



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.

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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 Bengtson & 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 *neuroscientist* 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-laugh 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, imagining 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.

Åsa Alftberg is an ethnologist at the Department of Social Work, Malmö University. Her research interests are body, health and materiality but also knowledge translation, mainly in relation to ageing and old age, as well as disability and neuroscientific settings. Email: asa.alfberg@mau.se.

Peter Bengtsen is an art historian and sociologist working as Assistant Professor at the Department of Arts and Cultural Sciences, Lund University. His research interests include street art, graffiti, the publicness of public space, spatial justice, and the representation of neuroscience and neurological disease in popular media. Email: peter.bengtsen@kultur.lu.se.

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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