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Chapter 33. Neuroscience, Novelty and the Sociology of the Brain

For Petersen, A. (2023) Handbook on the Sociology of Health and Medicine, Cheltenham: Edward Elgar.

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Abstract

Knowledge about the brain is argued by many to have the potential to yield powerful insights for our selves and societies. This chapter will examine how neuroscience is framed by, and can be impactful within, a range of social domains. Central to this is the construction of neuroscientific knowledge as novel and of quintessential import. Through the analysis, I will demonstrate how the brain is (sometimes) rendered as significant, and with what effects. At the same time, I also reflect on some of the limits to this; for example, professional ambivalence and chagrin about how neuroscientific notions circulate within their field of practice. Hence, the chapter makes plain the perceived import of neuroscience for a variety of personal and professional projects, while also suggesting how both celebrants and critics of neuroscience can sometimes overstate its traction within research, policy, and everyday life.

Keywords

Neuroscience, the brain, neuroethics, neurolaw, novelty

Introduction

Research about the brain – in particular, what has in recent decades been termed neuroscience – has long been enrolled within, and often purported to direct, debates around the constitution and governance of the self (Rose, 2007; Pickersgill, 2013; Vrecko, 2006).ⁱ From mental ill-health to criminality to bias and discrimination, neuroscientific research has been regularly and widely framed as having an important contribution to make to understanding and mitigating personal and social problems (Pickersgill and van Keulen, 2011). The promise of brain science has galvanised expectations and expenditure around the world, with neuroscience often regarded by policymakers and others as essential to invest in and engage with (Pykett, 2015).

Investments in brain research implicitly, and sometimes explicitly, endorse the contention that brain itself is an important object to invest in. In particular, the brains of infants,

children, and young people have been presented as being having the potential to afford benefit from ‘brain-targeted’ social and educational policies and interventions (Pykett and Disney, 2016). These are often presumed to result in healthier, happier, and more pro-social adults (Broer and Pickersgill, 2015a; Macvarish et al, 2014; O’Connor and Joffe, 2013).

Neuroscientific terms and notions can be discerned in sites that at first seem very different to the university, hospital, and corporate labs where much neuroscience is undertaken. The brain, and studies that seek to cast new light upon it, appear today within business magazines, the courts, parenting training programmes, self-help books and more (many of which have been described and analysed by sociologists; e.g., Gillies et al, 2016; Pickersgill, 2013; Williams et al, 2012). In the process, the physical brain translates into a kind of ‘imagined biological’ (Pickersgill, 2018). Through popular and scientific notions about the brain, individual, economic, epistemic, and political practices can, sometimes, be reworked - with new kinds of networks and relationships synthesised and expanded.

This chapter explores the enrolment of ideas and research about the brain within a range of institutional and interpersonal practices during the twenty-first century, in primarily (although not exclusively) Anglophonic contexts.ⁱⁱ I draw on research I have conducted from 2005 onwards, largely in the UK, through methods such as interviews, focus groups, and media and policy analysis, and interweave this with the arguments and findings of other scholars of (neuro)science and society.ⁱⁱⁱ In doing so, I largely elide questions about the growth of neuroscience itself. A range of analysts from the humanities and social sciences have drawn detailed pictures of some of the engines of innovation driving this (for example, Beaulieu, 2001; Dumit, 2004; Littlefield and Johnson, 2012; Restivo, 2017; Rose and Abi-Rached, 2013; Vidal and Ortega, 2017).^{iv} This broader scholarship informs the sociology of the brain articulated herein.^v

Import, Novelty and Neuroscience

Through the chapter, I elucidate some of the power and import of neuroscience, including the new kinds of relationalities sustained through it. However, my contention is that the societal and personal importance of the brain has certain limits. In that respect I depart from some of the more voluble celebrants and critics of neuroscience. I am driven to do so by my respondents themselves (as well as data collected by other social scientists). While neuroscience might be taken to be important, and knowledge of the neurological deemed new, exciting, and salient in a number of ways, the brain is often constructed by a range of

social actors as an object of ‘mundane significance’ (Pickersgill et al, 2011). It is something of vitality, for sure, and yet vital only in relation to other identities and ideas about the self; for example, genetic, endocrinology, psychological, and sociological ontologies. Consequently, this chapter is about the import of the brain, but it also suggestive of how that import is itself constructed and by whom.

I contend that a salient aspect of this process of construction is the purported novelty of neuroscientific knowledge: that it is widely characterised as saying something new and significant about the brain, and indeed about the self more generally. My sense is that this notion perhaps also directs some of rapprochements between neuroscience and sociology that have been encouraged by scholars like TenHouten (1997), Franks (2010), and Tibbetts (2016) (as discussed by Von Scheve, 2011; Pickersgill, 2014). I have no interest in problematising the motivations underlying such proposals; however, they do not direct the analysis presented here. Instead, I take the novelty ascribed to neuroscience to be a social accomplishment, rather than necessarily being quintessential to neuroscientific knowledge itself (Pickersgill, 2013).

This concern with the sociology of novelty (Pickersgill, 2021) is, firstly, influenced by sociological research that has underscored how social scientists can themselves help to produce intrigue and excitement about the actors and objects they study (Barben et al., 2008; Brosnan, 2011; Burchell, 2009; Calvert and Martin, 2009; Macnaghten et al., 2005; Molyneux-Hodgson and Meyer, 2009). I am secondly, and relatedly, indebted to work in what has been called the sociology of expectations. This has revealed how the promise of a given innovation is strategically articulated in order to mobilise symbolic and financial resources that assist in ensuring its developmental and eventual instantiation (Borup et al, 2006; Gardner et al, 2017; Hedgecoe, 2006; Hedgecoe and Martin, 2003, 2008; Petersen, 2018; Petersen and Krisjansen, 2015). Thirdly, I draw on the important work of Andrew Webster (2002, 2005) on genomics and new health technologies. Webster’s insights into how the perceived novelty of an object relate to its discursive positioning vis-à-vis other entities and practices are suggestive of the ways in which novelty is socially negotiated and produced. Accordingly, novelty can be regarded as an achievement forged through societal discourses and activities. As such, the processes undergirding, and the effects of, attributions of novelty can be disentangled and inspected (Pickersgill, 2019).

Characterising Neuroscience

What exactly is this thing called ‘neuroscience’ to which I keep referring? As indicated above, it can be understood as simply ‘research on the brain and the nervous system’. Trying to pin down what neuroscience ‘really’ is can probably be regarded as a somewhat perilous task. Doing so is in many respects akin to seeking to provide a pithy definition of the social sciences, with all the epistemic divergence and ontological incompatibility that make up those disparate fields. It is perfectly possible, of course, to do a PhD ‘in’ neuroscience, to work in an institute for neuroscience research, and to characterise oneself as a neuroscientist. But many people studying the brain - i.e., contributing to neuroscience - view their primary specialism and aims as lying elsewhere. Psychiatry, psychology, and pharmacology are key examples of fields that make up neuroscience, yet so too are disciplines like mathematics, physics, and engineering. The neurosciences interweave and build upon insights from all these fields and more.

If ‘neuroscience’ is hugely wide-ranging, so too are the hopes of some its practitioners about what the study of the brain can achieve. While many in neuroscience might be modest, circumspect, or uncertain about the underpinnings, implications, and/or salience of the knowledge they produce (Fitzgerald, 2014, 2017; Hollin, 2017), others rather more explicitly and boldly seek to produce knowledge of ‘the human’. One popular student text, for instance, asserts that a number of “mysteries” are now being “unravelling” by neuroscientists (Bear et al, 2020: 4). Beyond neuroscience itself, politicians, corporate actors, patients, and a range of others have high hopes for what research on the brain might tell us about ourselves and one another.

The framing of neuroscience as an unraveller of mysteries places contemporary research on the brain as being part of series of epistemic endeavours that seek to reveal transhistorical truths about the human condition. This, of course, includes precursors to modern brain science from which many of today’s practitioners would seek to distance themselves, such as the racist work of craniometry (Carson, 1999). Despite this, raced (as well as classed and gendered) assumptions still permeate neuroscientific research. As the sociologist Oliver Rollins (2021) shows, studies of criminality are a key example of this.

Bain research has always been based on, and constituted through, emotional interactions and social relationships - no matter how technical it is (Cohn, 2008; Fitzgerald, 2017; Pickersgill, 2012; Shostak and Waggoner, 2011; Star, 1989). In so doing, societal assumptions and prejudices sediment within and constitute experimental work. A number of neuroscientists are aware, to varying degrees, of the biases that can shape their research. Accordingly, they

seek to excise these from their investigations, through careful study designs and analysis. Whether this is fully possible is debateable, though, no matter how seemingly well-intentioned.

At the same time, the aims to do so – as well as the rise of disciplines such as ‘social neuroscience’ (Young, 2012) – speak to the ambitions of some opinion-leaders to step outside their social contexts and examine these from a place of singular objectivity. Claims in relation to this can sometimes rest on the technological and methodological developments that can present today’s neuroscience as singularly ‘new’ and hence enabling of uniquely objective research. In this regard, the novelty ascribed to contemporary neuroscience is part of the scientific and ethical boundary work (Gieryn, 1983; Wainwright et al, 2006) that seeks to separate it from older, more overtly problematic endeavours (such as phrenology).

How have some neuroscientists come to be able to make such compelling claims about being unravellers of mysteries, and to have – on occasion – notable effects on societies? For some, the answer is simply because neuroscience by its nature reveals important truths about humanity. From the perspective of the history and sociology of science, however, this is a dissatisfying response. As historian Fernando Vidal and sociologist Francisco Ortega have highlighted, part of the reason that seemingly novel neuroscience has such cultural traction in a range of nations is precisely because of the very long historical roots of the idea that ‘we’ are ‘our’ brains (Vidal, 2009; Vidal and Ortega, 2017). Within societies that centre the individual, and which regard knowledge, reflection, and action upon the self as culturally valorous and even essential, brains can be treated as remarkably special things. If cerebral matter is regarded as the font of the self, and the self is a socially celebrated construct, then the affixing of significance to knowledge practices relating to the brain makes sense. This creates challenges for other kinds of intellectual projects – not least sociology itself (Duster, 2006; Roberts and Rollins, 2020) – which are minded to focus more on the constitution of social power, order, and meaning than the somatic processes of individuals.

Circulating Images

The neurotechnologies employed within much brain research have proven to be compelling to many. In these, brain activity is, for instance, inferred through oxygen consumption (functional magnetic resonance imaging; fMRI) or the flow of blood (positron emission tomography; PET). The results from studies using fMRI and PET – which are, of course, numerical – can be represented through often colourful images that imply how the brain

‘lights up’ in response to, for example, particular cognitive stimuli. The significance attributed to these techniques reflects the popularity of older technologies for brain research that themselves were characterised as novel, important, and societally relevant over a century ago (Borck, 2001, 2005).

Aside from a range of publics, neuroimaging studies using fMRI and PET have also attracted the attention of humanities scholars and social scientists. Anthropologist Joe Dumit (2004), for instance, has noted that imaging studies build in particular assumptions about the brain which research then purports to discover. Many neuroscientists themselves are quite aware of this issue. Likewise, the problems of correlative imaging studies, as well as the false assurances provided by bright colouring, are well rehearsed within the neuroscientific literature (Vul et al, 2009). These matters can be experienced as deeply troubling to some neuroscientists, who are uneasy about how readily claims made about the power and implications of neurotechnologies circulate. Neuroscientific studies of deception-detection (discussed below) are a case in point.

Such concerns hardly detract, however, from the cultural force of neuroimages themselves (Gardner et al, 2018). Often erroneously termed ‘pictures’ of the brain, they are aesthetically compelling (Joyce, 2008). It is easy, to put it plainly, to read too much into them. Yet, as representations of complex statistical data they take considerable work to generate (Beaulieu, 2000), and their seeming simplicity can belie the labour and time invested in their production (Joyce, 2011). They are also often representations of collections of individuals averaged across a group, rather than ‘pictures’ of a single person’s brain. Still, it as a consequence of their ostensibly easy – if misleading - interpretability that they are so mobile, and come to be embedded within a range of discursive networks.

Beyond neuroimaging per se, an increasing number of sociologists and others have, over the last 15 years, come to study the place, role, and impact of brain research in societies. Rose (2007), Thornton (2011), Pitts-Taylor (2016) and many others have reflected upon how neurologic notions are used to describe the self, and to provide a vocabulary through which to articulate its wants and needs. Indeed, it has been suggested that the reduction of oneself to one’s brain might even be a kind of duty within some cultural contexts (Pitts-Taylor, 2010: 649). This style of thought is informed by Foucauldian scholarship, which has galvanised much work in the sociology of the brain.

Sociological work on neuroscience, though, also needs to pay close attention to some of the tensions and ambivalences that can characterise the circulation and sedimentation of ideas about the brain within social institutions, discourses, and practices. Consequently, other scholars have used interviews and focus groups to explore the nuances through which people engage with neuroscientific notions and findings (Bröer and Heerings, 2013; Choudhury et al., 2012; Moutaud, 2011; Pickersgill et al., 2011; Singh, 2013; see, relatedly, Thomson, 2005). Such writings paint a slightly more complex picture of the power of neuroscience: one that is suggestive of the limits of the importance of brain research, as well as the evident effects it has had on understandings of subjectivity. Even media representations of neuroscience, which can be key sources and conduits for some more breathless claims about the significance of brain research, can sometimes discuss this in ways that are more playful and ironic than might be assumed (Pickersgill et al, 2017; see also Whiteley, 2012).

Picture, Pills, and Personhood

As noted, brain scans and other representations of neurological matter are readily apparent within the popular media. This is not least within content pertaining to wellness, health, and dis-ease. Through their circulation, images generated by neurotechnologies can become key actants in networks of claims-making about the nature of personhood and the interventionist strategies employed to act upon it. ‘We are our brains’, asserts the title of a popular Penguin book (Swaab, 2014), with the cover image showing – perhaps predictably – a picture of what Beaulieu (2000) refers to as ‘the space beneath the skull’.

As Cohn (2010) has shown, neuroimages can be invested with hopes, expectations, and both epistemological and ontological significance. Such hopes include the possibility of destigmatising mental ill-health (Buchman et al, 2013; see, relatedly, Rapp, 2011). This is despite the fact that biological explanations for experiences regarded as psychiatric disorders have been shown to increase stigma in certain circumstances and in some ways (Loughman and Haslam, 2018). Still, neuroimages can be understood by some people living with psychological distress as having the facility to uniquely reveal an important biological truth about psychopathology (Cohn, 2010). More generally, neuroscientific knowledge has been enrolled into self-advocacy, such as the neurodiversity movement in relation to autism (Ortega, 2009).

Neuroscientific research and imagery can also bolster or support clinical care, with ‘neural imaginaries’ (Buchbinder, 2015) being invoked by clinicians to help patients understand their

conditions in particular ways. Such ‘selective neurologisation’ (Barnett et al, 2020) can even be employed by practitioners who might be somewhat sceptical about the significance of brain research, as in the case of treatment for addiction. Within mental health practice, as well as within other realms of clinical care, practitioners can find neuroscientific notions and findings intriguing and even inspiring (Barnett et al, 2018).

At the same time, healthcare providers and those they treat can also reject research on the brain and neuroscientific notions when these fail to align with practical realities, clinical epistemologies, and pre-existing ontological assumptions (Barnett et al, 2022; Helén, 2011; Netherland, 2011; Pickersgill, 2011b). Neuroimages, and the wider findings and notions of the neurosciences, can also be treated as unserious or even simply ignored by other publics who encounter them (Pickersgill et al., 2011). Compelling though they might be to some, and perhaps many, the rhetorical effects and promissory nature of images cannot be completely taken for granted: ambivalence endures (Bertorelli, 2016; Whiteley et al, 2017).

Ideas about the brain are also part and parcel of the selling and consumption of psychopharmaceuticals to address mental ill-health. Drugs such as antidepressants have been marketed to considerable effect around the world, with the cultural instantiation of these substances and the disorders they purport to treat being reciprocally produced (Healy, 2004). Pills themselves can be imbued with particular significance and both personal and cultural meanings. As anthropologists and sociologists have shown, pills can become part of the stories that people who prescribe and people who take them tell about selfhood and distress (Jenkins, 2009; Karp, 2006). They are also, though, a propellant for discourses contesting the power of the mental health professions – and psychiatry in particular – and the kinds of models of self and society that these are perceived to build and help to sustain (Coles et al, 2013; Mills, 2013; Newnes et al, 2001).

Psychopharmaceuticals also ‘leak’ (Lovell, 2006: 138) from biomedically-mediated spaces into social arenas where they are used less for ‘therapy’ and increasingly for ‘enhancement’. More generally, brain research is contributing to shifts in the boundaries between these domains (Williams, 2010; Williams et al, 2011). Reflecting the entwinements to both ‘do’ and ‘be’ well within many societies (Greco, 1993), pharmaceutical enhancement can in some respects be both socially sanctioned and even, to a degree, encouraged (Martin et al., 2011; Williams et al., 2008). Drugs that facilitate concentration and wakefulness are particularly notable in this regard. Key examples are Modafinil, which is used to treat sleep disorders, as

well as Ritalin, which is often prescribed for attention deficit hyperactivity disorder (ADHD) (Pickersgill and Hogle, 2015).

As sociologists have shown, both actual and envisioned ‘off-label’ consumption practices associated with these drugs are shaped by experiential expertise and wider understandings of risk and reward (Coveney, 2011; Steward and Pickersgill, 2019): use relates to, and is shaped by, social contexts (Coveney and Bjønness, 2019). Consumption also corresponds with wider social norms and identities, and in this respect mirrors the ‘off-label’ uses associated with a range of other substances, such as Viagra (Mamo and Fishman, 2011). Accordingly, while practices of ‘enhancement’ through off-label drug use is longstanding, the purported novelty of neuroscientific knowledge and considerations of the import of the brain might help to lend psychopharmaceuticals particular cultural purchase as enhancements (including, in relation to their positioning as foci of clinical and normative concern).

Cultivating Developing Brains

Alongside its circulation within popular culture, neuroscience is also visible within a range of professional discourses and practices. Some of these loop back into sites of knowledge production. In this respect, a range of universities have directly (or indirectly through external funds) sponsored activities that seek to entwine neuroscientific approaches to ostensibly quite different endeavours such as policy, philosophy, music, and economics (Littlefield and Johnson, 2012; Pykett, 2013; Schüll and Zaloom, 2011). One key example is ‘neurolaw’, initiatives in relation to which have been very well-funded in the USA (see below). As well as underscoring the “preoccupation with interdisciplinarity” (Barry et al, 2008: 21) characteristic of contemporary universities, such investments speak to the sense of novelty and import with which neuroscientific knowledge is itself invested. It is in part through ascriptions of these that flows of hard capital are legitimised and accelerated.

One of the most visible engagements between neuroscience and the professions can be seen in education and social work. Biomedicalized discourses of children and young people, and their learning and development, are widespread – by policymakers, the media, and organisations such as UNICEF (Snoek and Horstkötter, 2021). These discourses configure a particular type of child and young person whose brains require care and attention; in the process, they seek to direct policy and practice. The imagined brain that is discursively constituted can garner the support of policymakers in ways that might be more successful than claims-making about the needs of children per se (Broer and Pickersgill, 2015b). This is,

to an extent, to the chagrin of some who work within early years policy, social work and related professions, especially given concerns that the evidence used in campaigns does not in fact well support the claims with which it is associated (ibid). At the same time, many in these fields are well aware that brain science can serve as a valuable rhetorical device to encourage expenditures in under-resourced areas.

This is especially the case for infants, with parenting programmes aiming to inculcate, amongst other things, a kind of neurological identification of babies and young children (Wall, 2018). Some parents find much to offer in neuroscience, locating in it both veracity and validation for their parenting practices. This is particularly striking with regards to parenting aimed at the cultivation of individuals well-aligned with particular middle-class norms in relation to the pursuit of different kinds of excellence (Nadesan, 2002). This is even as these intensive practices generate their own anxieties (Wall, 2010). However, other parents can be decidedly more ambivalent and agnostic about the import and novelty of neuroscientific knowledge. In this respect, caregivers sometimes reflect that the significance of research on the brain can be overstated, or that guidance ostensibly based upon it can fail to align with their everyday expertise, experiences, and needs (Broer et al, 2020).

For teenagers, self-help texts, policy documents, and scientific articles can contribute to the synthesis of a kind of ‘neurological adolescent’ (Choudhury et al, 2012). In turn, those who care for and support young people – not least, parents and teachers – are presented as having benefit to afford from close engagement with neuroscience (Choudhury and Wannyn, 2021). Some neuroscientists have explicitly advocated for the potential of their work to produce important knowledge about the developing brain that could and should guide policy and practice (Blakemore et al, 2011; Shonkoff, 2011).

In line with this, the last decade saw an enthusiasm for so-called ‘neuroeducation’ (Battro et al, 2008; Williamson et al, 2018). As the Aims and Scope listed for the Elsevier journal *Trends in Neuroscience and Education* assert: “Neuroscience is to education what biology is to medicine and physics is to architecture” (Elsevier, 2021). Neuroscience is framed here not solely as an intriguing, or even important, adjunct to education; rather, it is presented as foundational. Such statements characterise the epistemological and, indeed, ontological ambitions of some who seek to more closely entwine neuroscience within apparently related fields.

Still, while the actively constructed novelty and import of neuroscientific knowledge might encourage some developments within neuroeducation, it is not clear that the rapprochement between neuroscience and education is quite as close as some wish it to be. Teaching professionals themselves, for instance, can be sceptical of the promise and purported utility of brain science (Pickersgill et al, 2011). As a Royal Society (2011) report into ‘Neuroscience: Implications for Education and Lifelong Learning’ reflected over a decade ago, the “practical applications” of neuroscience for education were “still some way off”. That seemingly largely remains the case - although advocates might disagree.

Normativity and the Neurosciences

Another profession that has been framed as, and which sometimes frames itself as having, significant benefit to afford from neuroscience is law (Pickersgill, 2011a). Neuroimages have come to circulate within legal spheres, including the courts themselves (Gurley and Marcus, 2008; Jones and Shen, 2012). Interest in ‘neurolaw’ has been significant this century, propelled by significant investments by bodies like the MacArthur Foundation. The Foundation initially supported the Law and Neuroscience Project from 2007, and thereafter the Research Network on Law and Neuroscience (MacArthur Foundation, 2021). Owen D. Jones, the Network Director, and Francis X. Shen have asserted that “a lot in law hinges on how the brain works” (Jones and Shen, 2016: 1), and that many “will often find in neurolaw both useful insights and potentially new frameworks” for grappling with complex legal issues (ibid: 2).

An interest in neurolaw is nevertheless not the same as an uncritical celebration of all things neuro. The MacArthur Research Network itself recognises the limits of neuroscience, such as in relation to a “defendant’s level of developmental maturity at the time of the crime” (Faigman et al, 2017: 4). In this respect, whether “a particular individual is or is not mature continues to be a pivotal legal issue, but may not be one that science can answer with any certainty” – although research on brain development is nevertheless “valuable and admissible” (ibid). More generally, the reliability and utility of neuroscience for law has been hotly contested (Jones and Shen, 2012; Patel et al, 2007), and the impact of neuroimages called into question despite their assumed rhetorical appeal (Aono et al, 2019).

The (partial) embrace of brain research by some lawyers is a not altogether surprising development, given its cultural traction and the open-mindedness of many within law to innovations that might afford them benefit within their practise. In the same way, the

controversy that has resulted from this will also be familiar to legal professionals and scholars, and to observers of the legal system. Lie detection is a key example of such ambivalence, simultaneously being a case study of legal embracement and contestation (Balmer, 2018). The use of MRI techniques as a kind of neurotechnological lie-detection has complicated this further.

For a decade or so, neurotechnological lie-detection was an active site of study, ethical debate, legal possibility, and economic activity. Hopes and expectations existed that it could – perhaps – be relevant and applicable to the requirements of courts (Simpson, 2008). Some researchers were optimistic that fMRI could reveal ‘the truth’ of a statement, and various companies began to purvey their services in this regard to both public and private sectors (Littlefield, 2009; Pickersgill, 2011a). Yet, neurotechnological lie-detection was underpinned by somewhat questionable assumptions about the nature of deception and social action, and ethical and scientific concerns were swift to emerge (Greely and Illes, 2007; Miller, 2009). They thereafter proliferated widely, and significant resistances to the admissibility of neurotechnological lie-detection also evolved despite its initial purported promise (Lowenberg, 2010).

The ethical concerns circulating around the use of neurotechnologies within legal process were often linked to an academic project that arose in response to the purported novelty and significance of neuroscientific knowledge: ‘neuroethics’. This field was constituted, in part, through a contention that neuroscience generated important new questions that demand careful and specific scrutiny (e.g., Farah, 2012). Further, longstanding matters of significance for ethicists have been understood to be recast in light of neuroscientific developments (see Fuchs, 2006; Glannon, 2011; Illes et al., 2006).

In this regard, neuroethics forms part of a wider shift to anticipate, respond to, and shape moral and ethical concerns in relation to, and implications of, physical and biomedical research – particularly that deemed to be new and important. Such reflexive governance of science (Braun et al, 2010) acts through ethics training and review, codes of conduct, and recommendations to policymakers and to researchers about the social and ethical implications of science. These texts and expert advisories are often produced by public or quasi-public bodies, such as the European Commission European Group on Ethics in Science and New Technologies (EGE), or the Nuffield Council on Bioethics in the UK. In the case of neuroscience, the production of guidance and ethical evaluations of brain research help to

substantiate and propel the field-making of neuroethics (Conrad and De Vries, 2011; Brosnan, 2011; Martin et al., 2011; Rose, 2007).

The normativities of neuroscience – what should be done *by* neuroscientists, and what should be done *with* neuroscience – have consequently come to be seen as matters of increasing import, focusing the attention of a range of scholars. This focus is itself shaped through, for instance, the origins of funding for research into both neuroscience and its ethical dimensions. As with genetics in earlier decades, a notable source of sponsorship for research on the ethics of neuroscience are large-scale initiatives on neuroscience per se (see, e.g. Rose, 2014). This means that the kinds of questions neuroethicists are able to galvanise support to address are, to an extent, contoured by the kinds of questions that neuroscientists are funded by governments and the private sector to answer.^{vi}

Perhaps one of the most striking examples of the imbrication of state power with neuroscience is the investments that have been made in brain research by militaries (see, e.g., Board on Army Science and Technology, 2009). The military funding of neuroimaging projects that raise the eyebrows of many scientists – such as neurotechnological lie-detection – has disquieted many (Moreno, 2006; Tennison and Moreno, 2012). The purported novelty and import of neuroscientific knowledge thus catalyses the imbrication of neuroscience within the epistemic and normative regimes of military power in ways that clearly trouble any attempt to stubbornly claim that such research is ‘value neutral’.

Conclusion

As knowledge about the brain develops, this can move from the laboratory into wider society - and in the process, the brain itself is discursively remade. The imagined biological that results is often compelling, helping to undergird a range of political, professional, and personal projects. Central to this process is the import and promise attached to neuroscience. The perceived novelty of neuroscientific knowledge, combined with longstanding ideas about the brain as the seat of the self, help both to substantiate and valorise neuroscience as a vital epistemic and ontological activity, and to accelerate its social circulation.

In turn, the growing place, role, and impact of neuroscience in and on a range of societies has propelled a range of scholarship on the sociology of the brain. These works have, in particular, illustrated the ways in which neuroscientific technologies, knowledge, and idioms find traction – or not – within a range of discursive and practical arenas. The ‘or not’ in the previous sentence is a key qualification: sociologists and others have traced the limits of

neuroscience to rework existing social practices and vernaculars for the articulation of subjectivities, as well as its successes in this regard. Personal and professional ideas and understandings can, for example, devalue neuroscientific knowledge when this is regarded by social actors as misaligned with what they consider that they already know. The brain is, consequently, an object of ‘mundane significance’ for many social actors. It is important, to be sure - yet only in conjunction with a range of other conceptions about the self and others.

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^{iv} Rather than provide a potted summary here, I instead commend these excellent existing works to interested readers.

^v Restivo (2017) has also drawn out the outlines for a sociology of the brain. My analysis differs from his programme through its exclusive focus on ideas and representations about the brain and their ramifications, rather than a consideration of how the social contributes to constituting the neurological per se.

^{vi} I am grateful to Adrian Carter (Monash University) for this point.