hypothesis of functional lesion on the fact that symptoms of hysteria closely resembled those of organic diseases caused by a circumscribed anatomical lesion. By drawing on neuromimesis, i.e. the visual similarity between the symptoms of hysteria and those of corresponding organic disorders, Charcot reasoned that lesions of admittedly different types must cause both categories of symptoms, yet with similar neuroanatomical locations (Ibid). In one case the lesion was proven to be structural, and in the other presumed to be of functional nature.

A similar comparative approach formed the foundation for Charcot's subsequent use of hypnosis as an experimental tool in his hysteria research. Charcot viewed the hypnotic condition as an abnormal sleep-like state that could only be induced to the full extent in hysterical subjects (Charcot 1890: 299). He never developed a consistent theoretical explanation of hypnosis, but adopted instead a phenomenological approach to studying it. Charcot and his collaborators experimented with various ways of artificially producing and manipulating the hypnotic state in their patients. They then induced in the hypnotised subjects transient hysterical symptoms and compared them to their 'genuine' counterparts. Moreover, they systematically measured and registered the physical effects of their experimental interventions (Charcot 1890).

Based on these experiments, Charcot concluded that hypnosis was a purely physiological phenomenon made up of three distinct phases: lethargy, catalepsy and somnambulism. Moreover, he claimed that in each of these phases the hypnotised patients manifested distinct, highly characteristic and measurable physical conditions, which resembled various hysterical symptoms (Charcot 1889: 290-295). By visualising and comparing both spontaneously developed and hypnotically induced hysterical symptoms through photography and the graphical tracing of respiratory curves, Charcot declared these differently produced symptoms to be identical. Drawing on the visual similarity between their physical expressions, Charcot thus contended that hysteria and hypnosis relied on the same neurophysiological mechanisms. In other words, he postulated that a functional brain lesion caused both of them, and he used both photography and graphical tracings to visually substantiate his claim.

Consequently, Charcot termed hypnosis an "artificial neurosis" (Charcot 1890: 298) and started using it experimentally to produce as well as terminate different hysterical symptoms at his own will. In a carefully constructed experimental setup, he plunged his subjects in various stages of hypnotic trance and then instigated and terminated hysterical contractures, paralyses, anaesthesias, mutism and blindness. Hypnosis thus became hysteria's experimental analogue in his research. The usefulness of this approach seemed almost self-evident. Charcot was no longer dependent on his patients to spontaneously develop a specific symptom of interest. Instead, through hypnosis he could replicate any hysterical symptom and thereby fully control its type, anatomical distribution, severity, duration and temporal development. He relied on such use of hypnosis not only for the sake of scientific investigations of the symptoms, but also for demonstrations during both his medical and public lectures.

Yet even though the close entanglement of hysteria and hypnosis endowed Charcot's research project with experimental flexibility, in the end it also turned out to be its major weak spot. Charcot's carefully constructed experimental edifice crumbled when a rival doctor, Hyppolite Bernheim, contested his contention that hypnosis was a purely neurophysiological phenomenon, and a pathological one at that. Bernheim's counterclaim was that hypnosis could only be properly understood as a normal and natural psychological condition during which the subject exhibits a pronounced susceptibility to suggestion (Bernheim 1889: 149). According to Bernheim, a hypnotised subject did not manifest characteristic physical symptoms as Charcot claimed, but merely acted in response to the hypnotist's either implicit expectations or explicitly formulated instructions (Ibid).

In essence, Bernheim's critique fully negated the validity of Charcot's experimental use of hypnosis in hysteria research. It effectively reinterpreted Charcot's experiments as mere role-playing between the hypnotist and his subjects. Within this new context, the visual similarity between hypnotic and hysterical phenomena—as evidenced by a plethora of photographs and graphical tracings—became meaningless. Instead of implying the existence of a common brain lesion, these images could just as easily be viewed as visual documentation of either conscious or unconscious simulation. Soon, Charcot's own pupils followed suit, not only by abandoning the use of hypnosis as an experimental tool, but also by questioning Charcot's very understanding of hysteria as a neurological disorder. Pierre Janet, Joseph Babinski and Sigmund Freud developed their own theories of hysteria all of which departed from their teacher's neurological model. A common point was that they all reframed hysteria as a form of a psychological disorder, an 'all-in-the-mind' illness without a clear-cut physiological origin.

Twenty-first Century Revival of the Link Between Hysteria and Hypnosis

Throughout most of the 20th century, Freud's model of hysteria as a mental illness caused by the supressed memories of past traumatic events provided the dominant framework for diagnosing and treating this disorder. Within the medical terminology, new labels displaced the term hysteria and its lingering, long out-dated etymological link to the female uterus as the erroneously presumed origin of the disease. The new diagnostic categories—including conversion disorder, somatoform disorders and dissociation disorders—placed the emphasis on the causative role of psychological factors in the development of present-day manifestations of hysteria. Yet these new labels failed to make the baffling symptoms more acceptable either to patients or to doctors. Patients who kept appearing in clinics with the symptoms comparable to those that had previously been categorised as hysterical have often remained undiagnosed (Stone et al. 2008). Decreasing diagnostic frequency coupled with waning research interest made hysteria invisible.

This situation began to gradually change in the late 1990s with the publication of several functional neuroimaging studies investigating hysterical symptoms (Tiihonen et al. 1995, Marshall et al. 1997). First using PET (positron emission tomography) and then almost exclusively relying on fMRI (functional magnetic resonance imaging), a number of neurologists started to claim that hysterical symptoms are related to visualisable dysfunctions of the brain (see for example Spence et al. 2000, Vuilleumier et al. 2001, Burgmer et al. 2006, Stone et al. 2007). Functional brain scans generated by these studies seem to suggest that—despite the lack of any detectable anatomical brain damage—the hysterical patients' patterns of neural activities differ distinctly from those of comparable healthy subjects.

The number of neuroimaging studies of hysteria published to date remains very small. Moreover, the insights provided by this research remain tentative, since the individual studies diverge in their results. Yet, despite the current inability of the contemporary image-based research to provide a consensus as to which concrete patterns of neural activity could underlie various hysterical symptoms, this strand of research has nevertheless been successful in reviving the idea of hysteria as a brain disorder. In fact, it can be said that the new research focuses on visualising Charcot's hypothesised functional brain lesion.

Interestingly, the current research has revived an additional aspect of Charcot's approach to investigating hysteria. In the context of functional neuroimaging studies, hypnosis is once again gaining currency as a potentially useful research tool that allows scientists to controllably replicate hysterical symptoms of interest under experimental conditions (Oakley & Halligan 2009). In other words, hypnosis is being used anew as an experimental analogue of hysteria. As I will show in the subsequent sections, even though the present-day implementation of hypnosis to study hysteria is driven by the use of novel brain imaging technologies, it nevertheless manifests several significant parallels to Charcot's use of hypnosis more than a hundred years earlier.

Hypnosis as a Poorly Understood Tool for Studying Hysteria

Although hypnosis has been repeatedly used in neuroscientific research to model hysterical symptoms within the last twenty years (Halligan et al. 2000, Cojan et al. 2009b, Burgmer et al. 2013, Deeley et al. 2013), its nature remains scarcely understood. One of the major issues is that the current state of research has not yet been able to resolve the long-standing controversy initially ignited by the conflict between Charcot and Bernheim. There is still no decisive proof as to whether hypnosis corresponds to a distinct altered state of mind with underlying neurophysiological changes as presumed by Charcot, or to a hypnotised subject's compliance with the hypnotist's suggestion as claimed by Bernheim (Oakley 2008). Even though both of these divergent stances have supporters, the neuroimaging community tends to associate hypnosis with a distinct neurophysiological state and focuses on generating data that supports such a view. Neuroimaging studies of hypnosis thus actively contribute to the constitution of what Anne Beaulieu termed the "mind-in-the-brain" by searching for visual proof that the hypnotic condition—understood as a distinct mental state—correlates with a set of identifiable brain processes (Beaulieu 2000:7).

So far the findings of basic research into hypnosis are inconclusive. Several neuroimaging studies have implicated the controlled induction of a hypnotic condition with distinct changes in the pattern of neural activity (Oakley & Halligan 2009: 264-5, McGeowan et al. 2009). Overall, however, the results are mutually inconsistent and no unequivocal neural basis of hypnotic condition has yet been identified (Oakley 2008). Nevertheless, such provisional findings of the intrinsic research into hypnosis provide the conceptual basis for the neuroimaging studies of hypnotically induced hysterical symptoms (see for example Cojan et al. 2009: 862-3).

Whereas neuroimaging studies appear to support Charcot's view of hypnosis as an altered mental state, his other views seem to have fared worse with contemporary researchers. They have explicitly discarded both Charcot's claim that hypnosis represents a primarily pathological condition and his division of it into three distinct stages (Laurence et al. 2008: 230). To investigate both hypnosis in its own right and hypnotically induced hysterical symptoms, today's researchers no longer use patients. Instead, they recruit healthy individuals previously tested to be free of any psychiatric disorders. Moreover, Charcot's three consecutive stages of hypnosis with their measurable physical signs have been displaced by new categories of hypnotic depth and hypnotisability. Despite these apparent changes, in what follows I will argue that contemporary research has not fully shaken off the legacy of Charcot's concepts.

Hypnotic depth refers to the perceived intensity of the hypnotic experience. Since variations of hypnotic depth have been associated with measurable changes in the neural activity (Oakley 2008: 20-21), maintaining it at a considerable and stable level throughout the experiment represents an important precondition for a neuroimaging study involving hypnotically-induced hysterical symptoms. Unable to objectively measure it, researchers instead train their experimental subjects to assess their hypnotic depth through self-reporting while lying inside the scanner. Thus, whereas Charcot judged the efficacy of the hypnotic induction based on the physical conditions his patients exhibited, neuroimaging studies rely instead on the subjects' self-evaluation. Based on their experience of the hypnotic condition, gained prior to the imaging experiment, the subjects are asked to grade their level of hypnotic depth in relation to a chosen numerical scale (Oakley et al. 2007). Despite this attempt at quantification, such estimation of hypnotic depth remains a highly subjective measure that is difficult to reliably compare across different individuals.

Another descriptive measure used in contemporary hypnosis research is called hypnotisability or hypnotic suggestibility. It refers to the individual's tendency to respond to hypnosis and hypnotic suggestions that modify his/her sensory experience and behaviour. To determine a subject's hypnotisability, s/he is first induced into a hypnotic trance and then exposed to a sequence of suggestions that systematically alter his/her perception, motor behaviour and memory. A variety of standardised scales are then used to quantify the individual's hypnotisability depending on the degree of their responsiveness to these suggestions (Woody et al. 2005). Based on their score, the individual's hypnosability is categorised as high, medium or low. Despite the use of standardised scales to quantify its variations among individuals, the potential reasons behind this variability remain unclear (Laurence et al. 2008). Further, whether these different levels of hypnotisability represent the individual's innate trait or if they can be modified through training remains a matter of debate (Ibid: 232). The dividing line in this debate corresponds to the different views that researchers hold on hypnosis in general. Those who view hypnosis as a mere compliance with the hypnotist's suggestions claim that hypnotisability is a learned ability (Ibid). In the neuroimaging community, however, hypnotisability is generally regarded as an unmodifiable trait with a genetic component (Bell 2010).

Significantly, all neuroimaging studies of hypnotically-induced symptoms of hysteria to date have been performed on healthy volunteers who had been previously assessed as highly hypnotically suggestible. Thus, the participants of these studies have already been preselected for their increased responsiveness to developing hypnotic phenomena that closely resemble hysterical symptoms. In his research, Charcot regarded such increased susceptibility to suggestion as an indicator of latent hysteria, a pathological state of the nervous system that has not been triggered yet to produce visible symptoms. Within current research, the high hypnotisability is merely registered as a phenomenological fact that allows for easy modelling of hysterical symptoms (Oakley et al. 2007). On the surface, the selected participants' increased responsiveness to hypnotic suggestion appears to have a purely instrumental role in current hysteria research. Explicitly, it is not ascribed any meaning in itself, either as a potential sign of pathology or of normalcy. What remains unmentioned in these studies, however, is that on average only one in ten adults receives high scores on the standardised scales, which makes high hypnotisability a relatively rare trait (Bell 2010). Against the historical backdrop of Charcot's research, we should thus not overlook the possibility that this particular choice of experimental subjects has epistemic consequences. It can be argued that by selecting experimental subjects based on such a rare trait, the current research at least implicitly revives and even reinforces the presumably pathological link between increased suggestibility and hysteria.

In fact, several behavioural studies have taken one step further in this direction and directly tested Charcot's assumed pathological association between hysteria and hypnosis. Two studies reported a higher level of hypnotic susceptibility in hysterical patients relative either to patients suffering from other conditions or to healthy individuals (Kuyk et al. 1999, Roelofs et al. 2002). However, their results were contradicted by other studies that failed to establish any statistically significant evidence of increased hypnotisability in patients exhibiting hysterical symptoms (Goldstein et al. 2000, Litwin et al. 2001, Moene et al. 2001). Within the current research context, the presumed pathological correlation between hysteria and hypnosis remains an unresolved issue at the empirical level. Nevertheless, it can be said that the lingering effects of Charcot's initial claims seem to at least implicitly influence the current research. This is reflected in the specific selection of experimental subjects based on their high responsiveness to hypnotic suggestion, but also in the recurring although so far inconclusive attempts to find evidence for a presumed correlation between hypnotic susceptibility and the presence of hysterical symptoms in diagnosed patients.

Imaging the Brain: Hypnosis as a(n) (Un)Reliable Model of Hysteria

As discussed previously, Charcot viewed the phenomenological similarity between the spontaneously developed hysterical symptoms and their hypnotically-induced counterparts as the definitive proof that comparable neural processes underlie both hysteria and hypnosis. Charcot was limited to visualising the external physical manifestations of hypnotic suggestion and then using these images to make inferences about their possible neurological causes. Today's researchers instead rely on the state-of-the-art technologies to visualise distinct patterns of brain activities attributable to the investigated hypnotic phenomena. The arrival of new brain imaging technologies has thus shifted the focus from the surface of the human body to the "space inside the scull" (Beaulieu 2000).

Although these imaging technologies have often been hailed, especially in the popular press, for enabling neuroscientists to observe the human brain at work (see for example Zimmer 2014), they do not facilitate any direct access to the brain activities of interest. In fact, to even arrive at a visualisation of brain activity, scientists use complex machinery to first produce data which then undergo several stages of data processing. The resulting brain scans are thus highly constructed images based on which scientists make inferences about brain activity.

Even more importanly, these images do not allow any direct comparison of such complex and diffuse phenomena such as hysteria and hypnosis. To be able to use brain imaging technologies for establishing if hysteria and hypnosis share a neural basis, researchers rely on experimental set-ups. As we will see in the following analysis, it is through experimental set-ups that researchers artificially isolate chosen aspects of both hysteria and hypnosis and translate them into seemingly clear-cut brain scans which they can then compare. Thus to answer the question of how researchers use brain images to investigate the relation between hysteria and hypnosis, we have to take a closer look at the decisions they make when designing their experiments.

A pioneering neuroimaging study by Halligan et al. (2000) used PET to visualise the brain activity of a 25-year-old healthy, highly hypnotisable male. Following a standard hypnotic induction, the depth of which was monitored throughout the experiment, a left leg paralysis was produced through hypnotic suggestion. The paralysis was modelled to closely resemble the hysterical leg paralysis previously studied with PET by Marshall et al. (1997). The subject was then placed inside a PET scanner and instructed to prepare to move or try to move either his normal or his hypnotically paralysed leg on cue. However, since both legs were tightly restrained, no actual movement took place. This experimental design was identical to the one performed by the hysterical subject in the Marshall et al. (1997) study.

While the subject performed these tasks, PET images of his brain were collected by the scanner. In the subsequent process of data analysis, Halligan et al. compared the subject's neural responses during the attempt to move the hypnotically paralysed leg to the neural responses during the attempt to move the normal leg. The result was a brain map with a distinct pattern of neural activations that showed a significant overlap with the brain map previously published by Marshall et al. Based on the visual similarity of the brain activations between a hysterical patient and the hypnotised subject, Halligan et al. argued that their imaging results supported the view that "hysterical and hypnotic paralysis share common neural systems" (Halligan et al. 2000: 987). Their statement not only echoed Charcot's initial claim that hypnosis and hysteria rely on overlapping neurological mechanisms, but also appeared to finally provide it with a visual proof in the form of brain scans. In another parallel to Charcot, Halligan et al. concluded that owing to their shared neural mechanisms, "hypnotic phenomena provide a versatile and testable model for understanding and treating conversion hysteria symptoms" (Ibid).

However, the optimism of the Halligan et al. study was somewhat overstated, since the findings of such a single-case comparison cannot be generalised beyond the individual patient. Attempting to circumvent this problem, subsequent neuroimaging studies of hypnotically induced paralysis shifted to recruiting groups of highly hypnotisable patients for the experiments. This was the case with the Ward et al. study (2003) that also used PET, but this time to visualise the differential neural activations associated with the attempted movement during hypnotically induced left leg paralysis relative to rest in a hypnotised state. As opposed to Halligan et al, the Ward et al. experiment was performed on twelve male volunteers whose legs were unrestrained during the measurement.

After statistically averaging their results across all participants, Ward et al. arrived at a pattern of neural activations that failed to fully replicate the results of the Halligan et al. study. Although there was a partial overlap between the brain activations detected by these two studies, there were also considerable differences. Some of the brain areas that, according to Halligan et al., played an important role in hypnotic paralysis remained inactive in Ward et al. study (2003: 310). Conversely, the new study generated brain maps that showed a more diverse pattern of neural activations, implicating a possible contribution of additional brain areas (Ibid: 302). Ward et al. thus opened the possibility that different brain mechanisms underlie hypnotic paralysis than those suggested by the previous study. Moreover, the authors suggested that although hypnosis may be useful for modelling hysterical symptoms in a controlled fashion, "paralysis produced by suggestion following hypnotic induction may not readily transfer to patients", since the real-life hysterical symptoms appear to be more complex than those modelled through hypnosis (Ibid: 311).

More recent studies into the putative link between hysteria and hypnosis used fMRI, a neuroimaging technology with a higher spatial and temporal resolution than PET. Moreover, researchers have started to implement more complex experimental designs instead of merely instructing subjects to attempt to move while lying inside a scanner. For instance, in the studies by Cojan et al. (2009a, 2009b), subjects were instructed by means of a visual cue first to prepare a hand movement, and then either to execute it by pressing a button, or to abort it. In their first study, Cojan et al. (2009a) used this task to investigate the neural activation underpinning a left arm paralysis in a single female patient. They then repeated the task with the group of twelve volunteers, who either performed it in a normal state of wakefulness or during hypnosis combined with a suggestion of left hand paralysis (Cojan et al. 2009b). For each of these studies, the researchers computed respective activation patterns for different aspects of the selected task. Their images showed "some similarities but also clear differences" between neural activations associated with hypnotically-induced and hysterical paralysis (Cojan et al. 2009a: 1035). Thus, they concluded that despite some shared underlying neural activations, both hypnosis and hysteria also entail some specific and mutually distinct neural processes (Ibid: 1036). In this case, brain maps appeared to suggest that the phenomenological similarity of hypnotic and hysterical symptoms does not translate into a shared neural basis.

Burgmer et al. (2006/2013) came to a similar conclusion through a different experimental design. In two parallel studies, they asked their subjects to perform an identical task—first to observe a video of a moving hand and then to try to imitate the represented movement. In the first study (Burgmer et al. 2006), they investigated the neural activity of four patients with hysterical hand paralysis while performing the task. In the subsequent study, they scanned nineteen healthy volunteers, both in a normal state and under hypnosis accompanied by a suggestion of a hand paralysis (Burgmer et al. 2013). Even though their studies implicated partly different brain regions than the Cojan et al, they also established partial discrepancies in the neurological underpinnings between hysterical and hypnotically-induced paralysis (Ibid: 443). They tentatively ascribed these differences to the transitory nature of hypnotic paralysis as opposed to its hysterical counterpart, while also admitting that the relationship between hypnosis and hysteria "requires further consideration" and investigation (Ibid).

The above overview makes one aspect of the current research stand out: Researchers draw their conclusions about the potential similarity between neural underpinnings of hypnotic and hysterical paralysis by visually comparing images of the brain activation patterns derived from parallel experiments. A separate experiment is first conducted with patients exhibiting a hysterical paralysis limited to a particular limb. The same experiment is then repeated with highly hypnotisable healthy individuals in whom an equivalent paralysis has been hypnotically induced. Each of these experiments produces respective images showing patterns of neural activation attributed, on the one hand, to hysterical and, on the other hand, to hypnotic paralysis. These images are then compared to each other to establish to what extent and at which anatomical locations in the brain the patterns of neural activation either overlap or show clear differences.

However, the caveat behind this apparently clear-cut approach is that there is no direct way of using functional neuroimaging technologies to determine the distinct neural activity underlying such complex and poorly understood phenomena as either hysteria or hypnosis. Firstly, brain images in general grant only an indirect access to brain activity and this access is mediated through the given technology. Secondly, a set of brain images resulting from a concrete neuroimaging study is produced through the chosen experimental procedures and conditions, which are built into these images. As we have seen in the examples above, different researchers used different imaging technologies, implemented different tasks and contrasted different experimental conditions. Some studies had a single experimental subjects, while others recruited a group of participants. Some studies compared the attempted movement during hypnotically-induced paralysis to a resting state in hypnotic condition, whereas other contrasted it with an attempted movement in the state of normal wakefulness. Some researchers restrained their subjects to make their movement impossible, whereas others did not. Some opted for a very simple, others for a more complex task. All these choices were informed by the researchers' theoretical assumptions and hypotheses about the neural underpinning of both hysteria and hypnosis (see for example Cojan et al. 2009b: 863, Burgmer et al. 2013: 438).

All of the above decisions had an epistemic effect on the results of the respective studies, thus contributing to the mutual discrepancies and even contradictions among their findings. However, without a reliable theoretical understanding of what hypnosis is to start with, none of these competing experimental approaches and their respective findings can be evaluated as more valid than their alternatives. In effect, the search for common neural mechanism behind hysteria and hypnosis by means of brain imaging has so far come up with inconclusive results, leaving the relationship between these two phenomena unresolved.

Conclusion

The advent of functional neuroimaging led not only to the resurgence of scientific interest into hysteria, but also revived Charcot's long-abandoned concept of the functional brain lesion as the potential cause of hysteria and once again brought into focus the use of hypnosis as an experimental tool. Initially, this new image-based hysteria research was celebrated in specialist circles for its potential to finally unravel the age-old mystery of this elusive disorder (Tallabs 2005, Oakley 2006). Yet, as I have aimed to show in this article, the brain imaging studies so far have been much less successful in providing new and transformative knowledge of hysteria than in reopening many of the conceptual problems that haunted Charcot's original research endeavour.

In a parallel to Charcot's approach, contemporary researchers use one scarcely understood phenomenon to model another that is equally poorly understood. On the surface, the use of hypnosis as an experimental tool seems to offer a much greater control in studying the hysterical symptoms that are of interest. It appears to allow researchers to induce, modify and stop "behaviourally indistinguishable versions" of the same symptoms as and when they deem appropriate, or to artificially isolate a particular aspect of the symptom (Ward et al. 2003: 310). However, since the very nature of these induced phenomena as well as their relation to spontaneously developed hysterical symptoms remains opaque, the apparent control offered by hypnosis turns out to be deceptive. In fact, as we have seen in the examples above, by displacing hysterical symptoms with their hypnotically modelled counterparts, researchers introduce into their experimental setup additional ambiguities for which they are unable to fully account.

In another parallel to Charcot, contemporary researchers rely on the comparisons of images derived from matching experimental setups to establish if hysteria and hypnosis share common neural underpinnings. As opposed to Charcot, who relied on the images that depicted the outside of the patients' body, contemporary researchers use technologies that allow them to visualise the neural activity from inside the experimental subject's head. Yet despite their technological superiority, these images are not able to provide insights into hysteria without a clear theoretical framework that would guide both their production and their interpretation. Charcot's images became meaningless when Bernheim questioned the validity of his theoretical framework. Similarly, the epistemic validity of these only seemingly straightforward images of the hypnotised brain remains problematic within current hysteria research as long as there is no clear theoretical understanding of either hysteria or hypnosis within which their production and interpretation could be anchored. Thus, when using hypnosis to investigate hysteria, present-day researchers grapple with similar conceptual problems as Charcot once did.

Notwithstanding the enormous technological advances in the imaging technologies between Charcot's time and today, the major challenge that any image-based research of hysteria via hypnosis faces seems to be situated at the conceptual and methodological level. The main question is not what we can see in the image—whether they show us the surface of the body or allow access to the space inside the brain—but how their meaning is constituted within the scientific context. Without a plausible theoretical framework to guide their production and interpretation, such images remain epistemically ambiguous and unable to produce new insights into either hysteria or hypnosis. The coupling of the new visualising technologies with the experimental use of hypnosis has thus so far failed to deliver on the promise of solving the hysteria's mystery. In fact, what these seemingly straightforward multi-coloured images of the brain have made visible so far is that hysteria remains just as elusive a phenomenon as it has been for centuries.

Acknowledgements

Thank you to two anonymous reviewers for their constructive criticism and to the editors of this volume for their helpful comments and suggestions. I would also like to thank Torsten Wüstenberg from the Department for Psychiatry and

Psychotherapy at the Charité Berlin for insightful discussions and continued support over the course of my research.

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Culture Unbound
Journal of Current Cultural Research

Everyday Imaginaries, Narratives and Strokes
An Ethnographic Exploration of Narratives Among Stroke Patients and their Spouses

By Michael Andersen

Abstract

That a stroke is a disruptive event in many people's lives is no secret. That it also represents challenges to the communal construction of narratives between couples is less explored, and is the subject matter of this paper. With a narrative theoretical approach to ethnographic fieldwork conducted among couples where one partner has had a stroke, this article explores how everyday imaginaries are challenged when narratives are reassessed following a stroke. The paper suggests that sometimes the communal narratives are taken over by the part not directly afflicted by the stroke. Thus, when the non-afflicted spouse is in control of the narratives, they may be utilized as a way to monitor both the relationship as well as the brain of the spouse afflicted by the stroke.

Keywords: Illness, Narratives, Relationships, Ethnography, Everyday Life.

Andersen, Michael: "Everyday Imaginaries, Narratives and Strokes: An Ethnographic Exploration of Narratives Among Stroke Patients and their Spouses", *Culture Unbound*, Volume 10, issue 1, 2018: 83–101. Published by Linköping University Electronic Press: http://www.cultureunbound.ep.liu.se

Introduction

> "…if I hadn't been here things would be really bad, because Mr. Nielsen has no initiative whatsoever…zip, absolutely nothing. It's an okay life anyway; you know I wouldn't be without it. You get used to it, but if you think about it, I'm 71 and I was 56 when it happened (Mr. Nielsen's stroke), that's a lot of years. We have been married for forty-two years. Fifteen of those years have been in this way. If you begin to think like that it hurts. After all, we weren't supposed to be in this situation" (Mrs. Nielsen).

The children's book "*Found in the Waterlily*", written and illustrated by the Ukranian artist Svetlana Dorosheva (2016), tells the tale of magical creatures that set out to describe the anatomy and behavior of these hitherto mythical human beings. What the magical creatures discover is that the human brain is an interesting construct, invented by humans to make it seem like we live in the same reality, although inside each brain is a unique world where the person really lives. Inspired by Kathleen Lennon's use of the term *everyday imaginaries*, which signifies the constant construction of imaginary shared entities within everyday life, I will discuss what happens when someone has a neurological condition that causes one to lose the ability to share these imaginary constructs. To encapsulate how such imaginaries are shared, I approach them through the analytical lens of narrative ethnography (Ricoeur 1984). In line with anthropologists Cheryl Mattingly and Linda Garro, I argue that we share our imagined reality through, and in, our communal narratives (2000). It is by analyzing the ruptures in these narratives that we get a sense of how our "imagined being together" is constructed.[1] Based on fieldwork among stroke patients and their significant others in Denmark, this article discusses what happens when the brain is affected by a stroke, and the impact this has on the everyday imaginaries of people who have had a stroke, but also how this affects their spouses. Thus, the article analyses interviews with stroke sufferers and their spouses. On the basis of the analysis, it considers what happens when the everyday imaginaries are challenged, and how the narratives are transformed in the process.

Literature on the topic of stroke has grown exponentially in the past three decades, ranging from self-help books on preventing strokes (Spence 2006) and coping with strokes (Raymond 2009) to neuroscientific articles on the correlation between strokes and genetics (Hassan and Markus 2000). Strokes represent a major medical issue that may cause expressive and receptive aphasia, loss of vision, paralysis, cognitive impairment as well as death. Consequently, strokes have a presence in almost all areas of society. Class (McFadden et al. 2009), gender (Petrea et al. 2009), race (Gaines and Burke 1995) and sexuality (Valanis et al.

2000) are just some of the parameters that are taken into consideration when the susceptibility to stroke is assessed and when looking at the impact of stroke. So it makes sense not only from an individual perspective, but also from a societal standpoint, that strokes are widely researched. As statistics from the "American Heart Association" shows, although the rates in CVD (cardiovascular disease) have dropped in recent years, leading to fewer fatalities (Go et al. 2013), strokes are still a major cause of deaths and long-term disability. In an article from 2003, Jan A. Staessen et al. state that worldwide, stroke is second only to ischemic heart disease as a cause of death (Staessen et al. 2003). A great deal of emphasis has been put on prevention. Lifestyle changes in particular have been promoted as being important to lowering the risk of stroke (Kurth et al. 2006). Identifying a number of risks as disparate as tobacco use and the level of education (Galimanis et al. 2009), stroke has manifested itself outside the confines of the body. A large number of social scientific studies show that stroke may have a significant impact on people's everyday lives. (McKevitt et al 2004). Among these studies, many deal with how strokes affect not only the individual but also the afflicted person's social surroundings, including a potential spouse (Becker 1997; Pilkington 1999). This article places itself within the group of studies that explores how the shared narratives of couples are affected by a stroke (Manzo et. al 1995).

Everyday Imaginaries and Narratives

That we share and construct our lives communally is an old anthropological axiom. Whether this life is constructed through, for example, shared myths (Levi-Strauss 1955) or inherent socio-material interdependence (Tsing 2005, Latour 2013), the point that we are interwoven into each other's lives is the basis of all social sciences. In phenomenological and existentialist terms our Being-in-the-world is characterized by being thrown into a world in which it becomes itself through this relation to the world (Heidegger 1962 [1927])—a world shared by numerous other beings. Hence, as Alfred Schutz (1967) argues, many of us share life-worlds. Following up on the phenomenological tradition, Kathleen Lennon proposes the use of the term *everyday imaginaries* in her book entitled *Imaginations and the Imaginary* (Lennon 2015). In this work, she explores how we embody and construct imaginaries through our bodily and social presence in the world. As our openness towards the world is defined by these imaginaries—they essentially allow us to see certain meanings emanate from the world, while not being fixed categories—we have a responsibility to register, and be aware of what these imaginaries do. As Lennon argues:

> […] imaginaries need to be countered by alternative (and multiple) imaginaries, which make both cognitive and affective sense to the different groups of people who share a social space. We have suggested that one of the tasks of writers, visual artists, musicians and, perhaps, political leaders is to offer us new imaginary structures. But this is also a task in which we all take some part, via our everyday *iteration* of everyday imaginaries" (Lennon 2015: 138).

The question is how to approach these *iterations* of everyday imaginaries. In this article I suggest that imaginaries can be approached through their manifestations as narratives. By looking at how everyday imaginaries are sustained and created through, and in, the shared narratives of couples that live together, I will argue that these imaginaries are disrupted when a partner has a stroke. Furthermore, I will argue that the stroke, as a disruptive event, imposes a reassessment of the narratives that sustained the everyday imaginaries.

There is one name that continuously appears when doing research on narrative theory; Paul Ricoeur. With Ricoeur's reformulation of narrative theory, he brought hermeneutics back to the forefront of modern philosophy by arguing that a hermeneutical approach to linguistics or language allows for an understanding human subjectivity (Ricoeur 1966). With his threefold *mimesis,* which is a significant methodological feature in one of his most famous works, *Temps et récit* (1991 [1983]), Ricoeur analyses how humans create narratives to construct meaning, and how these narratives are intrinsically tied to temporality. According to Ricoeur, narratives go beyond a "normal" description of time as the experience of linear succession (i.e., one minute following another), and instead express a phenomenological time in which time itself is experienced through its threefold dimensions: past, present and future. Everyday life is comprised of narratives; these often have a strong suggestion of causality, which negates the meaningless succession of events. Thus, when telling a story about everyday life, one is choosing what to tell, how to tell it and how to connect one's choices in order to create a cohesive narrative (Ricoeur 1984).

Ricoeur explains the versatile use of events in narrative configurations by pointing to the structure of the mimesis model that consists of mimesis 1 (*prefiguration*): the prefigured basis that underlies the logic of the narration's plot (Ricoeur 2002) and mimesis 2 (*configuration*): a kind of narrative "emplotment" in which an imaginative order creates and sustains a plot (Kaplan 2003). All of the narration's elements become feasible within the plot, and so it mediates between the story's objects and subjects, configuring their place within the network of the plot. Further, there is mimesis 3 (*refiguration*): which takes the imaginative perspectives from mimesis 2 and integrates them into lived experience—making them part of one's identity and self-understanding. In short, for something to be understood it must rely on the ways in which our being-in-the-world is presented to us in our everyday lives, as it relates to how we understand the world. This is possible because, as human beings, our experience of the world is always already ordered, or prefigured, in a certain way. In effect, the narratives that we create play on our expectations and experiences. As a cyclical and hermeneutical process, the mimesis never ends. This is basically due to the fact that new life circumstances constantly alter and change the narrative, something which continuously calls for new interpretations. On the basis of our altered circumstances and new experiences, new networks of interpretation between subjects and objects are realized, and become part of one's identity formation. Events from the past are then prefigured, configured and refigured to match the new circumstances (Ricoeur 1984).

According to Ricoeur, a narrative lives by cohesion and structure, and a narrative that does not consider the plot (or the contemporaneous state of affairs) lacks that structure. Yet impressions of events are not fixed once and for all, but are malleable and change over time. This means that a narration is constantly open to changes and may co-exist along with other, perhaps contradicting, narratives of a certain event. This is best understood if one considers how a certain person, who one knows, may be configured in various narrations as defined by a range of different adjectives; e.g., good, bad, ugly, etc. While any given narration presents a part of the person in reference to the plot, the person might be different in another narration. Of course, we all know that people are multifaceted, but in the narration there is little structural difference between people or objects, or even events, as they pertain to the plot of the narration. As will become apparent in this article, in my informants' narrations, particular events are almost always configured in a certain manner; namely, that the stroke is a seminal event—an event that is thoroughly reviewed and disseminated as something that has altered the informants' communal way of life, as well as the everyday imaginaries of the couples.

Numerous philosophers and social scientists have conducted research on the use of narratives in the ethnography on illness. One of these is Arthur Frank, who in his book, *The Wounded Storyteller* (1995), presents three types of narratives that he argues are often encountered when dealing with people who are suffering or recovering from a prolonged period of bad health. Frank's illness narratives should not be confused with Ricoeur's narrative theory because of the similarity in taxonomy. Frank does not present the process of creating narratives as much as he describes the results of the narratives. These results are typologized into "restitution", "quest" and "chaos" narratives. The restitution narrative follows the narrative often encountered when dealing with a minor illness, such as the flu—

namely, locating the virus, getting treatment, rest or medicine and finally getting better. The quest narrative is somewhat opposite to the "return" of the restitution narrative; it is the integration of the experience of the illness into a retrospective as well as prospective dimension. An illustrative example could be a stress-related illness, which causes one to reconsider the pace and direction of one's life, potentially altering it. In essence, the quest narrative could be interpreted as an eye-opener; it offers a premonition about what might happen if one does not alter one's course in life. Finally, the chaos narrative is the direct opposite of the restitution narrative. It is devoid of a route, a plot or even a meaningful beginning or end. It is essentially difficult to understand, as there is no predictability or attempt to create a common thread throughout the narrative. As sociologist Sarah Nettleton et al. argue in "Enigmatic Illness: Narratives of Patients who Live with Medically Unexplained Symptoms" (2004), chaos narratives are often found among patients who live with undiagnosed illnesses. Thus, the chaos narrative—far from having what Mattingly and Garro (2000: 18) would call the "power of the narrative", namely, connotative language and shared imagery—is a narrative without control and without the time to create any kind of narrative stability.

Much of the ethnographic literature on disease and illness stresses that illness is often disruptive to narratives (Murphy 1987; Kleinman 1988; Becker 1993; Kaufman 1988; Bury 1982; Mattingly 2002), and as will be discussed in this article, it can also be disruptive to everyday imaginaries. As Gaylene Becker writes on the construction of post-stroke narratives in *Disrupted Lives* (1997), illness narratives all begin with the advent of a disruptive event that questions one's temporal being in the world:

> Illness challenges one's knowledge of one's body. People experience the time before their illness and its aftermath as two separate realities. This perception of a dual reality of the known world (the recent past) and the "bad dream" (the present) constitutes chaos (Becker 1997: 37).

Coupled with Frank's reasoning, the chaotic narratives represent a change in the structure and function of the former narratives, and as Becker argues, new narratives gradually replace the old ones. But sometimes this replacement takes on the character of a reassessment of old narratives, and thus, as Kleinman (1988) argues, post-illness narratives change not only the constitution and production of current narratives, but also previous narratives.

In the following section, I will discuss the role of reassessment in the communal construction of post-stroke narratives among the informants. The interviews that will be presented were conducted between 2011 and 2014. They primarily dealt with the informants' experiences of everyday life after a stroke. During the interviews, the spouses of the afflicted were present, and, as John Manzo et al. argue, the involvement of the spouse in the communal narrative—particularly concerning the event of the stroke—was very significant (Manzo et. al 1995). Also of interest is the fact that all these interviews were conducted with couples that have been living together and shared an everyday life for more than 40 years. It could thus reasonably be argued that the narratives presented in the interviews have been assessed and reassessed numerous times at the point of interviewing. Similarly, it is interesting to note how all of the persons afflicted are men, and how gender could potentially be seen as playing a role in terms of the expectations of caregiving as well as caretaking in communal narratives.

The Narratives that are Being Reassessed

Mr. and Mrs. Olsen live in a small apartment in Amager, Copenhagen. They are both around the age of 80 and have been married for more than 50 years. When I meet them, it has been less than a year since Mr. Olsen had a stroke, followed by a week of hospitalization. Mr. Olsen seems nervous, and Mrs. Olsen explains to me that, ever since the stroke, he has had a hard time finding the right words. Mr. Olsen says very little during the interview, and when he does, he asks his wife if what he is saying is true. The following is an excerpt from the interview:

> (MA) *What can you remember, Mr. Olsen, from when it happened?*
>
> (Mr. Olsen) Not much other than we were having dinner here, weren't we?
>
> (Mrs. Olsen) No, we hadn't started eating yet.
>
> (Mr. Olsen) But we were about to, weren't we?
>
> (Mrs. Olsen) Yes, we were about to, and you hadn't had your glass of red wine, like we usually have, and then I knew something was wrong (smiles). Otherwise, I can't really say what we experienced, and you can't remember it. You can remember lying in the recovery room. Do you remember that?
>
> (Mr. Olsen) Yes, kind of—don't I?
>
> (Mrs. Olsen) (…) But in everyday life, things are working out fine, except not exactly as I would like it.

> (MA) *In what way?*
>
> (Mrs. Olsen) It's when you (*looks at Mr. Olsen*) can't reme…I have more things to do because you don't do so much. And then the fact that you can't remember makes me very sad, but we can't change that.
>
> (MA) *But what is it you can't remember, Mr. Olsen*?
>
> (Mrs. Olsen) I just tried something. We saw one of the women we know, who used to clean at our shop (they used to own a dry-cleaning shop). She said that her father also had [a stroke] and that he can't remember phone numbers anymore. So I asked you (looks at Mr. Olsen), "What's my mobile telephone-number, and what's the number for the landline?" But you do remember those numbers…so how is it you feel that you can't remember?
>
> (Mr. Olsen) That's difficult to say, I think.

In this example, it is interesting to note the construction of the narrative in combination with assumptions about the nature of a stroke. While Mrs. Olsen assumes that Mr. Olsen has a limited memory because of the stroke, he does actually remember the things that Mrs. Olsen questions a person who has had a stroke would remember (i.e., telephone numbers). What is particularly curious is how his minor speech deficiency is perceived as a sign of memory loss. In other words, Mr. Olsen is presented as being incapable of constructing his own narrative—and thus his own identity—due to the stroke, and instead his wife becomes the constructor. However, she seems to construct a narrative that is influenced by what she assumes a person afflicted by a stroke would be like, which her talk with the cleaning lady exemplifies. Similarly, when speaking about the actual evening of the stroke, Mrs. Olsen introduces assumptions about the cause of the stroke.

> (Mrs. Olsen) It's a strange thing, but it was Friday the 11th of February, and our son was here, and we were about to have some lovely food – it was steak tartare—so we were going to have a glass of red wine along with that. So I arranged the plates, but you were very fidgety (*she looks at Mr. Olsen*), you were all over the place, and then suddenly you sat down in here (the living room), and then our son called me. Then Mr. Olsen sat like this (*portrays a lopsided position*), with your mouth and leg hanging down.

> (Mr. Olsen) On my left side, wasn't it?
>
> (Mrs. Olsen) Then he said, "It's a strange thing", you know he could speak: "It's like my jaw is dislocated."
>
> (Mr. Olsen) But that was just on the other side, wasn't it?
>
> (Mrs. Olsen) Yes, it was the opposite side, and that was to a certain extent also correct, because in May 2008 we went to Rigshospitalet (a large hospital in Denmark) and a constriction of arteries was identified, and it was apparently the one that had darted up into his brain… that's how it happened. But our son was rather quick and called for an ambulance, and then I said, "We have to go to Rigshospitalet", because that's what they said back then, but they don't do that—the paramedics—and then we were driven to Glostrup. But it's an ugly ordeal—a very ugly ordeal.

As outlined, the narratives surrounding a stroke tend to be communal. But what is of particular interest in the narrative above is the sudden shift in time. Mrs. Olsen begins by talking about how the evening of the stroke progressed, going through the events meticulously and chronologically. However, when the question arises about where the stroke was first physically detectable, Mrs. Olsen incorporates another point in time into her narrative. This occasion serves to provide an explanation for the event of the stroke—namely, Mr. Olsen's constriction of arteries and the identification of this problem some years earlier. In her narrative, Mrs. Olsen manages to connect a previous event with the event of the stroke, even though she claims that the constriction of Mr. Olsen's arteries was detected on the right side of his jaw, whereas she also claims that the stroke was physically detectable on the left side of his jaw. This fact is lost in the overall narration due to the explanation that Mrs. Olsen offers about the mythos of the stroke. In essence, the retrospective dimension of the narration becomes the overall figure to explain the event of the stroke—as a sort of premonition, the stroke was always inherently present in the constriction of the arteries. Mirroring the structure of ancient Greek tragedies, the subtle or invisible warnings suggested at the beginning of the plot only become fully apparent at the end. The narrative essentially shows how a past event foretold the plot of the narration; i.e., the end was always present at the beginning. To that extent, the narration also represents a failed incorporation of the warning, which alludes to the possibility that the future event of the stroke could have been avoided if one had incorporated this warning into everyday life.

The interview excerpts also show how different heterogeneous elements become tied together, even though their significance to the narration is slightly obscured. For instance, the steak tartare that the family was supposed to eat along with a glass of red wine is a piece of information that does not immediately seem to add anything to the overall story. But it could be analyzed in relation to the establishment of a former prefigured basis for the narration. Although steak tartare is not an item commonly found on Danish dinner plates, the information creates the sense of a specific dining situation and establishes a background through which the shock of the stroke is filtered.

All the same, the narrative does not correspond very neatly with the narrative typologies presented by Frank. While Mr. Olsen knows that he has changed, he doesn't seem to know how he has changed, and Mrs. Olsen constantly attempts to put her finger on this change, but cannot really identify where it actually is. Thus, Mr. Olsen's narrative is not one of "restitution" or "chaos", nor is it a "quest". Different pre-stroke and post-stroke "signs" are taken into consideration by the couple during their narration. However, the changes in their everyday practices are not presented as willful; rather, they are changes that have been forced upon them. But identifying these changes—i.e., placing them in a meaningful relation to their notion of *a* stroke—is difficult. Mr. and Mrs. Olsen struggle to gain meaning from their pre-conceptions of what a stroke is, the information they receive about strokes in general and Mr. Olsen's actual experience of a stroke. In essence, something has to be wrong with the brain of Mr. Olsen since he has had a stroke, and this must have caused a change in his identity—the question is what this change is.

The stroke occupies a specific space in their communal narration as something that changed the couple's particular way of being. Mr. Olsen's brain is not the same, and hence their relationship has changed. This becomes clear when Mr. and Mrs. Olsen each explain how they think their everyday lives changed after the stroke. One of the things Mrs. Olsen notes is how her husband is no longer able to take their usual walk around the neighborhood. As Mrs. Olsen attributes this to Mr. Olsen's stroke, I ask at the beginning of the interview when his inability to walk this distance had started; she answers that Mr. Olsen had not been able to manage it for over two years. As she realizes that this does not correspond with the timeframe of his stroke, she blames general ageing instead. This demonstrates how Mr. Olsen's categorization as a stroke victim initially serves to explain the change in their everyday lives, while general ageing is later given as the explanation. In this sense, it is important that the stroke is used as an explanation in the narrative; i.e., to assign meaning to a change. This is something one often encounters in interviews, where the stroke—being a seminal event—is used to explain changes, most of which are often for the worse.

There are, however, also several positive narratives about stroke survival; general stories about how the stroke changed a hectic career into a more reflective and balanced life and stories about how to regain one's old lifestyle. The story of a neurologist who had a stroke that provided her with new insights into understanding the brain in *My Stroke of Insight* (Taylor 2006) and a movie, *Flawless,*[2] about how a stroke may force one to overcome prejudice (Schumacher 1999), are just a few examples of stories that fit into the cult of positive thinking (Ehrenreich 2009). The stroke is depicted in the media as a tragic event that may be mitigated if one "just" listens to what the stroke (as an anamorphous being) "is trying to say"—e.g. to change your lifestyle, reconsider your relationship with your family, work, etc. Hence, the stroke is not only an event: in many cases, it also becomes a point of identification. Thus, being a stroke victim is also potentially an identity that may give meaning to everyday life and explain a variety of limitations. However, being identified with one's brain deficit represents a challenge to one's notion of subjectivity (Andersen 2015) and thus the narratives that support this subjectivity are similarly challenged.

The hesitant way that Mr. Olsen talks about what happened—i.e., answering my questions by posing questions to his wife—shows how doubtful he is about his own narrative and subjectivity. One could argue that this uncertainty is due to the relatively unique situation Mr. Olsen finds himself in, but one could also say that it is difficult for him to reclaim a narrative that has been taken over by his wife. A narrative that Mrs. Olsen continuously, and throughout the interview, expresses that she feels she has had to be in charge of ever since Mr. Olsen's stroke. Finally, we could add that Mr. Olsen might appreciate Mrs. Olsen's possession of the narrative, as it offers a kind of safety in terms of his unique identity; i.e. that there is someone who knows the narrative better than he does, thus confirming the existence of that particular narrative. Yet, this narrative is currently being reassessed due to the perception of how a stroke would impact the narrative, and hence the everyday imaginaries are challenged and unsettled. In that sense, the shared imaginaries have been dispersed due to the anticipation of a stroke's impact on the communal narratives. However, the fact that Mrs. Olsen possesses their communal narrative, also retroactively confirms the existence of everyday imaginaries that the couple could get back to. In many interviews with couples, who have been living together years after the event of the stroke, the new narratives have been told numerous times, and so, despite their ambiguity, are integrated into everyday life.

The Narratives that have been Reassessed

Mr. and Mrs. Nielsen are in their early seventies. Mr. Nielsen had a stroke 15 years ago and he and his wife have struggled with the repercussions of the stroke ever since. Amongst these is a partial paralysis of the right side of Mr. Nielsen's body. When Mrs. Nielsen talks about Mr. Nielsen's stroke she produces a very powerful narrative. This may in part be due to the fact that they have "performed" the narrative a couple of times for nursing students, as Mrs. Nielsen is the chairman of a local stroke organization:

> (Mrs. Nielsen) He couldn't even sit when he was struck—he was like a toddler. Then he had what I would call an idiotic expression, and I thought, "Wow", but that's gone—it went away. A lot of things went away. He was discharged at the end of November and went to a day hospital for around fourteen days into December, and then I was talking to [the staff at the hospital], asking if he could get into Montebello. "No, that's totally hopeless. It's very difficult getting down there". Then I asked, "Can you apply?", "Yes, if you have to be so difficult, then we will." After fourteen days, we could go. We went for three weeks, and, at that time, I could come as a helper, and when Mr. Nielsen left the hospital, he could walk with a cane and then someone had to walk beside him, and when we came to Montebello, they made him walk by himself with a cane, and he has done so ever since. It just goes to show that intensive training gives such a result half a year later. Just think what would have happened if it had been intensive from the beginning…you know that…there are numerous research studies that show that if you are given a hand and get a quick rehabilitation then…maybe you're not capable of running a marathon, and you will probably always have to walk with a cane…but a lot can happen, and you know that, but it's not prioritized, because it's old people. I can see that when we apply for money [for the stroke foundation]. If I can integrate something into the application about how it might help young people as well, then it helps. It's a strange society. It's slightly bitter because young people also get old. That's how the youth is—we would probably have thought the same. You forget that you get old one day.

As Mrs. Nielsen tells the story of her husband's stroke, the narrative becomes the story of a struggle to get help. She alludes to the fact that, if it had not been for her own persistent behavior, Mr. Nielsen would have had little to no help in regaining some of his physical abilities. Telling the story, Mrs. Nielsen uses the narrative to portray an overall ideological point—namely, that young people are indifferent to old people who experience illness—and this is reflected in how the healthcare system in general cares for elderly people. The way Mrs. Nielsen operates in time is particularly curious here; she argues that she, due to having been young once, can understand the attitude and premises of this attitude. In this way, Mrs. Nielsen uses her former self as a universal character of "youth", who—due to her experience and a new categorization in life—is able to see how elderly stroke patients are somehow forgotten and written off by the Danish healthcare system. Mr. Nielsen's categorization as "old" within the narrative supports the general view that he is not eligible for further treatment in the form of training. Nevertheless, this categorization seems to contradict another categorization earlier in the interview, where Mrs. Nielsen describes Mr. Nielsen's categorization in the healthcare system as "young":

> (MA) *How long were you admitted, Mr. Nielsen?*
>
> (Mr. Nielsen) It's a long story because I was moved from there and over to Bispebjerg Hospital, because Mrs. Nielsen knew that out there, they had some proper facilities…
>
> (Mrs. Nielsen) (*interrupts*)…they had a real stroke department. Back then, there weren't so many of them. Then a neurologist came by and said they would take him because he was so young. They wouldn't have told me that today, now that I am the chairman of the local stroke foundation. If so I would have said: "What did you say?"
>
> (MA) *That's an interesting explanation.*
>
> (Mrs. Nielsen) But that was the explanation—that he was young. I didn't think he was young…he was 60, but yes, he was young. But then they said "yes" and a bed was just supposed to come, so we moved out there on the 19th of May. Otherwise, he just lay and withered away at Amager Hospital with a physiotherapist coming by once a week… maybe twice.

As alluded to in the interview excerpts, Mrs. Nielsen explains how she has experienced that Mr. Nielsen has received different kinds of treatment depending on whether the healthcare system categorized him as old or as young. This may seem contradictory, yet Mrs. Nielsen expresses that she has experienced that Mr. Nielsen has been categorized as "old" due to the nature of his disease, even though his chronological age indicated that he was not old compared to most stroke patients. He was 60 years old at the time of the stroke, which situated him in a kind of limbo, or as Mary Douglas frames it, *Betwixt and Between* (1966), as the two narratives illustrate. Navigating through a healthcare system that does not seem to definitively place Mr. Nielsen within a certain category has confused Mrs. Nielsen, and has made it difficult for her to figure out what she thinks Mr. Nielsen is entitled to and not entitled to. This confusion of categories and their perceived relation to healthcare entitlement has continued ever since, and so when Mrs. Nielsen experiences that Mr. Nielsen is framed as "young" in this system, he is entitled to certain benefits; but the same applies to him being framed as "old", as exemplified by the extent to which Mr. Nielsen will receive free training to regain certain physical abilities. This limbo, being neither one nor the other in the system, represents an overall narrative on the disruption of identity following a stroke. Mrs. and Mr. Nielsen were searching for an identity for Mr. Nielsen within a healthcare system in which Mr. Nielsen was no longer a healthy 60-year-old man, but a diseased and crippled man of the same age. Even so, this uncertainty of categorization and identity also has some advantages that the couple has been able to utilize, such as actualizing a certain categorization and identity in different situations to achieve advantages. So when the narrative highlights the multiple identities given to Mr. Nielsen, it is consistent in showing how the disruption had an effect not just on him, but also on the management of his identity and experienced categorization within the healthcare system.

There are numerous examples of contradictory statements in narratives such as the one above. Sometimes, the dates are mixed up while, at other times, an event previously interpreted one way may be given an alternative interpretation within another narrative. The event may thus be configured in multiple and often contradictory ways that make sense within the specific narrative. In that sense events in narratives may be reassessed and altered every time the narrative is told. Sometimes, an event in the narrative may signify one thing and, at another, it may signify something completely different. A certain event might be the plot of one narrative and a minor feature in another. In essence, although the event might be the same, it is configured differently depending on the narrative and the plot of the narrative.

In a third interview, with Mr. and Mrs. Jensen, we see another example of how narratives may be constructed communally in order to assess the relationship between the couples. Between 1990 and 1997, Mr. Jensen had a total of seven strokes—approximately one each year—with the last stroke being, as he expressed it, the one that "broke the camel's back". During a conversation about traveling, Mr. and Mrs. Jensen construct a very illuminating narrative about a journey to the North Pole:

> (Mrs. Jensen) …but you've felt like traveling before, and we've also been out traveling. We've been to the US twice, and we visited some friends at the Ministry of Foreign Affairs in Brussels, but when you had just been

> discharged from the hospital, we went abroad, and Mr. Jensen walked a lot better then than he does now, and tell us, Mr. Jensen, where we went…
>
> (Mr. Jensen) First, we were at the North Pole.
>
> (Mrs. Jensen) (explains about their friends at the North Pole) ...then Mr. Jensen became ill, but we did it, anyway – didn't we, Mr. Jensen?
>
> (Mr. Jensen) Yes, and I don't regret it.
>
> (Mrs. Jensen) (directed at Mr. Jensen): Tell him how we did it…how we got up there.
>
> Mr. Jensen tells the story and, as in the excerpt above, his wife supports him whenever he misses a detail she finds important. What is so interesting about this is the seemingly rehearsed aspect of the narrative. They both know how to tell the story, and it becomes Mrs. Jensen's way to assess Mr. Jensen's mental state; i.e., as a way of asking: "Is Mr. Jensen still capable of telling the narrative that we both know?" Thus, the narrative—and the way the narrative is told as agreed to by both parties —is crucial for assessing both Mr. Jensen's health as well as his identity (e.g., does he have some degree of dementia, etc.). Hence, the narratives become a way to assess and reassess their relationship.

That Mr. Jensen has changed, and that Mrs. Jensen feels that she has had to be in charge of everything—including their narratives—is exemplified by a story in which she talks about her frustrations with Mr. Jensen developing kleptomania syndrome after his last stroke. This was subsequently the cause of social alienation. Mrs. Jensen sought the help of a neuropsychologist to explain to her what had become of the old Mr. Jensen, and how to make the new Mr. Jensen accommodate to a new version of their former life together. However, this life has not been without its bumps and hurdles, and Mr. Jensen is reliant on Mrs. Jensen's caregiving, as well as caretaking of their narratives.

Mr. Jensen makes it quite clear during the interview that he does not want to be in a persistent vegetative state and that, if he has another stroke, his wife has promised not to call an ambulance immediately—something that Mrs. Jensen knows will be extremely hard not to do. The multiple strokes—and the last one, in particular—have solidly placed him in a liminal state with limited control of his own narrative identity, which is confirmed continuously throughout the interview when Mr. Jensen asks Mrs. Jensen if what he is saying is actually correct. Paradoxically, it is through placing his trust in the communal narrative that he confirms that he is more than his damaged brain.

Concluding Thoughts

When we share our lives, our everyday imaginations crisscross and become interwoven. We express these imaginations through sharing narratives and the longer we stay together the more conjoined they become. When a stroke occurs, these entangled narratives may become challenged, and sharing a life where communal stories are challenged, often creates the need to reassess one's life. In this article I have approached how such a reassessment following a stroke, may cause the person with whom one is sharing a communal narrative to become increasingly involved, as well as in charge of the construction of the communal narrative.

As seen in the examples, the communal narrative is not simply a negotiation between each of the couples. Mrs. Olsen is in charge of theirs due to her husband's uncertainty; Mr. Olsen continually seeks his wife's help to re-tell their set story. However, his wife reveals her own insecurity about the narrative when she realizes that the stroke cannot explain a change in their everyday lives (e.g., being unable to take their daily walk). Mr. and Mrs. Nielsen have been able to alter their narratives to fit with their everyday life, despite various discrepancies. To a certain degree Mrs. Nielsen has taken over the construction of the communal narrative, albeit not to the same extent as Mrs. Jensen. The latter knows, and to a certain degree owns, the couple's communal narrative and can correct Mr. Jensen if he makes a mistake when telling a story. Mr. and Mrs. Jensen seem to have constructed a story upon which they have both agreed; but Mrs. Jensen uses it to test Mr. Jensen's mental abilities, and the narrative thus gives meaning insofar as Mr. Jensen is able to tell it.

The fragility of shared everyday imaginaries is exemplified when a disruptive event such as a stroke occurs. The narratives through which these imaginaries are continuously affirmed become disordered, and the partner who was not directly afflicted by the stroke is put in charge of the narrative. However, this simultaneously reveals to the partner not afflicted, the inherent construction of the imaginary nature that sustains the couple's communal everyday life. Consequently, the brain of the partner who has had a stroke essentially represents the loss of shared everyday imaginaries.

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Notes

[1] The resemblance between the notion of ”imagined being together” and Benedict Anderson's coining of the phrase ”imagined communities” is intentional (Anderson 2006[1991]). However, the focus in this article is on the constructions of everyday imaginaries between couples, and does not go into the question of the construction of nationalism.

[2] *Flawless* (1999) Joel Schumacher, Hollywood: MGM.

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Culture Unbound
Journal of Current Cultural Research

The Phenomenon of Brain World

Neuroculture in the Making by Patients with Parkinson's Disease

By Markus Idvall

Abstract

The aim of this article is to explore how the phenomenon of brain world, as a symptom of a possible emerging neuroculture, is perceived and enacted by patients with Parkinson's disease, who, in their daily life, are subjected to neuroscience, most often as chronically ill individuals hoping for a cure, but also in some instances as participants in clinical trials. The article is based on a multifaceted ethnographic material that maps the experiences of biomedical research among patients with Parkinson's. The main body of material consists of interviews carried out in 2012 and 2015, and comprises 19 transcripts of recorded conversations, conducted in groups as well as individually. The article argues that the exposure of the patients to clinical neuroscience gives birth to neuroculture. A materialist-discursive phenomenon called brain world—perceptions and enactments of the brain—is problematized on the basis of how patients cope with and reflect on their chronic illness in everyday life situations and in confrontation with clinical neuroscience. The embodied experience of the illness operates as the route into the brain world and also becomes the ground for how this world is featured with specific properties. Brain world is in this respect a contradictory entity: both plastic and fragile, both accessible and too complex, both strange and known. Most of all, brain world, in the eyes of the patients, relates to a territory still dominated by neuroscientists.

Keywords: Brain world, neuroculture, patient perspective, Parkinson's disease.

Idvall, Markus: "The Phenomenon of Brain World: Neuroculture in the Making by Patients with Parkinson's Disease", *Culture Unbound*, Volume 10, issue 1, 2018: 102–115. Published by Linköping University Electronic Press: http://www.culture-unbound.ep.liu.se

Introduction

> It is a dream: to repair a human brain by injecting new cells. In theory, this treatment could cure Alzheimer's, stroke, Parkinson's and other diseases that develop when brain cells die.
>
> In practice, realising the dream starts with work on Parkinson's disease. This is because other neurological illnesses are more complicated, biologically speaking. They affect many different types of cell scattered throughout the nervous system. Parkinson's, on the other hand, mainly attacks one type of cell found in a specific area of the brain. This is why Parkinson's has become something of a test case; it is the most obvious choice of brain disease for trying out a cure with a dose of new cells (Snaprud 2014: 70).

In an article of the Swedish popular science magazine *Forskning & Framsteg*, readers are invited to take a peek into the mysterious world of the brain. A new kind of research into cell transplants aimed at curing Parkinson's disease is presented. Scientists are working with different types of cell: cells from aborted human fetuses and various types of stem cell. The potential future experimental treatment with what are labelled as "induced pluripotent stem cells" (iPS) is illustrated across one page. The computer-generated image shows how skin cells will be taken from a patient. These are transformed into dopamine-producing cells and reintroduced into the patient through brain implantation. The illustration allows us to look into the patient's brain ("look into" with some reservations, since the illustrated brain is a dark and profoundly unidentified area here). We are shown the location of the implant by a cross in the exposed part of the brain. The graphics designer has chosen to write the name of this part: "Basal ganglia". This is the place from which the implanted stem cells—the new agents—will start branching out to replace the neurons that originally released the dopamine now lacking in the patient's brain and body.

Forskning & Framsteg is a great example of how new goals and findings in scientific research are illustrated in popular science (see e.g. Ideland 2002). The magazine opens a window on worlds that are otherwise hidden or inaccessible in people's daily lives. The above example is about the unknown life of the brain. The approach is similar to the way media, a few decades ago, exposed their audience to the inner world of the human body. One of the pioneers was the social anthropologist Emily Martin (1994), who in the 1990s analyzed how scientific knowledge about the body's immune system spread to, and was interpreted by, different sectors of society and popular culture. In a similar way, the inner world of the head—the brain—is now emerging and being explained in different societal contexts. New neuroscientific knowledge about the brain is picked up and used in social, economic and political settings.[1] A multitude of sites and agents in the brain is becoming visible. These sites and agents may be microscopic discoveries, but have epistemological and ontological consequences for people. Together they constitute a brain world and, so to speak, a new part of the human body, and —in extension—a new part of society at large. The basal ganglia, popularized by Parkinson's researchers, is only one of many examples of how different sites and agents in the brain appear in the wake of biomedical research and take on an increasingly important role in societal discussions and contexts related to fighting chronic diseases, improving public health and increasing people's individual capacity.

How important is the development of this new brain world in society as a whole? Is it valid, as some scholars claim, to speak about the emergence of a neuroculture that is transforming our relationship to ourselves, our relationships to who we are and the sort of lives we live? Is there an "emerging neuro-ontology", as suggested by the sociologist Nikolas Rose and the historian of science Joelle M. Abi-Rached, based on a "somatic ethic gradually extending from the body to the embodied mind—the brain" (2013: 22)? Is neuroscience's understanding of the brain becoming a part of how we approach and live our day-to-day life?

The aim of this article is to explore how the phenomenon of the brain world, as a possible symptom of an emerging neuroculture, is perceived and enacted by patients with Parkinson's disease. The patients in their daily life are subjected to various forms of neuroscience (cell transplants, genetics, growth factors, etc.), most often as chronically ill individuals hoping for a cure, but also in some instances as participants in clinical trials. This article focuses on the "materialist-discursive […] performativity" of how these patients relate to the type of expertise matters that they encounter and that they, through their illness and their position as patients, also embody. Within this materialist framing of what neuroculture may be, I refer to the gender scholar Victoria Pitts-Taylor's expression "complexly embrained embodiment" as a foundation for understanding how culture is shaped by "entanglement[s] of matter, measure, and meaning" (2016: 10, 31, italics in original). The material reality that exists in the fact that the individuals are treated for their illness and thereby exposed to different kinds of biomedical intervention (diagnosis, treatments, pharmaceuticals, experiments) is mutually co-productive with the symbols and interpretations that the individuals live by when enduring their disease. A phenomenon such as the brain world thus imposes what Pitts-Taylor calls, "an onto-epistemological approach, one that takes questions of being and knowing as inseparable" (2016: 20).

The results presented here come from an interview study with Parkinson's patients in which the idea of a brain world appeared as an additional topic. The interviews were intended to deal with issues of informed consent and patient power in connection with clinical trials. However, the idea of a brain world was so important that it supplanted to some extent the pre-established topics of discussion that were focused on patient information, consent procedures and medical staff-patient relationships, in care and clinical trials.

The discussion below starts with a brief description of the fieldwork. Thereafter, focus is directed onto how accounts by the patients of the loss of dopamine in the brain become a material route into the brain world. I then explore how the individuals relate to this new, strange world. On the one hand, it is a world that belongs to—and is contingent on the experiences of—the patients. On the other hand, this world's visibility and accessibility depends heavily on medical expertise and technology. Finally, the possible significance of the concept of "neuroculture" is presented, and how it is linked to the phenomenon of the brain world.

Material and Methods

This article is based on a multifaceted ethnographic material that reflects the experiences of biomedical research among patients and research subjects. The main body of the material consists of interviews carried out in 2012 and 2015, and comprises 19 transcripts of recorded conversations, some of which were conducted in groups while others were conducted individually. In total, 32 persons with Parkinson's disease participated in the conversations. The participants were from 35 to 80 years old and included both men and women. The majority were men in their 50s and 60s.

The group conversations took place in focus groups. They were carried out in 2012 within the framework of a multidisciplinary research project called TRANSEURO.[2] Three focus groups, each consisting of 5-6 participants, of Parkinson's patients were formed to discuss the topic of experimental medical treatments.[3]

The individual interviews with Parkinson's patients were conducted in 2015 within a project in the research environment BAGADILICO.[4] Sixteen people were interviewed about their experiences in taking part in clinical trials within Parkinson's research. Relatives of the patients also participated in eight of the interviews.[5]

This article is based also on material from a handful of observations made in my subjects' own environments. Further, it draws on books and articles in which people with Parkinson's describe their experiences of the illness and of medical research.

The Route into the Brain World

The materialist-discursive route into the brain world of Parkinson's patients is founded on current biomedical explanatory models, which were established in the 1950s and 60s through scientific research in Sweden and Austria (Palfreman 2015:26-28). The current theory of how Parkinson's develops is based on the role of dopamine deficiency. When the neurons that release dopamine in a healthy brain die for some reason, dopamine in the brain becomes deficient, and the various symptoms of Parkinson's disease—rigidity, tremor, freezing—develop (Hagell 2004: 78-79).

The route of Parkinson's patients into the brain world starts when they embody the biomedical explanatory model that identifies a lack of dopamine in the brain as the cause of the disease. The route of patients differs from that of medical experts (doctors, scientists). The patients may focus on dopamine, but transform the explanatory model into an entity other than the conventional diagnosis model—an entity that is vaguer and more individual than the original medical model. According to how medical anthropologist Arthur Kleinman (1980) has described how ill individuals cope with disease, a lay explanatory model forms the basis of how individual Parkinson's patients interpret their illness, while they allow dopamine (or rather the lack of dopamine) to become a guide into the brain world. In the illness explanations adopted by Parkinson's patients, the brain world emerges as a critical inner area for the disease. When these individuals learn that the origin of their illness and somatic symptoms is situated in the brain, the fleshy organ becomes a complexly embrained embodiment, subject to different types of interpretation and understanding: it becomes a materialist-discursive brain world (Pitts-Taylor 2016: 10).

The onset of Parkinson's, which is so crucial for the route into the brain world, is often described as gradual and insidious. Patients frequently refer to a specific day on which the diagnosis was given, but suggest that they had probably been ill for a long time without knowing it. There had been signs that something was wrong. A twitching finger or a leg that felt weak. In retrospect, this can be traced to the progressive death of nerve cells. In line with this, a woman who was diagnosed when she was in her 40s and had felt signs even earlier, explained that the symptoms did not become noticeable until, according to her calculations, 50 per cent of the neurons that release dopamine had disappeared. Another woman, who was in her 50s at the time of the interview, and who had been diagnosed a few years earlier, considered whether she could herself have caused the successive disappearance of nerve cells through her lifestyle. She told me that she was hooked on "kicks" even as a child. For example, she loved going on rollercoasters. And as an adult, she still has an attraction for kicks. After the diagnosis, she wondered whether this obsession has tired the brain and driven the cells away.

As a consequence of these queries, she is now trying to live in a way that does not exhaust the brain. At her place of work, for example, she does not want to learn the new business system that her employer is introducing. Learning a new system would be too big a strain on the brain, she says. In her view it might accelerate the progression of the disease.

A drug against Parkinson's was developed in the 1960s, following the discovery of dopamine a few years earlier. Levodopa, or L-dopa, as this new medicine was called, turned out to be an effective treatment that compensates for the lack of dopamine and alleviates the motor symptoms (Hagell 2004:79). L-dopa revolutionized the lives of patients. Suddenly, it was possible to treat severely ill patients. However, it was soon discovered that L-dopa is associated with a number of side-effects and complications for Parkinson's patients. In particular, the medication causes what are known as "dyskinesias" or "hypermobility" in many patients. In his book *Brain Storms*, Parkinson's patient and journalist Jon Palfreman summarizes the breakthrough period with L-dopa as follows:

> While L-dopa was vastly superior to what came before, the drug fell far short of being a cure. On the one hand, the L-dopa allowed "frozen" wheelchair-bound individuals to walk again and increased patients' life expectancy. On the other hand, virtually all patients taking levodopa were sentenced to future disabling motor complications (Palfreman 2015: 33).

For people with Parkinson's, the brain world is not just the area in which the disease originates. It is also a reception and target area for the various agents that are going to replace the lost dopamine. In this role, the brain world is an uncertain and diffuse environment for the patient. None of the dopamine replacements are ideal, and the uncertainty surrounding the replacement of dopamine becomes a central part of how patients experience their own situation. One man, who had sat silent during much of his focus group, suddenly said that the medication had affected him so strongly that he had had periods with such horrific nightmares that he fell out of bed. Another man, who had lived with his illness for around ten years, revealed in an individual interview that the medication had caused him to become addicted to computer games for some time. He managed his work, but spent all his waking hours at home playing. This resulted in a broken marriage. At the time of the interview, he was still heavily medicated, but he was happy that he had managed to stop taking the drug that had changed his personality.

The brain world of the patients is also reflected in their striving to find new ways of feeling better through new medication. An alternative to L-dopa for a patient with recent onset are the agents known as "dopamine agonists". Their effects on the Parkinson's symptoms are less than the effect of L-dopa, but they are often used when a patient experiences motor problems. The biological mechanism of these agonists differs from those of other medications. While L-dopa, for example, is converted to dopamine after entering the brain, the agonists activate receptors in the brain that produce dopamine.[6] One interviewee, who had been prescribed this medicine, explained that the agonists take a different path than dopamine in the brain—they take what she called "shortcuts". Jon Palfreman describes the agonists as follows:

> They pass freely through the blood-brain barrier and actually trick the receptors in the striatum [a part of the cerebrum] into action. While the brain isn't actually receiving dopamine, it "thinks" it is and reacts accordingly (Palfreman 2015: 33).

The route into the brain world often starts with an understanding of the brain as a malleable organ. This plasticity corresponds with the neuroscientific view of the brain (cf. Doidge 2007). Accounts by patients of how they handle illness are colored by an imaginary world in which the brain is believed to be what Rose and Abi-Rached call "a site of choice, prudence, and responsibility for each individual" (2013:52). "Exercise improves the grey matter", says one interviewee, who has started a training group that meets several times a week. The interviewee's explanation for this initiative is that exercise, in this case aerobics, significantly increases the blood supply to the brain. The assumed benefit from an active lifestyle is that one can free oneself from the drugs that have proved to have many side-effects after long-term use. Boxing as an antidote to excessive medication is another form of training mentioned by Parkinson's patients during the fieldwork. One man, who was diagnosed in his 40s, has been boxing several times a week for the past few years. He describes how his use of medication has been significantly reduced since he started training. He is now working actively to promote this particular form of training to other people with Parkinson's in Sweden.

Ironically, boxing has been linked to neurological disease, and is one of the sports that neuroscientists have warned against in the Swedish public debate (see e.g. *Aftonbladet*, 16 June, 2013). The legendary boxer Muhammad Ali (1942-2016) suffered from a type of Parkinson's and serves as a warning example for how damaging boxing can be to the brain. When people with Parkinson's box as a form of exercise, however, no punches to the head are allowed.

A World with Specific Properties

The anatomy of the brain has been more or less known since the mid-19th century, when neuroscience defined various regions of the brain and contributed to their mapping and characterization (Rose & Abi-Rached 2013: 62-63). Parkinson's patients sometimes use scientifically-based terms such as "Broca's area" or the "thalamus", but more often describe the brain as something strange and yet also a part of oneself. A woman of around 75 years of age, who was diagnosed with Parkinson's when she retired and is now beginning to feel limited by the disease, considers the brain to be a "mystery", and like "another planet".

Irrespective of the words they use, Parkinson's patients describe the brain as a relatively fragile and delicate world (They are joined in this opinion by the neuroscientists who oppose boxing). The aforementioned man, for example, who gathers his Parkinson's friends for training, supposes that "if something is injected into the head, it will affect both this and that". Another of my interviewees—a woman who has lived with Parkinson's for more than twenty years and who would personally be very hesitant to take part in invasive brain research such as cell transplants—associates brain surgery with "rooting around" in the brain. In other words, she considers the brain to be a fragile world, where researchers dig around during their operations. The brain seems to be a vulnerable area, which must be protected from too much interference, as there is a risk that the changes that follow surgery are too great. One interviewee illustrated the risks involved with brain surgery by telling me about two persons who had undergone the same type of operation, deep brain stimulation. This treatment involves electrodes being inserted into the brain to stimulate activity in specific sites, and to counteract the hypermobility associated with Parkinson's. My interviewee, who suffers from a relatively mild variant of the disease and who was not personally interested in any form of extensive surgery, told me that one of the two patients became well, whereas the other suffered a brain hemorrhage. Further, another of the interviewees emphasized the difficulty of finding the correct site for intervention in the brain. He participates in clinical research and says he does not believe it is possible to operate on the brain without affecting or disturbing its environment. The brain world is thus an interconnected territory in which every intervention, despite all possible precautions, has an effect in some direction or to some degree. From the perspective of the interviewee who participates in clinical trials, the effect on the brain can be both diffuse and unpredictable. Therefore, the interviewed man claimed that researchers who study consciousness and thoughts—psychologists—are needed in addition to researchers who investigate the physical brain—neurologists—when carrying out research projects that involve invasive procedures.

The fact that the brain is subjected to surgical procedures despite it being so vulnerable leads to a certain fascination among Parkinson's patients regarding interventions such as cell transplants. One patient whom I interviewed, who was not himself a research subject at the time, took an interest in clinical trials. He said that he had recently seen an operation involving a brain cell transplant on television. He told how "they went in with a large needle into the brain and found the exact site where the cells were to be placed". To him, this was the opposite of "rooting and digging" in the brain, as the operation was carried out with ultimate precision, skill and decisiveness in a fragile and vulnerable environment.

The brain world of Parkinson's patients is not only vulnerable and fascinating, but also constitutes a container for different sorts of "gear" that may help the body in its movements. This becomes evident when talking about the type of operation mentioned above—deep brain stimulation (DBS). The operation involves implanting what is known as a "neurostimulator" together with electrodes into the brain. A battery under the skin supplies power for the system, which sends electrical impulses to the brain from the implanted neurostimulator. The aim of the treatment is to free Parkinson's patients from their hypermobility. This is exactly what one of the interviewees experienced after her DBS operation. Before the treatment, she had severe problems with involuntary movements. People stared at her in public places, which caused her suffering. The operation made a great change in her life. The DBS implant supplies her brain with impulses, and gives her a concrete somatic experience. The fact that the DBS system can be switched off brings home even more intensely the feeling that the fully furnished brain, rather than the uncharged empty one, is the best friend of a body that moves normally. The interviewee has a folder at home with data about how the DBS system that she has implanted in her brain works and which settings have been made. She takes the folder with her every time she visits her neurologist, as if to show both herself and the doctor how her body's normal function depends on the brain being fully charged and equipped.

Images of one's own brain also create tangibility and a type of access into the brain. A handful of the interviewees have participated in invasive brain research related to cell transplants. One male research participant, who was later allocated to a randomized control trial, remembered that he had to do something with a joystick while lying in the MRI scanner[7] so that the researchers could "measure different movements in the brain". He added jokingly: "If you fall asleep during the scan, the result will be a bit strange".

The brain world thus appears to Parkinson's patients as something real. It is neuroculture in the making. But, what are the consequences of this neurocultural phenomenon for how these individuals relate to science and scientists? The next section discusses this question.

Privileged Territory for Researchers

The concept of the brain world is a form of lay knowledge about the brain among patients, and it seems that the more informed patients are about their illness, the more they can interact on equal terms with their healthcare provider. This corresponds to an ambition within the healthcare system for greater patient participation in patient-provider interaction both in Sweden and elsewhere. This ambition, however, is not as strong in the interviewees when it comes to their role in neuroscience. Several of them distance themselves from the idea that research subjects can form a partnership with scientists in the same way that patients act together with doctors and nurses in determining the course of treatment. Interventions in the brain are linked to possessing and managing certain knowledge—scientific knowledge about the brain—that the interviewees say they lack. This, therefore, automatically reduces their possibilities of participation on equal terms.

The brain is described as utterly complex by my interviewees, which is compatible with the lack of ambition described above. In the words of one of them, what the brain does—to provide a location for the embodiment of mind— makes it “cleverer than computers”. The complexity with which the brain is associated becomes an obstacle for the way in which the interviewees approach science. In their eyes, the brain is a world that is not fully accessible for anyone who lacks the scientific expertise required to understand it. In essence, it seems that the brain is too complicated for people in general to comprehend. The brain becomes instead the privileged territory of researchers. The brain world, in contrast, appears to be more accessible, since it is the negotiated contact surface that patients can use in their encounters with research (and the healthcare system).

Thus, most of the Parkinson’s patients who were interviewed did not believe in equality between researchers and patients. One woman explained, both with gestures and words, that research is “up here, and we are down there”. Another interviewee said that “brain research is too technical”, a sentiment with which her husband agreed. As non-specialists, this couple felt that they were completely in the hands of doctors and researchers. If they were to try to contribute something to brain research, it would inevitably be just a “superficial opinion”. Therefore, they did not believe in patient participation within research: “It is too specialized, and at a level that is unknown to us”.

Some interviewees even believed that greater patient participation within neuroscience is not a goal to strive towards since this kind of development would be unsafe for the performance of research. These individuals felt that limiting the researcher’s control by patient participation would pose a risk for how science can be productive.

However, some dissenting voices were heard. One of them belonged to an individual who is known for doing research within the Parkinson's field. This person has also participated in medical research projects both as an expert and as a research subject. However, none of these projects involved invasive brain research such as cell transplants. In the person's own words, it was what is seen as "less sexy" research that focuses on how to live with the disease rather than how to find a cure for it, which is assumed to be the goal of cell transplantation research. Paradoxically, this example illustrates how inaccessible brain research is for Parkinson's patients, even for those with a relatively good insight into the field. The brain that is "agentic" (Pitts-Taylor 2016: 60) in its complex materiality and biology demands that interventional operations of any kind must be made at micro-levels. These levels are invisible and inaccessible for people in general, but not for scientists who handle the technology and hold the knowledge that enables them to intervene into this materiality.

The Brain as Cultural Imaginary

The concept of neuroculture has been launched by several scholars who have pointed to the growing strength of neuroscience in recent years and how an increasing fascination and focus on the brain as a part of society has emerged at the same time (Vidal 2009; Rose & Abi-Rached 2013). It is, however, not clear what will be included in the concept of neuroculture. Will it be about increased general awareness of the brain's function and significance? Is it about a new type of cultural practice emerging among different groups and interests in society? Is it a new way of approaching issues of health, lifestyle and identity? Or is it about further aspects that we cannot yet grasp?

In this article, I have given some examples of how Parkinson's patients talk about processes and changes in their own bodies, which they link to the brain. I suggest that the embodied perspective of the brain that is articulated by the Parkinson's patients is an example of how neuroculture is emerging in society. This culture is materially anchored and symbolically shaped by complexly embodied individuals in different contexts. It is hierarchically stratified and constituted, in the sense that the interviewees regarded the researchers as the primary brain experts and interpreters, while they played down their own competence and significance in the field. At the same time, the patients' accounts contain a map of different sites, routes and agents in the brain—a world that enables the brain to emerge as more accessible and visible than ever before. Ideas about dopamine were the route into this brain world for people suffering from Parkinson's disease. Discussions about the lack of dopamine triggered awareness about the various mechanisms and properties of the brain. The patients referred to what is both fictional and true; to a brain world that concurrently represents strangeness, vulnerability, fragility, electricity, accessibility, and complexity.

The accounts given by patients thus contribute to a neuroculture by becoming building blocks in a new cultural imaginary, where the brain—its materiality, structure, function, significance and ethic—is in focus. Whether this new movement can be used as an empowering tool in society and in research remains to be seen.

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Notes

[1] For an overview of this development, see e.g. Rose & Abi-Rached 2013, Pitts-Taylor 2016 and Hansson & Idvall 2017.

[2] TRANSEURO, standing for "Neural Transplantation in the Treatment of Patients with Parkinson's Disease", started in 2010 and was set for realizing a small number of clinical trials with neural cell transplantations originally in England, Sweden and Germany. TRANSEURO is still active and is mainly a biomedical program (see www.transeuro.org.uk, 5 January 2018), but has also involved for some time a group of social and cultural scientists focused on issues of ethical governance (Idvall 2017b: 130-132).

[3] The TRANSEURO study, moreover, included three focus groups consisting of relatives and non-affected individuals representing the views of the public. The focus group study has been discussed in two publications (Idvall, Wiszmeg & Lundin 2013; Idvall 2017b).

[4] BAGADILICO, or "Basal Ganglia Disorders Linnaeus Consortium", is a cross-disciplinary research environment at Lund University focused on biomedical investigations of Parkinson's disease and Huntington's disease. It was formed in 2008 and includes a cultural scientific group, which has published three central books (Liljefors, Lundin & Wiszmeg 2012; Hagen 2013; Hansson & Idvall 2017; see also www.med.lu.se/bagadilico, 5 January 2018). My own participation in this cultural scientific group was based on a three-year grant from the Swedish National Research Council (*Vetenskapsrådet*), 2014-2016.

[5] Preliminary results relating to Parkinson's patients' tendency to synchronise their own time with that of research and thereby, if appropriate, accept recruitment to the studies, are found in Idvall (2017a, 2017c).

[6] https://en.wikipedia.org/wiki/Dopamine_agonist, 2018-02-22.

[7] MRI, or “magnetic resonance imaging”, is a radiology-based medical technology that produces images of the inside of the body.

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Culture Unbound
Journal of Current Cultural Research

The Hamburgers in the Fridge:
An Interview with Professor Nikolas Rose about Interdisciplinary Collaboration, Neuroscience and Critical Friendship

By Kristofer Hansson and Karolina Lindh

During 2016 and 2017 the Cultural Studies Group of Neuroscience at the Department of Arts and Cultural Sciences at Lund University in Sweden organised a seminar series titled the 'Seminar on Neuroscience, Culture and Society'. Professor Nikolas Rose was one of the invited guest speakers; he is a researcher who strongly influences cultural reflections on neuroscience (Rose 2007, Abi-Rached & Rose 2010, Rose & Abi-Rached 2013). He visited us on the 22nd of March 2017 and during his visit Kristofer Hansson and Karolina Lindh took the opportunity to interview Professor Rose to hear more about his thoughts and experiences of interdisciplinary collaboration between neuroscience researchers and researchers in the social sciences and humanities.

Question: *Today you find neuroscientific knowledge almost everywhere, not only in the laboratory. You have written extensively about this, and in your article "The Human Sciences in the Biological Age" (2013), you write that social scientists and medical scholars should engage in a critical friendship. We would like to know a little more about this; how do you envision such a friendship?*

Nikolas Rose: There have always been psychological explanations and arguments about the brain, circulating outside the scientific literature. The real move of neuroscience out of the labs happens in the 1990s and 2000s, when some neuroscientists start to argue that they have expertise that can be relevant in a whole range of different disciplines. In a sense, these are all those disciplines that psychologists have already colonized, if you want to put it like that. Some neuroscientists argue that they can give more objective explanations or more objective underpinnings of explanations in those domains—the obvious one is clinical psychiatry—but you see this in education, legal system and in a range of other places.

Hansson, Kristofer & Karolina Lindh: "The Hamburgers in the Fridge: An Interview with Professor Nikolas Rose about Interdisciplinary Collaboration, Neuroscience and Critical Friendship", *Culture Unbound*, Volume 10, issue 1, 2018: 115–122. Published by Linköping University Electronic Press: http://www.cultureunbound.ep.liu.se

Sometimes it is entrepreneurial individuals who want to make the claim to have impact, certainly in the UK and in the United States. But these days the argument that your research has impact in the real world is central to doing well in assessments for promotion at Universities, and central to getting research funding. You have got to say that your research is having or will have an impact. The good side of that may be that neuroscientists are directing their attention towards important practical issues, but the bad side of it may be that neuroscientists are tempted to make exaggerated claims about the implications of their work for domains that they do not really understand. I think the legal system is one of those domains. Arguments about volition and free will have always played a key part in the criminal justice system, and some neuroscientists began to argue that because of the unconscious shaping of apparently willful volitional actions, this should really radically transform the way in which the criminal justice system operated. This wasn't only a very unwarranted extrapolation from the laboratory experiments to real-life situations, but it showed considerable ignorance about how legal systems worked.

So, the critical bit of the critical friendship is to try and inject a little more realism into these extrapolations, especially from clinical experiments or laboratory experiments with animals. The friendship side of it is to say that there is nothing for social scientists to be afraid of in the emergence of neurobiological accounts of human conduct. It is not as if, the limits of how it is possible to understand human beings come from psychology, which is folk psychology of sociologists—they mostly just think of human beings as psychological creatures with wishes and intentions and biographies and so forth. You will know, if you have done the history of psychology, that all those beliefs about what humans are like are quite recent, dating back to the 19th century. So, there is no reason why social scientists should say that "well, that's the right way to understand human beings and any other way is a great threat to that". The friendship is to try and encourage those kinds of relationships, the critical side is to do this without the over-claiming the neuroscientists often do.

But the more epistemological part is based on an assessment of how neuroscientists do their work. Because, since the emergence of neuroscience as a kind of label, in the 1960s, the argument was always that neuroscience should start by trying to understand the very basic components of the most simple systems, the most simple organisms at the most basic level. To take Eric Kandel's work on memory, done with the Californian sea slug that has about twenty thousand rather large neurons, is one example of this kind of neuroscientific research. You can make this Californian sea slug learn something—when its gill withdrawal reflex is repeatedly provoked, it will 'habituate'—and then you think you are understanding something about the basic elements of memory. Your challenge is then to scale that up from the sea slug to the rat, from the rat to the macaque, from the macaque to the higher primate and from the higher primate to the human; and from the single neuron to the billions of neurons and synapses in the human brain. It was almost as if that scaling up was a technical task, whereas I argue that it is the wrong way to conceive of the issue. This is a more difficult kind of critical friendship, because it is criticizing some very basic assumptions of experimental neuroscience. It is arguing that whatever you understand at this reductionist level, you need to recognize that this is only a first step, and that you need to put it back into the organism as a whole; and you have to understand how it works in the organism as a whole. This is not a novel thought! Claude Bernard, in his book on experimental medicine, agues exactly that; the researchers should never ever forget that if they are isolating things in the laboratory, what they really are trying to understand are complex organisms in their world. That is the more difficult part of the critical relationship because it requires not just a rethinking of experimental practice, but a rethinking of the object—the object that the experiment is directed towards.

Question: *It is really interesting to see the two terms critical and friendship together. We have this long history in the social sciences and the humanities with critique; for example Ivan Illich and Michel Foucault. Then we have the term friendship that we see more as a metaphor. We think that you point out that we in the social sciences and the humanities should also engage in this kind of friendship.*

Nikolas Rose: Yes, I suppose it depends how attracted one is to the posture of critique. I think what Foucault did was more description than critique. I would like to think that that kind of work, genealogical work, is not itself critique, it is designed to make criticism and critique possible. Because you uncover the way in which the machinery, the apparatus, the complex sets of connections amongst things work; what they bring into existence and how they have emerged just directly; how they function, what the consequences are. Once you have begun to describe that set of relations, how they come about and what they produce, you are in a position to make critical evaluations of them and these are in many ways political and ethical evaluations about the kinds of people you would like us to be, the kinds of things you think are good for humans and so on. But they don't spring fully formed out of the description. It is a bit Weberian, you go into studying an area because you are passionate about a set of problems, but you leave your passion at the door in order to understand what is going on; then you bring the passion back in the end. Just continually saying what is wrong with things and how naive people are, and how scientists do not really understand their own assumptions—I do not find that a particularly appealing posture. I would also argue that most work in the life sciences is probably more sophisticated, more subtle, more difficult to achieve than the work of most social scientists. It is quite difficult to makes things true in the life sciences. In social sciences it's not so hard to make things true if you have a lot of convincing rhetoric and you can mobilize enough supporters in the circles around you. This is why I think it is necessary to go beyond critique. The friendship bit of it, is to say that the questions that the researchers in the life sciences are trying to understand are often important questions. One might want to work with them to understand those questions. To try and work on the assumption that they are well-meaning individuals just the same as you are, rather than to start from a hermeneutics of suspicion about what they are doing, that they are only in for the money, for the influence, for the research papers and so on. They probably are in it for all those things as well, but no more than the social scientists.

Question: *How do you work with medical researchers in a more practical way? What does your research practice with medical researchers look like?*

Nikolas Rose: There are many different ways of doing it. I have students, especially research students who work as anthropologists with life scientists of various sorts, for instance with people who work in synthetic biology. They have labs and my research students go and embed themselves in the labs, they sit in and they take on some roles, they do some of the work and they get trained up in various ways. They sit in the lab meetings but they are not just passive observers, they to ask people questions like: why do you think that is important? Why are you doing that? What is the role of that experiment? How does that experiment link to this experiment? Why is this specific part so important to understand? In particular in some of these emerging disciplines, there are still many un-answered questions and different points of view and actually some of the researchers find it rather useful to be asked to think and speak explicitly about these issues.

In the current research that I am doing, I try and work with life scientists right from the beginning of developing of the research. In the work we are doing on mental ill-health in cities, for a whole range of reasons, stress was one of the issues that kept coming up, so we started reading some work on stress. We identified the person who was working in my institution, who was the guy most enthusiastic about stress research, and we went and talked to him about the research that we were doing. Partly to learn the protocol that he was using to measure cortisol levels as an index of stress, partly to see what he felt about the experiment that we were doing. He became interested in this experiment and became a collaborator in the research. Although we have not got to the stage now of writing the papers, we will probably co-author some of the papers. The same with how we are developing this app to assess mental states in city space and time. The app was developed by someone in an early intervention psychosis unit to monitor the mental state of those who had a first psychotic episode. We saw the app, we thought it would be very good to monitor mental states in the migrant populations that we were studying, and we went to talk to him. We started to work with designers; they are interested in space and how space might affect people's experience of being in cities. Our psychiatrist colleague is usually a lab researcher; he is finding it kind of fascinating to think about these broader issues. But people thinking of these broader issues are also fascinated to think about how this stuff gets into the brain.

So, if you can get people excited about something, you work together. It does not mean that you will not argue about it; especially about methodology! The first question most scientists ask is: "This is the experimental group, so where is your control group? How much data are you going to have? How many variables have you got? If you have got those number of variables, you need to have at least this number of subjects in your experimental group, and at least these number in your control group, in order to power up the statistics". Those of us who are into sort of street level of ethnography think that "oh no there is no way we are going to get something like that, 500 subjects and 500 controls". We then have interesting discussions about whether it is possible to get any data that is robust data from these kind of quasi experimental technologies, quasi experimental research designs.

It is also relevant, that how you work across the disciplines differs according to, to be crude about it, agent status. For a young social scientist, it is quite prestigious to be able to work with a life scientist and publish in a collaborative way. For a post-doc life scientist, it's not at all prestigious to work with a social scientist and publish in "Body and Society" or something like that. They are not going to get their tenure because they published in "Body and Society"; so there are real differences. When you are senior in your career and you have nothing to lose, then it is easier to collaborate. You know, you don't need to build up your CV, you are not really worried about getting another big grant or something like that. You are free to experiment in a way that you are probably not if you are at an earlier stage in your career.

Question: *But if there is no friendship?*

Nikolas Rose: Then there is no collaboration. If people do not trust one another and they do not find it interesting to talk to one another and they do not feel that they can talk frankly about the problems without it immediately becoming critique.

Because there are many problems, as we, as anybody who has done research knows. From the very beginning you run into all sorts of problems, you make all sorts of mistakes. You try and learn from your mistakes and correct things, but it does not look at all like it looks when you write it up for the article, you know it is a much messier process. Unless you can begin to talk about that frankly, without thinking that whoever you are talking to is going back and talking to their friends saying, "Oh do you know professor so and so, he really does not understand x, y and z". Unless you can have a relationship of trust, then it is not going to work. Certainly, for the medics and the life scientists, you are pulling people out of their comfort zone, you are pulling them out of what they know. And you are pulling them away from the things that they know are going to be the conventional ways of advancing their research trajectory and their research career. There has got to be something interesting and enjoyable for them to be doing there. Whereas most social scientists think it is a good thing to be working with a life scientist, it is fun and enjoyable and we are studying them. They usually do not like being studied! They do not like being our rats! In one of the very first collaborations I was in with some geneticists, I was trying to make them understand why they might want to work with us, and the person who was in charge of the genetic side, she said, "Well, what he is trying to say is that we are his rats!" They thought that was funny but they did not like being the rats.

Question: *During your lecture yesterday, you were talking about labs and experiments and we were seeing that as metaphors, how you were talking of trying to do new things without knowing whether it will turn out right or not. We really liked the metaphors of seeing ourselves as doing some form of experiments or being in lab or so. Could you elaborate a little bit on that?*

Nikolas Rose: I think there are experiments in a number of different ways, but I do not think they are entirely metaphors. It depends on what you mean by an experiment. So, part of the experiment is this: is it possible for a group of social scientists and a group of life scientists to come to a common understanding of what a problem is, a common agreement as to a set of research protocols and a common agreement as to how the data should be collected, interpreted and analyzed. To some extent, this gets to be formalized: if you are going to do an experiment or doing any work which involves human subjects, you have got to put it through an ethics committee. And if you put it through an ethics committee, you have got to make a lot of the things about your protocols explicit, so the group actually has to sit down together and say "right, are we all prepared to sign up, we are doing this, we are doing this, we are doing this and we are doing this...". Is it possible for people to actually agree? In our experiment we have seen that it is possible for people to agree, as far as getting the protocols and the empirical research are concerned. But we do not yet know whether it is possible to get people to agree when you get the different findings together, as to which findings are important and which are not important, which bits you can discard. This is partly because we have got multiple methods going on. So that bit is experimental. And then, I suppose, the whole approach is experimental. Is it possible to take this idea of a collaborative biosocial or sociobiological approach to a question, to a problem to operationalize it, to carry out a piece of research, to draw conclusions which have some practical consequences? Is it actually possible to do that? It is possible to do a thought-experiment that you can do it. It is possible to write a manifesto that says; “It should be done!” But whether it is possible to take a particular question and make it researchable and do the research; that I do not know.

Now, I do know from years and years ago, when I was a baby biologist, that, especially if you are a baby biologist and you are trying to do experiments in the lab, they fail all the time. You have not got the reagents right, it is the wrong temperature, you have put it in the wrong place, somebody turned off the fridge, you forgot it was a long weekend and you came back on the Tuesday rather than on the Monday and everything had gone to hell and somebody had left a hamburger in the fridge because they were going eat it the next day and it polluted everything. All you know is that your experiments failed. You try and find the different reasons, was it the hamburger in the fridge, was it the wrong reagent? Then you try it again, and gradually you begin to learn what makes a difference and what does not make a difference. And if you are fortunate you make the thing work, but you do learn from the failures. You do learn, “Ah, this reagent only works if you have the temperature between 18 and 22 degrees. If it is 15 degrees it is not going to work and if it is 24 degrees it is not going to work”. So, you learn something, that the concentration of the bugs has to be like this, etc. All of this which is usually quite tacit knowledge, which you acquire in becoming a skilled experimenter: you know the craft work of doing it. You learn from the failures. To be a sociologist you also go through a long period of training. My sociology students, they start going out in focus groups and things like that in the first year. They design questionnaires and the questionnaires fail because they have leading questions and things like that; over four years they learn through their failures how to do it. It would not be surprising, that in even more complex situations when you are using the techniques from different sorts of disciplines, a lot of the time it is going to fail. “Oh, we did not realize we could not make the correlation between what you were getting in this rating scale and what you were getting in the app because they were using different definitions of stress” or whatever it happens to be. But you hope to learn; it is not trivial to say that you learn from the failures.

Question: *Do you think that if we use the hamburger and the fridge, as an example, do you think that we can come together as social scientists and natural scientists to focus on our mistakes?*

Nikolas Rose: I hope we are not the hamburgers in the fridge! I think as long as social scientists realize that when they identify the craftwork that is required to make an experiment in biomedicine work, that that is not a critique of the experiment, the craftwork is how you make the experiment work. As long as we are prepared to engage and not be ironic all the time about it. As long as we are prepared to do it genuinely, to actually think together. It also depends on whether there are questions or problems that you think can only be adequately understood through this collaboration. I do not think it is something that you should do just for its own sake, because it is good to collaborate, "oh let us collaborate". I do not think that is a good reason for doing it. But I think that if there are specific questions of importance that can only be understood by bringing these things together, then it is worth doing. I personally think that questions of mental ill health can only be understood that way. Then it is worth trying to do it and see what happens.

Question: *Thank you for your time and thank you for answering our questions!*

Nikolas Rose: Thank you!

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Culture Unbound
Journal of Current Cultural Research

Interdisciplinary Entanglements: A review of *Rethinking Interdisciplinarity across the Social Sciences and Neurosciences*, by Felicity Callard and Des Fitzgerald (2015): Palgrave Macmillan

By Rachel Irwin

In the 1987 cult classic film, *The Princess Bride*, Vizzini repeatedly uses the word "inconceivable" until finally Inigo Montoya says to him 'You keep using that word. I do not think it means what you think it means.' In very much the same way, stakeholders in the research process—funders, researchers, supervisors, university rectors—keep using the term "interdisciplinary", seemingly without quite understanding what it means.

The ambiguity in the implementation of the term "interdisciplinary" is the starting point of *Rethinking Interdisciplinarity across the social sciences and neurosciences* by Felicity Callard and Des Fitzgerald. The book is largely auto-ethnographic, as the authors reflect upon their personal experiences in the field of neuroscience. They describe their involvement in a number of specific interdisciplinary collaborations, including the Hubbub project which explored 'the dynamics of rest, noise, tumult, activity and work, as they operate in mental health, the neurosciences, the arts and the everyday (Hubbub, n.d.).'

Callard and Fitzgerald discuss how the research environment for neuroscience is unique. The terrain of neuroscience deals with 'minds, brain, and their environments' and addresses 'many of the most pressing societal questions of our age.' Neuroscience also lies at the nexus of classic debates on nature versus nurture, thus benefitting from interdisciplinary perspectives. Practically, the authors discuss that in the late 2000s and early 2010s, there was a confluence of interest in interdisciplinary research in neuroscience, and they highlight the role of funders such as the Volkswagen Foundation and the Wellcome Trust, amongst others. Yet, despite situating this book in a particular social field in a particular time and place, insights on interdisciplinary research apply to medical and public health research more broadly; and the book is written in a way that is applicable to any type of interdisciplinary collaboration.

Irwin, Rachel: "Interdisciplinary Entanglements: A review of *Rethinking Interdisciplinarity across the Social Sciences and Neurosciences*, by Felicity Callard and Des Fitzgerald (2015): Palgrave Macmillan", *Culture Unbound*, Volume 10, issue 1, 2018: 123–127. Published by Linköping University Electronic Press: http://www.cultureunbound.ep.liu.se

In discussing their experiences of interdisciplinary research, several key points emerge:

1. Too often, interdisciplinary research is, in fact, multidisciplinary. That is, in a given umbrella project, neuroscientists and social scientists may tackle a research problem from their own epistemological and methodological starting points, and then come together and share insights in a final conference or workshop. Alternatively, social scientists and humanities researchers may be called upon to give context to quantitative research. Instead, the authors call for a 'more fractious kind of interdisciplinarity' that 'brings together epistemological and ontological domains—within and across the life sciences, interpretive social sciences and the humanities.' Certainly, the authors are not suggesting that a social scientist with no clinical research experience start reading MRIs and that a lab scientist do ethnography. But they do call for interdisciplinary research groups to 'entangle' themselves in the 'methods, logics and principles' of each other's disciplines (115).

2. The space of interdisciplinary research is a significant problem in its own right (28-29). Interdisciplinary research is a social field and the authors suggest viewing this space as a legitimate research object (62). For instance, the authors reflect upon the very modes and means of working, focusing on the range of apps and platforms used to communicate, store and share material amongst researchers. (228). Here a strength of the book is its thick description. Callard and Fitzgerald's accounts of their experiences are very detailed—leaving no social interaction unanalysed. Furthermore, the authors invite the reader to analyse and to learn from the emotions of the field, particularly the unease and 'unsettledness' that one may feel during interactions with colleagues from other disciplines (see point 4).

3. **There are practical challenges to interdisciplinary research—but the risks may be exaggerated.** A key challenge is for researchers to gain an in-depth understanding of the literature in multiple fields. This extends to the 'publish or perish' culture of academia, and the authors note that many journals are hesitant to publish interdisciplinary work (Byrne, 2014 as discussed in Callard and Fitzgerald, 2015). Similarly, funding schemes are often targeted towards single disciplines. The authors describe the challenges they have faced with reviewers of journals and funding applications—if a biologist and a social scientist are asked to review the same application, the two reviews may come to vastly different conclusions. Callard and Fitzgerald also recognise that these challenges disproportionally affect early-career researchers who are struggling to find permanent positions (Byrne, 2014, as discussed in Callard and Fitzgerald, 2015).

4. While Callard and Fitzgerald are cognizant of these real concerns, they downplay them and ask the reader to fight against the sclerotic silos in academia. They also note here that there is a role for leaders in research—funders, journal editors and university administrators—to create an environment for interdisciplinary research; and a role for funders to learn from each other.

5. Related to points 2 and 3, **working in an interdisciplinary setting can be emotionally demanding.** Here the authors discuss the asymmetries of power, funding, and cultural capital that exist between different disciplines; related to this are struggles against assumed spatial and temporal relations—who does what, where and when in an interdisciplinary collaboration. The authors are very honest in their experiences, and also include quotes from reviews they have received. They ask 'how are we to make interdisciplinary research happen [when] we find ourselves surrounded by colleagues who variously understand our work to be garbage, or see us as ethically deformed bureaucrats?' (373). While the authors discuss their own emotional regulation—that is, how they deal with the emotionally demanding aspects of interdisciplinary research—they also conclude that unequal power relations may be useful in certain instances. In fact, they invoke Foucault to suggest that that a measure of sadomasochism may be desirable in an interdisciplinary collaboration (316), although they lost me a bit on this point. I am not convinced that everyone would like to have a submission/domination dynamic in their research collaboration. The authors write about learning to live with unequal exchange, even learning from it (325); on one hand I see the value in this, but on the other hand I also see that these types of unequal relationships can be destructive, especially to early-career researchers.

7. Finally, **good interdisciplinary research requires the right people at the right time.** Not everyone will enjoy interdisciplinary research (178-179). The authors point out that social scientists who have spent their careers critiquing the reductionist views of quantitative research and quantitative researchers who do not respect social science and the humanities are not the right people to seek out for collaboration. Callard and Fitzgerald recognise here that there is no point in wasting time and energy on researchers who simply are not interested in interdisciplinary collaborations. Additionally, the success of interdisciplinary collaboration is also about being in the right place at the right time—in which funders and high-level interest converge to make opportunities happen.

At its best, the book is inspirational and encourages researchers to set aside some of the preconceptions and indoctrinations of our 'home' disciplines. It balances nicely between the practical challenges of interdisciplinary research and the more conceptual and theoretical aspects which underpin research as a social field. It is also fitting that the authors also have chosen to publish using the Palgrave Pivot format. This is a new format launched by Palgrave in 2012, which allows authors to publish research at its "natural length." (Palgrave, 2017). Volumes are between 25,000 and 50,000 words—longer than a journal article, but shorter than a typical book. For a book about unique research, it seems appropriate to choose a unique format.

However, there were two perspectives I would have liked to see further discussed in the book. Firstly, gender is alluded to throughout the text, but these insights could have been more explicitly discussed. The ways in which gender and sex are understood and used as concepts in research differ across neuroscientific disciplines (180–181); and different disciplines are also gendered in that hierarchies, harassment and discrimination vary across departments and disciplines. I would have liked to see more consideration of how gender affects interdisciplinary collaboration. Secondly, I would have liked to see a discussion of interdisciplinarity in teaching. How can we inspire interdisciplinary thinking in students? As in research, there are practical issues to consider—how do you design and run a course with lecturers from different methodological and epistemological backgrounds? What are the power dynamics affecting such a course?

In conclusion, if you find yourself in a research rut, and short of new ideas, then this book is for you. While focused on neuroscience, the book is applicable to all spheres of research. The authors ask us to 'think beyond the level of a discipline' and to consider 'other scales and logics at which something different might take place' (147). Here the key lesson of this book is two-fold: (1) we need to think more creatively about the forms and modes of interdisciplinary research and (2) that we need to embrace and learn from the barriers and challenges of interdisciplinary research, rather than allowing these to hinder collaboration. In 2018, the world is facing so many problems—melting glaciers, light pollution, the impacts of austerity, political chaos, amongst myriad others. Perhaps if more researchers took these lessons to heart, we could image a different kind of research which is suitable to tackling the contentious issues of our time.

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