The politics of plasticity: Sex and gender in the 21st century brain
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Chapter four

Plastic parenting: a family portrait

‘It takes a village to raise a child’
(Nigerian proverb)

Introduction

In April 2015, Rebecca Saxe, Professor of Cognitive Neuroscience at the Massachusetts Institute of Technology, laid down in a magnetic resonance imaging scanner with her sleeping child to create the first MRI image ever made of mother and child together. She shared the image online, accompanied by a brief article in which she explained how she sees in this image a ‘venerable symbol of human love’:

I saw a very old image made new. The Mother and Child is a powerful symbol of love and innocence, beauty and fertility. Although these maternal values, and the women who embody them, may be venerated, they are usually viewed in opposition to other values: inquiry and intellect, progress and power. But I am a neuroscientist, and I worked to create this image; and I am also the mother in it, curled up inside the tube with my infant son. (Saxe 2015)

In an interview with another online source, Saxe further commented that:
These brain scanners are extremely modern technology, only available here and now, to the wealthiest place and time in human history … [Yet] the image you see would look the same if it had been made on any continent or in any century, because the biology of human mothers and children you see in the picture has been the same for thousands, probably tens of thousands of years. (quoted in DiDomizio 2015)

With this image and her interpretation of it, Saxe both invokes motherhood as a universal, eternal, natural phenomenon and motherhood as a contingent, changing cultural practice. In this chapter, I am concerned with the way in which the brain of the infant and the brain of the parent, as phenomena emerging in developmental and social neuroscience, function at this intersection of the universal and the contingent, the biological and the social, the old and the new, simultaneously affirming and reinventing motherhood.26

The significance of Saxe’s image is that maternal love is not just symbolised by the closeness of the embrace and the tenderness of the kiss, but that this intimate bond is depicted as a bond between brains. In the twenty-first century, what counts as good parenting is often first and foremost considered brain-based parenting. In this discourse, raising a child well has become synonymous with optimizing brains, using expert knowledge about the infant brain and the parental brain. This expert knowledge has focused on brain plasticity as a key principle. The infant brain is represented as excessively impressionable, absorbing all blessings and all insults with life-long consequences. The maternal brain is also understood as going through a limited period of extensive plasticity, reorganizing itself to meet the child’s demands. Interestingly, as Thornton (2011b, 2014) has argued, and as I will discuss in more detail below, the popular discourse surrounding the notion of maternal plasticity has reinvented motherhood in a way that conjoints traditional notions of the mother as primary caregiver and domestic figure with the notions Saxe aims to invoke by depicting motherly love with state-of-the-art technology: power, professionalism, rationality.

Recently, the paternal brain has been added to this family of plastic brains, demonstrating a transformation akin to that of its female counterpart. Here, I will paint a broader picture of this family of mother, father, and child, tracing how recent neuroscientific studies provoke both the affirmation and the subversion of the heteronormative nuclear family. Doing so, I will pay attention to the way in which the biologisation of parenting has proceeded hand-in-hand with

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the politicisation of parenting, as images of both infant brain and parental brain provide ‘a visible and calculable “space” for biopolitical knowledge and intervention’ (Thornton 2011b, 400), allowing experts to ‘measure’ adequate parenting and mandating governments to interfere when parents are at risk of being a risk for their child. In this chapter, I discuss how neuroplasticity, represented as a critical window of opportunity in the infant and in the parent, designates certain families as at-risk and as appropriate targets for intervention, and how it fosters an ideology of intensive parenting that responds to and further enacts social inequalities related to gender and class. However, at the same time I wish to make the case that emerging research on the plastic maternal and paternal brain can be read differently and mobilised to challenge the naturalised ideals of intensive parenting as good parenting, of the mother as the primary caregiver, and of the nuclear family as the optimal developmental environment.

‘Get it right in the early years’: the plastic infant brain

Let us start with another story. In 1909, 11-year-old William (‘Billy’) James Sidis enrolled at Harvard University as the youngest person in history to ever do so. After applying unsuccessfully at age 9, he was now accepted into a special program for extraordinarily gifted children. During his first year on campus, the ‘little lad in knickerbockers’ (Addington 1910, 693) astonished the Harvard Mathematical Club with a lecture on fourth-dimensional space. The press reportedly widely on the marvel of his intellect, which seemed not a gift from nature but rather the ‘wonderfully successful result of a scientific forcing experiment’ (New York Times 1909).

Young Billy was the son of Boris Sidis, a medical psychologist with a keen interest in educational psychology. He was named after his father’s friend and mentor, the noted psychologist William James. In The Principles of Psychology, James had described the phenomenon of brain plasticity, noting the brain’s capacity to change as well as its tendency to resist change and to form habits. He described habit as the ‘fly-wheel of society’, keeping ‘different social strata from mixing’ by ensuring the formation of character at an early age (1890, 121). He argued mankind could capitalise on this principle by making sure only the most advantageous habits are laid down as early as possible (222). In later work, he described how adults, too, albeit with greater effort, could propel themselves to greater heights of excellence
and productivity by tapping into the hidden reservoir of mental energy that anyone possesses (1907).27

Boris Sidis applied these ideas in his clinical practice and in his own home, providing for his son ‘an education having as its chief purpose the training of the child to make facile, habitual, and profitable use of its hidden energies’ (Addington Bruce 1910, 692). Like James, Sidis was interested in the societal impact of habit formation and the possibility of accessing typically wasted mental reserves. In his book Philistine and Genius (1911), published shortly after James’s death, he argued that the educational system of his time, with its ‘mediocre teachers, department-store super-intendents, clerkly principals and deans with bookkeepers’ souls’ (54), turned children into ‘philistines’ with a ‘mob mentality’ by imposing discipline and routine on their minds. No wonder, he argued, that the world is riddled with crime, poverty, war, corruption, and disease. Against the philistine, he set up the figure of the genius: plastic of mind and independent of thought, drawn to beauty and truth rather than to authority and brute force. To cultivate ‘a strong, healthy, great race of genius’ (87), children’s mental potential had to be accessed and stimulated by providing constant novelty. ‘If you do not direct the energies in the right course’, he urged parents, ‘the child will waste them in the wrong direction’ (69). This training had to be commenced between the second and third year of a child’s life: ‘To delay is a mistake and a wrong to the child. We can at that early period awaken a love of knowledge which will persist through life’ (67-68).

The press was keen to report any emerging evidence of Sidis junior having a breakdown or rebelling against his father (e.g. New York Times 1910, 1924, 1937). Ruling experts at the time held that intelligence was genetically determined, and that it should be left to unfold on its own accord (Kett 1978). It was considered unhealthy to attempt to accelerate cognitive development, and precocity was associated with negative outcomes: “early ripe, early rot” was a slogan most frequently encountered’ (Terman 1954, 222). In a time where the state depended primarily on physical labour for its economic prosperity, concerns about promoting physical health took precedence over concerns with cognitive development (Vandenbroeck, Coussée & Bradt 2010).

27. James’s theory of hidden mental energy is possibly the source of the contemporary myth that we use only 10% of our brains, but other sources are also plausible (Beyerstein 1999). According to one recent poll, almost 50% of teachers in the UK and The Netherlands believe this myth to be true (Dekker, Lee, Howard-Jones & Jolles 2012). Popular plasticity-based representations of the brain as a muscle that can be bulked up can be seen as a variation of this myth: according to this discourse, we always use 100% of the brain but training can vastly expand our mental capacities.
How different it is now. Had the Sidis family lived today, their theories would probably have been met with a lot more enthusiasm. In our increasingly information-based economy, optimising the cognitive development of children has become a major concern for both the state and for parents. During the 1990s, the ‘decade of the brain’, this concern gave rise to what Thornton (2011b) has called ‘the first three years movement’: a movement of scientific experts that translates neuroscientific findings into everyday parenting advise, emphasizing ‘both the centrality of the first three years for “wiring” and “molding” babies’ brains, and the supreme status of brain imaging and neuroscience as authoritative guides for early child development policy and practices’ (402). Even though most evidence for the importance of early experiences has actually come from the behavioural sciences, this movement relied heavily on neuroscientific arguments to maximise its appeal and authority (Bruer 1999, 2001). The notion of plasticity in particular has functioned as key principle: within this movement, the first three years of a child’s life have come to be understood as a critical, life-determining window of opportunity, during which parents can ‘make or break’ their child’s future. For example, the UK-based Wavetrust campaign writes in its report *The 1001 Critical Days* that during this period, ‘connections in the brain are created at a rate of one million per second! The earliest experiences shape a baby’s brain development and have a lifelong impact on that baby’s mental and emotional health’ (Leadsom et al. 2014). Similarly, the Australian Early Development Census informs parents that a baby’s brain develops so rapidly, that ‘if we get it right in the early years, we can expect to see children thrive throughout school and their adult lives’.28

Early-intervention advocates acknowledge life-long plasticity, but emphasise that there is a large difference in degree between plasticity during the early years and plasticity in later life.29 In addition, life-long plasticity is represented as contingent on early experiences that have to ‘activate the plasticity of the developing brain’ (Bonnier 2008, 853, my emphasis). In other words, the message given to parents is that ‘very early experiences alone produce lifetime potential’ (Nasesan 2002, 405; see also O’Connor & Joffe 2013; Wall 2010). As Nadesan has noted, this model of development

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29. For example, the website of the Harvard University Center on the Developing Child states: ‘Just as a weak foundation compromises the quality and strength of a house, adverse experiences early in life can impair brain architecture, with negative effects lasting into adulthood’, which is accessible at the following link: http://developingchild.harvard.edu/science/key-concepts/brain-architecture/.
objectifies and segregates time into fixed states. The first stage is early childhood … a spatialized zone fertile with possibility [which] must be scrutinized with the intent of identifying phenomena that contribute to outcomes measured in the second state, adulthood … This second and ‘dependent’ state [is represented in] ‘objective’ measures of ability and/or professional success. (Nadesan 2002, 413; see also Thornton 2011b)

This model is a prime example of what Schmitz (2012) has termed ‘modern neurodeterminism’, which fuses themes of malleability and permanence, and articulates the brain as both the result and the source of our experiences. It acknowledges the influence of environmental factors when looking back, but not when looking forward: ‘Brain materiality has to be essential at the point of intervention; otherwise it cannot be modulated, manipulated or controlled’ (262).

Like James and Sidis, early-intervention advocates are concerned not just with the development of individual children but also with the future of the state and its citizenry. One of the key claims of the first-three-years movement is that structural social problems like poverty, crime, drug abuse, or teen pregnancy are best addressed during the infant years via interventions that ensure optimal emotional and cognitive development (Breuer 1999; Edwards, Gillies & Horsley, 2014; Kagan 1998; Thornton 2011b). This idea has successfully influenced policies in a number of countries (this is particularly well-documented in the UK: e.g. Edwards, Gillies & Horsley 2014; Gillies 2013; Lee 2011; O’Connor & Joffe 2013).

However, the movement has also been met with considerable critique (for a more extensive recent review, see MacVarish, Lee & Lowe 2014). Some have challenged the scientific basis of its ‘infant determinism’ (Kagan 1998), arguing that the scientific evidence does not support the notion of a critical window of cognitive development in humans or the claim that an enriched environment can enhance brain development over and beyond a ‘good enough’ environment (e.g. Bruer 1999, 2001). Other critiques have focused on the impact of the early-intervention discourse, arguing that even though brain-based parenting advice appears neutral and objective, in fact it does prescribe which parenting practices count as good and moral, and when state intervention is legitimate (Gillies 2013; Kagan 1998). In particular, it has been noted how the movement, by representing the infant brain as ‘infinitely and permanently neurologically vulnerable to parental influence’ (Macvarish Lee & Lowe 2015, 248), further reinforces the ideology of intensive mothering that started to develop under the influence of post-World War II developmental psychology (Hays 1996, Furedi 2001). This ideology, as I have discussed in the previous chapter, compels mothers to ‘acquire detailed knowledge of what
the experts consider proper child development and then spend a good deal of time and money attempting to foster it’ (Hays 1996, 8). Yet these amounts of time and money are not available for poor mothers: the very mothers who are, most of all, expected to break the cycle of poverty by optimising their child’s brain.

The first-three-years movement, however, adopts a neoliberal worldview in which such structural power inequalities recede into the background, and notions of self-monitoring, self-management and self-optimisation prevail (Thornton 2011b). Gillies, for example, has argued that the movement suggests ‘that we could all compete on a level playing field if only our mothers performed optimally’ (2013, 16). As such, poor mothers come to be associated with inadequate, even neglectful parenting, in need of state surveillance and intervention (Nadesan 2002, O’Connor & Joffe 2013). The result is that poor mothers are faced with increased interference and coercion and that their children are taken away from them more often, while the state can legitimately cut welfare spending (Edwards, Gillies & Horsley 2014; Gillies 2013; Wall 2004). As such, the early-intervention discourse responds to and enacts a gendered and class-specific social order.

In this early-intervention discourse, then, parenting has become thoroughly politicised: family-life during the pre-school years has become a public concern as the first-three-years movement ‘places parents at the centre of the policy stage but simultaneously demotes and marginalizes them’ (Macvarish, Lee & Lowe 2015, 248). In other words, parents are made personally responsible for a host of structural, social problems (whereby the parents most affected by those problems have to shoulder the most responsibility), but with the same gesture, the state gains the mandate to step in and take control. Ultimately, the parents themselves—tasked with the impossible challenge of managing all risks in their child’s lives, and therefore inevitably incapable30—have become the biggest risk factor in their child’s life (Fox 2009; Furedi 2001; Lee, Macvarish & Lowe 2010).

30. In this respect, it may be useful to think of parenthood as it is constructed in early-intervention discourse as enacting not a neoliberal subject but rather what Isin (2004) has termed the ‘neurotic subject’ who ‘is less understood as a rational, calculating and competent subject who can evaluate alternatives with relative success to avoid or eliminate risks and more as someone who is anxious, under stress and increasingly insecure and is asked to manage its neurosis’ (2004, 225). The neurotic citizen, more affective than cognitive, is a figure ‘whose anxieties and insecurities are objects of government not in order to cure or eliminate such states, but to manage them’ (Ibid.). In other words, the neurotic subject is not so much governed through freedom but rather through fear and her or his conduct is not calibrated via calculated, profit-oriented decisions, but rather through symbolic acts and rituals that soothe and reassure its anxiety. It is true that, as Thornton (2011b) notes, the early-intervention discourse ‘[uses] images of infants’ brains to constitute maternal emotion as a visible and calculable “space” for biopolitical knowledge and intervention’ (400), but there is no way for individual parents to actually oversee and quantify the risks imposed on their child’s brain and to act on this assessment in any rational way. This is also evident in Nadesan’s (2002) description of educational toys for young children that were popular in the 1990s. Noting that neuroscience is unable to explain—let alone predict—child development to the extent promised by
It is in this context of risk, and of the parent as risk factor, that I want to consider the parental brain in the next sections of this chapter. In time, brain-based parenting has come to refer not only to knowing and optimising the infant brain, but also to knowing, using and optimising the parental brain (e.g. Hughes & Baylin 2012). Research has focused on the neurobiological changes taking place in mothers and fathers, in order to identify the parenting networks that facilitate and motivate bonding and caregiving (for reviews, see Numan & Insel 2003; Pereira & Ferreira 2016; Swain 2008). These changes include hormonal and neuronal responses. Even though these two are intimately connected, my discussion will only address changes in the brain on maternal and paternal neuroplasticity (see Pitts-Taylor 2016 for a similar discussion focused on oxytocin). I will make the case that emerging research on maternal and paternal plasticity has the potential to challenge conventional understandings of mothering as a natural process, of the mother as the primary caregiver, and of the nuclear (i.e. heterosexual) family as the optimal developmental environment. However, by reading the maternal and paternal brain in the context of the first-three-years movement, it will also become clear that the parental brain as yet another critical plastic period contributes to the construction of parents-at-risk and parents-as-risk. My aim here is not to accept or reject the phenomenon of the plastic parental brain on empirical or political grounds, but rather to map the multiple connections and implications it generates.

‘Mothers are made, not born’: the plastic maternal brain

The neurobiology of maternal behaviour is increasingly becoming a topic of scientific interest. In this research program an interesting phenomenon has emerged: the plastic maternal brain. Studies have shown that structural and functional changes take place in the brains of new mothers during and after pregnancy, changes that are believed to facilitate the motivation and execution of maternal behaviour (e.g. in non-human animals: Featherstone, Fleming & Ivy 2000; Keyser-Marcus et al. 2001; Kinsley et al. 2006; in humans: Kim et al. 2010). These alterations have been linked to hormonal changes during pregnancy, parturition, and post-natal parental advice literature she maintains that developmental toys ‘fill the void created by scientific uncertainty’, performing a ritual function: ‘As ritual objects, educational toys were implicitly held to protect children (at least symbolically) from the threats of a declining educational system and they were believed to demonstrate parental concern and involvement to the parents themselves’ (Nadesan 2002, 415). Instead of the empowered parent providing the child with a competitive edge over its peers through the consumption of educational videos and flashcards, then, the parent that is constructed by the early-development discourse is an anxious, inherently incompetent figure. In her recent book Brain Culture, Pykett (2015) takes up the neurotic subject as the emblematic figure of contemporary neurocultures.
interactions like lactation (see Russell, Douglas & Ingram 2001; Brunton & Russell 2008). Together, these experiences ‘[fashion] a more complex organ that can accommodate an increasingly demanding environment’ (Kinsley et al. 1999, 137). These changes do not only induce specific maternal behaviours, like pup retrieval and nest building in the case of rats, but are also believed to increase the mother’s general cognitive abilities including hippocampal-dependent memory and learning (Kinsley et al. 1999; Pawluski, Walker & Galea 2006a; Pawluski et al. 2006). This benefits a mother’s caretaking abilities, but also generalises to other tasks. For example, experiments have demonstrated that rats with maternal experience perform better in a maze than maternally inexperienced female rats (e.g. Love et al. 2005). These reorganisations appear to have long-lasting results: ‘once a mother, always a mother’ (Pereira & Ferreira 2016, 76).

Importantly, these changes do not seem to be fully determined by the physical experiences of pregnancy, parturition, and lactation. Adoptive mothers undergo behavioural and neurobiological changes that are highly similar to birth mothers through interacting with their foster offspring. Early studies by Rosenblatt, for example, have shown that non-pregnant female rats will show adequate maternal behaviour after being exposed to pups for a few days (Rosenblatt 1967, 1975; see also Orpen & Fleming 1987). The available evidence suggests that this behavioural change is accompanied by neurobiological changes similar to (albeit not entirely the same as) those in maternal rats (e.g. Felton et al. 1998; Kalinichev et al. 2000). Similarly, studies in humans have shown that the quality of maternal behaviour and mother-infant bonding is similar for adoptive mothers and birth mothers (e.g. Singer et al. 1985, Suwalsky et al. 2008), suggesting that ‘a hormonally primed mother is not essential for normal infant development’ (Numan & Insel 2003, 318). Two recent EEG studies have suggested that adoptive mothers display similar brain activity as birth mothers when observing their children (Grasso et al. 2009; Hernández-González et al. 2016). Together, the studies suggest that the maternalisation of the brain is not necessarily an automatic, purely physical occurrence, but that the mother’s (subjective) experiences affect her neurobiology as well and can constitute an alternative route to a similar result.

By highlighting the reciprocal nature of the mother-infant relationship as well as the subsidiary role of pregnancy, delivery, and breastfeeding, this research program has started to suggest that ‘mothers are made, not born’ (Society for Neuroscience 2014). Maternal behaviour is no longer viewed as an innate, instinctive trait possessed by all females alike, but rather as a set of interactions emerging from a complex interplay of genetic, hormonal, neuronal, cognitive, emotional, and behavioural factors (Pereira & Ferreira 2016). In other words,
maternal behaviour is increasingly understood as a biosocial phenomenon that involves the material body as much as it involves subjective experiences. This frames motherhood as set of varying, individual experiences rather than a single, universal experience.

The nature of maternal behaviour and of the mother-infant bond has been a fundamental concern of feminist scholarship and activism. Since its beginnings, the feminist movement has produced numerous and widely varying perspectives on motherhood that claim, celebrate, reject, and reinvent it (both within and outside of heterosexual couplings) at different moments in time. Many have examined women’s naturalised role as mothers in relation to their oppression and isolation in the domestic sphere, critiquing representations of maternity as a universal part of female nature. This large body of scholarship has demonstrated, instead, that motherhood is: a historically, culturally, legally, economically, and politically embedded social institution; situated in power structures organizing not only gender but also class and race; and not (just) an identity or relationship but rather (also) a work (see Arendell 2000; Kawash 2011). Conventional understandings of the relationships between reproduction, motherhood, kinship, and the nuclear family were thus challenged by the feminist movement and also by the LGBT movement. These relationships were further challenged by the advance of assisted reproductive technologies: welcomed by feminists like De Beauvoir and Firestone as freeing women from the ‘tyranny of biology’ (Firestone 1970, 193), but regarded more critically by others as a set of disciplining technologies that medicalise women’s bodies (e.g. Sawicki 1999).

As Grosz (1994) has pointed out, much of this feminist scholarship on motherhood has assumed a biologically determined, ahistorical body, separating this body from the social or psychological aspects of womanhood. Whereas egalitarian feminists have focused on transforming bodies (via technologies) and social constructionists have focused on transforming ideologies (via socialisation), she argues, both positions have neglected historical, lived bodies as ‘a cultural interweaving and production of nature’ (15-18). These are the bodies that Grosz insists feminist scholarship attends to, including their sexually specific differences that ‘may or may not be biological or universal. But whether biological or cultural, they are ineradicable’ (18). Here, I want to make the case that the recent neurobiological research on the maternal brain I discussed in this section provides a novel and potentially fruitful way of rethinking motherhood, one that considers this ‘embodied subjectivity’ or ‘psychical corporeality’ (22) of lived bodies. These studies highlight how embodied, interpersonal, and affective ties between mother and infant emerge from complex interactions of genes, brain structures, hormones, past and present subjective experiences, emotions, social interactions, and many other factors.
As such, recent neurobiological studies invite us to consider maternal bodies as ‘neither brute nor passive’ (Grosz 1994, 18), as irreducibly fleshy but not pre-social, as deeply social but not purely ideological. They encounter motherhood as it emerges from the dynamic interaction of a complex range of factors that mutually constitute each other’s influence. Rather than a single, natural, or essential instinct or trait, motherhood then appears as multiply determined and ‘softly assembled’. Soft assemblies are robust yet dynamic outcomes with variable pathways, which are always embedded in a particular history, a particular environment, and a particular set of intentions and goals. Finally, these studies invite us to consider sexual differences, like the physical capacity of giving birth or breastfeeding, whilst demonstrating that these differences are by no means essential: giving birth is no prerequisite for what we call maternity in this context (whether a ‘female brain’ is a prerequisite is a question I address below; the answer will be that it is not). At least in theory, then, this research program provides one possible avenue for exploring ‘the ontological status of biology, the openness of organic processes to cultural intervention, transformation, or even production’ (23), and for challenging naturalised, essentialist notions of motherhood without having to bracket the material body.

Even though I argue that the plastic maternal brain, as a phenomenon that is currently emerging from a specific scientific program, provides a figure or tool to rethink motherhood from a critical feminist perspective, this is of course not necessarily how research outcomes in this area are interpreted by scientists and taken up in popular discourses. In fact, many studies that explore individual differences in maternal behaviour do so to link maternal plasticity to post-partum depression and other risks to the wellbeing of mother and child, thus contrasting optimal or normal motherhood with at-risk or pathological motherhood (Hillerer et al. 2014). Efforts to understand ‘defectively assembled maternal brains’ (Kinsley & Amory-Meyer 2010, 710) in the interest of preventing ‘less than optimal mothering’ (Barrett & Fleming 2011, 369) can, of course, improve the lives of certain mothers, but they do not challenge the idea that there is a singular notion of normal or optimal mothering.

Thornton’s analysis of the ‘entrepreneurialization of motherhood’ (2011b, 2014) points in a similar direction. Analysing public discussions of the plastic maternal brain, she shows that the notion that mothers are not born but made has already permeated popular culture, and that motherhood is increasingly understood in terms of empowerment, free choice, and authenticity: ‘The “good mother” is not a socially or biologically imposed norm to which women must

31. ‘Softly assembled’ is a term from dynamic systems theory that denotes systems with dynamically interacting, fluctuating components, in contrast with systems with fixed, immutable, static connections (Thelen & Smith 1994).
conform; rather, mothering is a limitless pursuit of the self and its values of enjoyment, happiness, and fulfilment’ (2011, 413). Despite this emphasis on freedom and choice, however, the notion of maternal neuroplasticity has given rise to a new socially prescribed ideal mother, a figure that Thornton calls ‘mommy economicus’ (2014). This ideal mother cultivates her maternal plasticity not only to optimise the development for her child, but also to enhance her own cognitive potential, which can be used at home but also at her paid job: ‘Because of the extraordinary plasticity of her brain, mommy economicus is agile, flexible, and adept at directly leveraging the customary practices of motherhood … for corporate profit and personal empowerment’ (2014, 273). As a result, motherhood is transformed into an entrepreneurial practice.

Thornton’s ‘mommy economicus’ embodies not only a neoliberal but also a postfeminist ideal. Her sexual difference defines her not as a limiting factor but as a resource: ‘she cannot discard her gender and, in fact, her gender gives her a competitive edge in the workplace’ (273). There is another side of the coin, however: in the mommy brain story, to not cultivate the maternal brain in line with brain-based parenting advice is to risk damaging outcomes, for the mother herself but especially for her child. Thus mothers are, obligation to vigilantly work on themselves, to build up and sustain their capital. This responsibility intensifies rather than replaces the tremendous responsibilities already placed on the mother in existing constructions of ideal maternity, such as caring for home and family and nurturing life. (281, my emphasis)

Thornton’s work shows how maternal plasticity, as it is taken up in popular parental advice, holds out to women the promise of having it all as well as the threat of imminent danger, thus compelling them to take up intensive, expert-led mothering practices. ‘[Moving] between notions of biological sexual difference (hormonally induced neuroplasticity) and the social practices of gender’ (281), this brain story establishes new connections between femininity, motherhood and paid work, but also reconstitutes familiar associations between women and domestic work and reaffirms an understanding of the female body as dangerous. In the end, Thornton writes, mommy economicus is but a “vulnerable empowered woman”—a woman whose female biology poses a constant threat to her well-being and her identity’ (283, quoting Dubriwny 2012).\textsuperscript{32}

\textsuperscript{32} Again, we might ask whether this new ideal figure of the mother is better understood as a neurotic subject rather than as a neoliberal subject (see Isin 2004). Thornton herself notes how much contemporary brain-
The crucial issue highlighted by Thornton’s work is that—whereas the notion of maternal neuroplasticity can, as I have argued, open up ways of rethinking the relationships between sex, gender, and the brain from a critical feminist perspective—maternal neuroplasticity is equally capable of ‘adapting, updating, and assimilating ideologies that are seemingly incompatible with neoliberalism’ (2014, 286). Here, it enfolds an ideology of intensive parenting. As such, any feminist project that mobilises neuroplasticity as a tool to challenge biological determinism and essentialism must take into account the ways in which such a move might inadvertently promote modes of governmentality that entrench the very ideologies this project aims to expose and eradicate.

‘Both mom and dad, brain-wise’: the plastic paternal brain

A question that I have left unattended so far is to what extent maternal plasticity is bound to the female brain. I have already noted that adoptive mothers appear to go through psychological and biological changes similar to those observed in birth mothers. What, then, about the father? Some have linked maternal plasticity explicitly to the female brain, suggesting for example that ‘the female brain appears to have evolved to adapt and change in ways that promote procreation … [possibly] a hedge against the unpredictability of the male brain’ (Kinsley & Amory-Meyer 2011, 980). However, recent studies suggest that the neurobiology of fathering is not so different from that of mothering. In this section, I will discuss how paternal plasticity relates to maternal plasticity and to what extent it also challenges naturalised gender norms, kinship, and the heteronormative nuclear family. Again, to keep the discussion to the point, I will focus solely on brain plasticity, but it should be noted that hormones, including testosterone and oxytocin, play an important role in the neurobiology of fatherhood (for reviews, see Swain et al 2014a; Wynne-Edwards 2001).

The first clues about the workings of the paternal brain have come from animal studies. It is well known that in a variety of species, males undergo certain behavioural changes when siring offspring; generally speaking, they become less aggressive and more nurturing (e.g. Vom Saal & Howard 1982; Vom Saal 1985). Insights into the neurobiological correlates of these behavioural changes have come from the research of Catherine Dulac, professor of molecular

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based parenting advice focuses on affective rather than cognitive processes, emphasising the importance of authentic motivation and genuinely experienced maternal love, and the intense fear this advice generates: ‘women’s extraordinary powers of influence are tied to overwhelming anxieties about the potential limitless repercussions of even the smallest actions’ (2011b, 415).
and cellular biology at Harvard University. Interested in the neurobiological correlates of social behaviour, she and her colleagues set out to study the ways in which rats recognise each other as male, female, or infant, and how social behaviours such as mating, aggression, and caretaking are then generated. Noting that across species, males engage in female-typical behaviour and vice versa, they wondered about the neural mechanisms behind this behavioural flexibility. Earlier work had found that blocking male rats’ ability to detect a conspecific’s sex by impairing the chemoreceptive vomeronasal organ (VNO) caused them to mount male and female conspecifics indiscriminately, and to display less aggression. Repeating the procedure with female rats, Dulac and her colleagues found that VNO-deficient females engage in male-typical sexual behaviour and, when having pups, display less maternal behaviour (Kimchi, Xu & Dulac 2007). The authors conclude that, in spite of the prevailing model of brain dichotomy, their results point to ‘a new model of sexual dimorphism in which the effector circuits of both male and female behaviors exist in the brain of each sex’ (1013).

In a follow-up study, Dulac further investigated how these different behaviours are regulated in both male and female rats (Wu et al. 2014). Here, evidence is found for two separate but connected neural pathways, one underlying aggression towards pups and one underlying parental behaviour, existing in both males and females, virgins and parents. Which pathway is activated and which is inhibited, either via a shared mechanism or independently, depends on a complex interaction of past experience (having mated or not), current stimuli (VNO detection) and hormonal factors. Sex is but one factor amongst many in these interactions. Taken together, these findings suggest that, at least in the rat, males and females have the same brain circuits associated with parenting.33 So, instead of two distinct brain forms, or even one continuum, a unisex or ‘bisexual’ brain comes to the fore (Crews 2012).

Can this notion of a bisexual brain be extended to humans? A handful of recent studies have probed the human brain in search of the circuitry underlying paternal behaviour (Atzil et al. 2012; Abraham et al. 2014; De Pisapia et al. 2013; Kim et al. 2014; Kuo et al. 2012; Mascaro, Hackett & Rilling 2013; Mascaro, Hackett & Rilling 2014; Wittfoth-Schardt et al. 2012; for reviews, see Swain et al. 2014b; Feldman 2015). Most of these studies imaged the brains of fathers looking at images or listening to the recorded cries of their own children and unfamiliar children in order to specify the neural circuits involved in paternal responses. Overall, these studies point to a global ‘parental caregiving’ network (Feldman 2015) in the paternal brain involving areas associated with emotional regulation, motivation, social cognition, and

33. See also Lenschow et al. (2016): this similarity appears to extend even to brain areas representing the genitalia.
empathy. These areas are by and large the same as the ones found in mothers, but some subtle differences have also been identified. To my knowledge, only three studies directly compared mothers and fathers (Atzil et al. 2012; De Pisapia et al. 2013; Abraham et al. 2014). The first, using videos as a stimulus, found similar activation in areas associated with social cognition and empathy in mothers and fathers, but sex-specific correlations between hormone levels and brain activation (Atzil et al. 2012). A second study, comparing male and female parents and non-parents, found that women, independent of parental status, showed greater deactivation of brain areas associated with ‘mind wandering’ in response to the sound of hunger crying (De Pisapia et al. 2013).

The third and most recent study is of particular interest, since it included parental role (primary versus secondary caregiver) as a variable (Abraham et al. 2014). Subjects were recruited from heterosexual and homosexual couples and divided into three groups: primary-caregiving heterosexual mothers (PC-mothers), secondary-caregiving heterosexual fathers (SC-fathers) and primary-caregiving homosexual fathers (PC-fathers). Videos were taken at home of the parents interacting with their child, demonstrating greater synchrony in the PC-mothers and the PC-fathers than in the SC-fathers. Before scanning the parents’ brains, two brain networks of interest were identified: an emotional processing network, regulating attention and reflexive responses, and a cortical mentalising network, regulating social understanding, theory of mind, and cognitive empathy (1). Both networks were activated in all three groups in response to video images of the parent-child interactions, but group differences were also identified in two brain areas. Compared to the SC-fathers, both the PC-mothers and the PC-fathers exhibited increased activation of the amygdala, part of the emotional network. Compared to the PC-mothers, both the PC-fathers and the SC-fathers demonstrated greater activation of the superior temporal sulcus (STS), part of the mentalising network. A functional connection between the amygdala and the STS was identified in the PC-father group only.34 In the PC-father group, no differences were found between biological and adoptive fathers, and the authors assumed no influence of sexual orientation. In line with Dulac’s findings discussed above, the authors conclude that these results point to the existence of a global parenting network in the human brain that is largely the same for both men and women: ‘assuming the role of a committed parent and engaging in active care of the young may trigger this global

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34 Furthermore, parent-infant synchrony correlated with amygdala activation for the mothers and with STS activation for the fathers. Oxytocin levels were also assessed, yielding a correlation with activation of the emotional networks in mothers and of the mentalising network in fathers.
parental caregiving network in both men and women, in biological parents, and in those genetically unrelated to the child’ (Abraham et al. 2014, 4).

I suggest that in research on the paternal brain, as in research on the maternal brain, findings emerge that challenge notions of the mother as the natural primary caregiver, of the nuclear family as the most natural and optimal family constellation, and of kinship as genetically rather than affectively embodied. As Feldman (2015) has pointed out, ‘it is not known … how conditions such as extended versus nuclear living, co-sleeping, grandparental care, or traditional versus egalitarian sex roles shape parents’ brain during this plastic period’ (393). These are fruitful directions for research on the ‘situated’ parental brain (396).

The question then emerges to what extent it is still appropriate to designate behavioural or neurobiological phenomena as ‘maternal’ and ‘paternal’. If one does not need to give birth or be female\(^{35}\) in order to access the ‘maternal pathway’, then what makes it essentially maternal? Would it not be more appropriate to speak of a primary caregiving pathway and a secondary caregiving pathway, or refer to the pathways by their actual function (e.g. an emotional processing pathway)? This might seem like a trivial, semantic issue, but the effects of gendered terms can be quite real, as was evident in the press coverage of the study by Abraham et al. (2014). Even though the results of this study point to a global parenting network in the brain, the authors distinguish a maternal pathway and a paternal pathway. The maternal pathway is described as an ‘phylogenetically ancient’ emotional circuit, sensitised by the experience of pregnancy, birth and lactation (9795). The paternal pathway is described an evolutionarily more recent, alternative pathway, activated by care-giving behaviours independent of pregnancy and childbirth (Ibid.). These distinct pathways are then taken as a sign that ‘mothers’ and fathers’ brains evolved to complement each other in the joint effort of raising young infants’ despite the fact that men can recruit both pathways (5; see also Feldman 2015).\(^{36}\)

The media coverage of this study focused mainly on the possible implications for debates in the US over whether or not gay couples should be allowed to adopt.\(^{37}\) A dominant frame in this coverage was that ‘biologically, gay couples are fit to be parents as straight couples

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\(^{35}\) Or even feminine: masculinity and femininity were assessed in Abraham et al.’s study using the Ben Sex Role Inventory. No group difference between the SC-fathers and PC-fathers was found.

\(^{36}\) Whether women in secondary caregiving roles also recruit the ‘paternal pathway’ remains an open empirical question.

\(^{37}\) In Obergefell v Hodges (2015), the US Supreme Court affirmed the constitutionality of same-sex marriage throughout the US in the spring of 2015, a year after this study was published, making adoption through federally funded agencies easier for gay couples. However, gay couples seeking to adopt still face more roadblocks than heterosexual couples. For example, privately funded agencies and agencies with a religious signature may still refuse to work with same-sex couples.
are’ (Dockterman 2014) because their brains enable them to perform the traditional gender roles of both the mother and the father: ‘Down to the most fundamental biological responses, gay people parent the same way heterosexuals do’ (Fox 2014), ‘gay fathers … seemed to be both mom and dad, brain-wise’ (Begley 2014), and ‘The brains of homosexual fathers adapt to take on the roles of both motherhood and fatherhood’ (Smith 2014). So even though this study of the paternal brain successfully decouples men and women from their designated gender roles, it seems that the preservation of the terms ‘maternal’ and ‘paternal’ leaves the actual gender roles, and thereby the heteronormative logic of the nuclear family, unchallenged. As a result, gay fatherhood gains support by virtue of mimicking traditional family life. In the context of gay marriage activism, such ‘respectability politics’ have been criticised by queer scholars for privileging the already-privileged (i.e. white, middle-class gays and lesbians) and for reifying heteronormative family values and institutions rather than transforming these in the interest of greater equality and inclusivity (e.g. Duggan 2002; Ettelbrink 1992; Lenon 2005; Taylor 2009; Valverde 2006). Same-sex couples’ inclusion, here, excludes the needs and experiences of parents who do not or cannot emulate this ideal, and excludes the possibility that alternative family dynamics may also constitute an ‘optimal’ developmental environment for young children.

Interlude: train the gay away?

The finding that primary caregiving fathers show similar brain activity to mothers can be mobilised as an argument to extend gay rights and allow same-sex couples to adopt—with the caveats considered above. However, plasticity-based arguments can also be (ab)used to argue against gay rights. Consider this quote:

Intensive exercise, training or imagination changes the brain microstructure. We are not victims of our biology or the experiences which shape the detail of our brain. Anatomy is not destiny; change is always possible. The brain is plastic and is in a constant state of change. Indeed the question is rather: what change is not possible?

We would not want to say that the structure of the brain you were born with has no effect. It has. It can be profound. But that structure can also be profoundly changed, and we don’t yet know the limits. They are probably sky-high.

(Whitehead & Whitehead 2009, paragraph 18-19)
Numerous brain training programs are marketed with optimistic celebrations of plasticity like this one. This particular quote, however, is part of an article that claims neuroplasticity vindicates sexual orientation conversion therapy (Whitehead & Whitehead 2009). Affiliated with the National Association for Research & Therapy of Homosexuality (NARTH), the authors Neil and Briar Whitehead advocate ‘the rights [sic] of gays to change their orientation if they wished’ (2013 [1999], 13). Central to their argument is a critique of brain organization theory—which they build on the same grounds as feminist critiques—and the assertion of an interactionist framework. They maintain that sexual orientation is not determined by genetic factors alone, nor by deliberate choice, but rather by individual, idiosyncratic responses to a range of unique life events (Whitehead 2011). ‘This is one situation where the postmodern is a reality,’ Neil Whitehead wrote in a submission to the New Zealand parliament in which he opposed the legalization of gay marriage; ‘Everyone has their own highly individualistic story. This is easily understood when we consider how very individual various formative sexual experiences are’ (2012, 2). By taking this position, the Whiteheads align themselves with the APA, which states that ‘no findings have emerged that permit scientists to conclude that sexual orientation is determined by any particular factor or factors. Many think that nature and nurture both play complex roles; most people experience little or no sense of choice about their sexual orientation’ (APA 2008, 4).

Byne and Parsons (1993) write that ‘a semblance of’ such an interactionist approach to sexual orientation already started to emerge in the 1980s, when the notion of brain plasticity began to find some acceptance and both biological and social scientist had to admit that their favoured explanations could not tell the whole story (228). When LeVay reported evidence of differences between heterosexual and homosexual men in the INAH 3—a nucleus in the hypothalamus—in 1991, ‘this uneasy truce was disrupted’ and biological theories started to dominate the field—until recently (Ibid.). In his report, LeVay suggested that the differences he found are innate, yet he had to concede that his evidence ‘does not allow one to decide if the size of the INAH 3 in an individual is the cause or consequence of that individual’s sexual orientation’ (1036).38

38 In the 2013 edition of the NARTH’s Journal of Sexuality, the editor commends the APA for their position and expresses his regret that the general public tends to believe sexual orientation is innate: ‘much education is needed if the public is to come to understand with the APA that ‘nature and nurture both play complex roles’ in the development of ‘homosexuality’ (Sutton 2013, 4). He recommends the Whiteheads’ book My Genes Made Me Do It (2013 [1999]), reviewed in the same issue, as a good place to start.

39. Subsequent rat studies demonstrated that sexual behavior indeed affects brain morphology in the SDN-POA, an area in the rat brain that is considered homologous to the INAH 3 in humans (Prince et al. 1998; Woodson, Balleine & Gorski 2002). When Byne et al. replicated (2001) LeVay’s 1991 study, they favoured an explanation that incorporates environmental influences.
One thing that LeVay was absolutely sure of, was that regardless of its causes, 'sexual orientation in humans is amenable to study at the biological level' (Ibid.). In the press, he similarly stated that 'what’s most important is that homosexuality is now a topic that can be studied in the laboratory as a problem in neurobiology, and not something that must be left to the psychiatrists or the psychologists' (quoted in Perlman 1999, quoted in Halley 1994, 534n121). As such, independently of what he asserted about the cause of homosexuality⁴⁰, LeVay already foreshadowed the work neuroplasticity would accomplish during the decade to come: to translate all social and biological factors into a common language, through which all of life can be measured, calculated, and controlled.

It is this neurofication of sexual orientation that the Whiteheads use to their advantage when they enlist plasticity in their argument in favour of conversion therapy. Even though the initial development of a homosexual orientation is the result of many interacting factors and not a choice, they argue, it can be voluntarily altered later in life because the brain is plastic:

some research may eventually show real and replicable biochemical and micro-structural differences between homosexual and heterosexual brains, but ... these will almost certainly prove to be primarily the result of long-term and frequent behaviors – training, if you like. ... Because of brain plasticity it’s quite possible that homosexuals could become more heterosexual though intense persistent work could be needed, about equivalent to thoroughly mastering a new musical instrument. (2013 [1999], 154-55, 158)⁴¹

Conversion therapy has been widely repudiated as ineffective, harmful and stigmatizing (e.g. APA 2009), and there is no evidence to suggest that sexual orientation can be altered via brain training.⁴² Yet even if sexual orientation could be changed voluntarily, of course we must

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⁴⁰ For a recent critique, see Jordan-Young 2010. For an interesting rereading of LeVay’s data that uncovers ‘a neurological complexity that LeVay has been able to record but not fully elucidate’, see Wilson (2004, 62).

⁴¹ They make a similar claim with respect to transgender identities: ‘It is known that the brain changes physically in response to our behavior … Transsexual brain differences are therefore more likely to be the result of transsexual behavior, rather than its cause … There is thus no basis for special civil rights to be granted to transsexuals’ (Whitehead 2010, 7-8).

⁴² The Whiteheads refer to Doidge’s book The brain that changes itself (2007) as if it would back up their claim. They quote Doidge’s statement that ‘the human libido is not a hardwired invariable biological urge but can be curiously fickle, easily altered by our psychology and the history of our sexual encounters.’ (95). However, nowhere in his book does Doidge suggest that sexual orientation can be changed by willful action.

Importantly, the claim that sexual orientation emerges from the interaction of biological and environmental factors does not necessarily imply that it can be changed at will. Van Anders, who recently proposed a dynamic framework of sexuality in which ‘change [is] potentially central rather than peripheral, irrelevant, or
ask what reason there is to believe it would necessary or desirable to change. The Whiteheads argue that even though ‘brains are not innately gay or straight’ (2013, 142), homosexuality is associated with poor (mental) health and dysfunctional family dynamics, and heterosexuality is therefore the preferable, healthy option. I am not interested here in debunking these reprehensible claims; I only wish to reflect on the way the Whiteheads use plasticity to bolster their opinions, which enacts ‘modern neurodeterminism’ (Schmitz 2012): by translating the factors that contributed to the development of a particular sexual orientation into one common language—that of the brain—they render these factors more or less irrelevant. What counts from that point on is that sexual orientation, as a property of a plastic brain, is (presumably) amenable to assessment and intervention.

In the introduction, I quoted Schmitz and Höppner who wrote that ‘[plasticity] is the virus with which neurofeminism has inoculated neuroscientific discourse during the last decade’ (2014, 16). The Whiteheads use the same virus in an attempt to inoculate the gay rights movement, which has used the argument of immutability to seek legal rights and protection under U.S. law. This strategy relies on the assertion that sexual orientation is hardwired: ‘choice is the enemy of neural truth’ (Walters 2014, 99). Several scientists, legal scholars and ethicists have argued that the immutability argument is inadequate, unnecessary and even harmful (e.g. Diamond & Rosky 2016; Halley 1994; Murphy 1997). The Whiteheads’ claims are a case in point of how treacherous it can be to tie political or ethical decisions to scientific truth-claims. Another lesson to be learned here, one that is highly pertinent to this study, is how easily plasticity-based arguments can be abused when they are invoked to merely reverse cause and effect, and to combat biological determinism with an appeal to self-determination. Such arguments bypass two crucial questions: first, how much ownership or control does one actually have over their own body/brain to change it at will (hint: it is not 100%), and second, who or what can decide what kinds of life and love are desirable (hint: it is not neuroscience)?

aberrant’, compares sexuality to ageing: there is continuous development, but it cannot be willed, forced or imposed (2015, 1179). This makes clear that the relationship between fixity and change is not as simple as popular accounts of plasticity tend to assume.

43. In recent years, elevated levels of mental and physical problems amongst gay men have been ascribed to internalized homo-negativity and the stress (including discrimination and violence) they experience as a sexual minority (Meyer 1995, 2003).
Fathers at risk and as risk

When contemplating the plastic paternal brain, it is pertinent to consider how plasticity designates specific male bodies as ‘at-risk’ and as appropriate targets for intervention. Despite an increasing politicisation of fatherhood during the past decades, fathers’ psychological functioning has been researched predominantly in terms of the impact they have on mother and child, rather than out of interest for their own experiences: ‘even assisting ill fathers focuses upon their children ... the very experience of fathering with mental illness is nowhere to be found as a topic, issue or problem to be considered’ (Galasinski 2013, 21). In other words, fathers at risk are mainly approached as a risk for their families. It is in this context that the paternal brain has become an object of interest. Research is called for in order ‘to identify changes in the parental brain among at-risk fathers in order to construct more specific and early interventions to prevent the onset of postpartum mood disorders and to optimise environments for child development’ (Kim et al. 2014, 531). Identifying ‘biomarkers for risk, resilience and intervention’ (Swain et al. 2014a, 4) in the paternal brain is pursued for the ‘implications for the study of human attachment for fathers, the assessment of associated risks, and formulation of interventions to improve infant mental health’ (Swain et al. 2014b, 400).

Getting fathers more involved in childcare is broadly seen as a positive goal that will enrich men’s lives and advance gender equality. Studies that challenge traditional gender roles by showing how men’s brains are just as suited to take care of a child as mothers’ brains can contribute to that goal. Whilst welcoming these studies, however, we should also consider what kind of subject positions are created and what kind of governmentality is enacted when paternal plasticity is mobilised primarily in the interest of identifying fathers as at-risk. Certainly, fathers are not targeted as much as mothers in popular, medical, and academic discussions about intensive parenting and early development, and several studies suggest that fathers are less impressed than mothers by anxiety-inducing expert advice (e.g. Shirani, Henwood & Coltart 2012; Owen et al. 2010; Wall 2010). It is doubtful that this will change dramatically in the near future. Yet, that does not take away the fact that studies of the paternal brain have not only the power to challenge heteronormativity and gender essentialism, but also the potential to legitimise and further entrench an ideology of individualised, intensive parenting.
Conclusion

We may say that all man's struggles, religious, moral and economical, all the combats and conflicts that fill the history of mankind, can be traced finally to the nature and vigor of the desires, beliefs and strivings which have been cultivated by the social environment in the early life of the individual. (Sidis 1911, 3-4)

William James Sidis abandoned academia before he was 25 and ended up living a secluded life working clerical jobs, estranged from his parents (his father died shortly after he left Harvard) and in constant conflict with the press, until he died of a stroke at age 46 (New York Times 1944; Wallace 1986). It appears that his education did not save him from misery.44 Perhaps for him (at least in the eyes of the press at the time), his parents were the biggest risk factor in his life precisely because they believed they could create the perfect intellectual and the perfect citizen. In any case, his story demonstrates that neither our personal nor our societal future is determined by the early development of our brain.

In this chapter, I have discussed how the infant brain, the maternal brain, and the paternal brain have recently emerged as critical windows of plasticity: windows of risk and opportunity through which the future of a child may be gauged and controlled. Following Thornton (2011b, 2014) and other scholars who have critiqued the first-three-years movement and the intensive mothering ideology it promotes, I have made the case that it is crucial to attend to the ways in which neuroplasticity designates parents as at risk and as a risk, legitimises surveillance and intervention of specific (i.e. gendered, classes, racialised) populations, and yokes partially reinvented but nevertheless essentialist gender roles to neoliberal ideals.

Yet at the same time, in a desire to establish ‘neurological intimacy’ (Wilson 1998, 417) instead of rejecting or bracketing the physical body, I have offered a different reading of the material and argued that recent studies of maternal and paternal plasticity can be a potent resource for a critical feminist project that aims to challenge gender essentialism, heteronormativity, and the ideal of the nuclear family by engaging the material, fleshy, lived body. My aim here was not necessarily to demonstrate that nature is inherently queer. Rather, what is at stake here is that recent neurobiological studies can be used to understand parental experiences as the deeply embodied outcome of intra-acting material and discursive variables.

44. It appears he did write quite prolifically, albeit pseudonymously, throughout his life. Dan Mahony has collected his work at www.sidis.net. Here, one can also find material contesting the image of Sidis as a ‘prodigious failure’ painted by the press.
Depending on one’s personal histories, beliefs, goals, intentions, resources, restraints, and physiologies, these embodiments may or may not turn out to be queer. This perspective acknowledges the (sexual) differences a fleshy body can make, and simultaneously reiterates the importance of considering bodies as cultural products. Popular plasticity discourses that celebrate individualism and self-determination erase both the specificity of material bodies and the structural power inequalities that impinge on these bodies. Instead, I argue, we can and should use neuroplasticity as a way of paying attention to both.