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# Sex/Gender Matters and Sex/Gender Materialities in the Brain

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The materiality of *sex/gender*[1] has been a contested arena of debate in Gender Studies, not only since Judith Butler's *Bodies That Matter* (1993), but, as we know, also before (e.g., Haraway 1986). Since then, we have moved forward, on one side, with the understanding of how science constructs the truth about sex/gender in human corporeality and its behavioral materiality. On the other, we have also made headway in understanding the biological logics and illogics of genes, gonads, genitals, and their interplays with the brain and other sexed/gendered parts of the body. Despite the accumulation of knowledge in each of these two discourses—the metatheoretical reflection on the construction of sex/gender on the one hand and the critical bio-medical production of sex/gender-related knowledge on the other—the transfer of insights between these two domains has progressed rather slowly. From my vantage point as a queerfeminist cognitive neuroscientist currently working in the lab, there is still an enormous disconnection between those who think in terms of a "symbolic" (or linguistic) signification of a sexed/gendered materiality on the one side, and those who believe in the "real" and objectifiable matter of sex/gender on the other. Further, scholars who examine how matter comes to meaning (e.g., scholars from Science Studies, Gender Studies, the Arts and Humanities) and researchers who conduct empirical hands-on investigations on matter (e.g., physicians, neuroscientists, biologists, physicists, chemists) still do not engage in exchange as often as interdisciplinary enterprise would require.

What complicates the communication between these two discourses was and still is that both groups of academics are trapped in their own disciplines: the Humanities, the Social and Cultural Sciences on one side and the Natural Sciences on the other. The transmission of knowledge



on theoretical and methodological levels is considerably hampered by disciplinary power. For instance, we can ask: Who from Genetics has ever read Haraway's *Primate Visions* (1989) and who from Gender Studies has ever glanced at Joel's "Male or Female? Brains Are Intersex" (2011)? Or who in Gender Studies would spend months conducting "reductionist" experiments and evaluating biology based data? In parallel, who from Chemistry would visit the archives to read what medical scientists published about gonads in the nineteenth century?

There are, of course, some who have engaged in such transgressive endeavors, e.g., Fausto-Sterling (2012a, b), Bleier (1984), Birke (1986), Haraway (1984), Roy (2008), Schmitz (2012), Jordan-Young (2010) and several others, Karen Barad being one of them. As a physicist and philosopher, Barad knows *what* matters when materiality materializes itself. She has dedicated considerable attention to the inextricable entanglement between what we would colloquially call "things" and their meaning (e.g., 2003, 2007, 2012), and, as I will discuss here, her revision of Judith Butler's concept of performativity helpfully advances a materialist-semiotic understanding of sexed/gendered matter. However, I argue that even Barad fails to fully address the question of how and where exactly sex/gender is instantiated in intra-active bodily materiality. In this chapter, I aim to delve into another type of materiality than that commonly studied in physics, namely into the matter of the brain. I will show the intransigence of dichotomously mattered sexed/gendered brain regions in neuroscientific practice, and argue that in contrast to the "non-vital" materiality of physics, addressing the brain's sex/gendered materiality requires a distinct approach to the "bio" of neurobiological matter.

With this goal in mind, the structure of this chapter will revolve around five main points: I begin with (1) my point of departure,[2] Butler's understanding of materiality, which is primarily concerned with surfaces, I argue, as opposed to what lies beneath them, and Barad's materialist intervention. Barad's conceptualization of agency at the depth of materiality is particularly valuable in enabling me to examine a very specific micro level of matter. However, I distinguish Barad's agential realist notion of (physical) matter from what I call bio-matter or more specifically neuro-matter, which is the main concern when studying the brain. This will bring us to examine the agency of neurobiological matter of

the brain (2) and the role sex/gender plays in it (3). I then ask (4) how much independent agency we want to ascribe to the specific subcortical matter itself, and I make (5) the applicability of an agentic materiality in neuroscientific empiricism a subject of discussion. In the following, I will apply a diffractive reading of feminist theories of the body and matter through Neuroscience in order to examine the entanglement of matter and agency in sexed/gendered brains.

## (1) Performativity and the Subsurface of Non-Vital and Neurobiological Matter

Relations of power are, as Foucault as well as Butler and others have demonstrated, inevitably entangled with the materiality of our bodies; a strict separation of these categories is untenable (Foucault 1976; Butler 1990, 1993). One of Butler's most important contributions to the theory of sex/gender is her understanding of sex/gender performativity, according to which being a woman or man is understood as a product of repeated activities within a system of sexed/gendered power relations and not as inevitable, natural materializations (1990). Through the iteration of normed statements, performativity has the *effect of materiality* and can therefore not be understood as a single, willful act, but rather as a practice of constant repetition and citation. To address the body's materiality in relation to sex/gender, Butler proposes

> [ . . . ] the return to the notion of matter, not as site or surface, but *as a process of materialization that stabilizes over time to produce the effect of boundary, fixity, and surface we call matter*" (1993, 9; emphasis in original)

In this context, the very materiality of our bodies has always been crisscrossed by binary sex/gender norms and can never be viewed as sex/gender-neutral. I would argue that exactly the same is true for our brains: in neuroscientific experiments, the "hard" and "independent" variable sex/gender, marked as F and M, is understood as a preliminary determinant and not a resulting factor. For instance, many MRI empirical settings are prepared by default so that the experiment could not even start without checking the box for F or M, thus making participants into sexed/gendered subjects even before the study begins. This suggests that



regulatory norms, sex/gender, and matter constitute an indivisible triad that finds its materialization in neuroscience too. But what if we turn the focus away from subjects (as individuals) and point at the cortical matter *itself*? Is there a sexed/gendered constitution of the materiality of the brain or does the term "constitution" not entail the idea of subject status, a status that only one piece of "bio-matter" cannot sustain? Past and present investigations on the regulation and constitution of the self through and in neuroscientific discourse confirm that neuroscientific research is part of a power/knowledge complex (Rose 2003; Maasen and Sutter 2007; Lettow 2008; Schaper-Rinkel 2012). However, when we are not referring to the neurosciences as discourses that enable the constitution of subjects, but to the brain itself, to this 1.3 kilograms of cerebral biology, this piece of material facticity with its own rules and which is a part of the subject and not the whole of it, how exactly do sexed/gendered discourses fit in, and how do they become material reality?

Butler's articulation of performativity as having the effect of materiality is insufficient to address these questions. While some have argued that Butler (1990, 1993) disregards or even dissolves material bodies into discourse or language (Duden 1993; Landweer 1994; Alaimo & Hekman 2008), I do not share this opinion. But I do want to note that she uses a very specific understanding of the body, namely a *human* body which constitutes and acts out sex/gender in its performative behavior and everyday interaction and social practice. On this point, Barad argues:

> Butler's concern is limited to the production of human bodies (and only certain aspects of their production, at that), and her theorization of materalization is parasitic on Foucault's notions of regulatory power and discursive practices, which are limited to the domain of human social practices. (2007, 145)

In this sense, in Butler's analyses, the body and its materiality only reach a human-biological surface, a point to which Barad also draws attention, claiming, like others, that matter cannot be only a "kind of citationality" nor a product of discursive acts (2007, 151).

It is true that we actually learn very little from Butler about the matter of the body and body parts, the transgression *underneath the skin* and the associated sex/gender constructions *within* the body. Butler

does not examine *where* and *why* these processes take place, or *why* they take place where they do. With respect to certain entities of "biological-material" manifestations *under the skin*, we only get a vague hint, which is moreover hard not to label as a subversive or inassimilable rest.

> It must be possible to concede and affirm an array of "materialities" that pertain to the body, that which is signified by the domains of biology, anatomy, physiology, hormonal and chemical composition [ . . . ]. None of this can be denied. (Butler 1993, 66–67)

By limiting the gaze to the body's border rather than into its inside, Butler loses sight of a certain materiality, the materiality of interest to science and particularly to biomedical science. Ironically, at the same time, she creates a close proximity to materiality within the body by equalizing sex and gender. This closeness to, and distancing from, a body-under-the-skin elides the material-"biological" body examined through the methods of all biomedical sciencies. And it is exactly this paradoxical situation of closeness and distancing to corporeal matter that keeps appearing and reappearing for those gap workers at the edge of science and gender studies.

Barad takes us one step further here: We pass through the body's border and get to the inside of materiality, where our attention is drawn to material processes and forms of agency. "[A]ny robust theory of the materialization of bodies would necessarily take account of *how the body's materiality*—for example, its anatomy and physiology—*and other material forces actively matter to the processes of materialization*" (2003, 809, emphasis in original).

If performativity is material, matter is active. Barad assumes that matter is a part of its own process of construction, it is generative and involved in the creation of its own meaning—albeit not prediscursively. Materiality is a doing that creates itself onto-epistemologically (Barad 2007). Following Haraway's (1995) idea of factuality or organisms taking an active part in creating its meaning by referring to it as "material-semiotic actors" (96), Barad's materialist conceptualization of agency allow an analysis of sex/gender materialization at a very specific micro level, at the level of neuro-matter.



However, it is important to keep in mind that while Barad's concept of materiality refers extensively to materialities and bodies in general, the main focus of her work is limited to *physical* material manifestations. In her posthumanist vision, Barad insists on the similarities between different materialities. In contrast, I would like to call attention to some specific characteristics of neurobiological matter. Contrary to most of the physical bodies to which Barad refers, neurobiological matter is a type of matter that we carry in our bodies and which is very much *alive*. Hence, the question becomes: How can this neurobiological, this living matter that we *have* in our bodies and that we at the same time also *are*, be comprehended in its active-agential and performative doing?

## (2) Agential Doing in Neurobiological Matter

In the brain, agential doing is in full swing! Neurons are firing, metabolic processes are taking place in and between cells, blood is circulating, action potentials are being activated and inhibited, brain fluid is flowing, old tissue is being removed, synapses are forming, the frontal lobe is "communicating" with the parietal lobe, subcortical structures are sending information to the cortex, and much, much more. Usually, these processes are signified by biology; it is the discipline of neurobiology that claims the sole power to define and explain these processes. However, I believe it could be interesting to examine exactly these processes diffractively, through the lens of queerfeminist theories of sex/gender, the body, and materialization.

### *Neurobiological Plasticity and Performativity*

In addition to these permanently ongoing processes, activity in the brain also displays another feature: the dynamic adaptability of the brain, expressed as *brain plasticity*.[3] Neurological plasticity represents lifelong adaption processes in the brain, and the whole nervous system, which depend on new experiences made by the individual.

The networks of neural cells and synapses in the brain, in the cortex and everywhere else, are constantly being stabilized, destroyed, and

rebuilt—always depending on what is going on in our minds, body, and environment. The cortex in particular is therefore not determined from the outset, neither in its structure and connectivity, nor in its patterns of functional activation. Instead, in the process of developing and while dealing with its environment, biological matter is constantly changing. The enormous dynamic of brain plasticity can explain the diversity of brains, because each person has different experiences. In the context of neurological plasticity, what happens in this material dimension is this: we learn. Or would it be more correct here to say: the brain learns agentially, and we learn along?

From the viewpoint of the neurosciences, learning necessitates modulation of existing neuronal networks and/or the formation of new networks. This process occurs at several levels. At the level of electrophysiology, the signal strength at the single activated synapse is increased—this is called *long-term potentiation* (Bliss & Lømo 1973). This sensitized transmission is accompanied at the biochemical level by the production of new molecules that stabilize well-used synapses, while at the same time creating new synapses and, in parallel, probably also pruning unused connections. Together this results, at the structural level, in new or more efficient connectivity. At the level of neurons or neuronal networks, learning is therefore nothing more than a change in connectivity patterns dependent on experience-driven synaptic activity (Kandel 2001).

The concept of neuronal plasticity introduces dynamism into our understanding of our mental organ. Consequently we have come to see the structure and function of the brain as increasingly receptive and responsive to the environment. In light of this idea, brain materiality becomes something that is always in the "doing" or in the process of "becoming," matter in which new neuronal networks are constructed as an effect of learning or "matter" is "mattering." A central aspect of these processes of neuro-material "becoming" is the repeated or frequent performance of similar or identical experiences outside the brain. We see now how *repetition* gains crucial significance at the point of materialized becoming—also for the functioning of the brain.

The neuroscientific view of brain plasticity as an outcome of learning, as a repetitive and iterative product of an interaction, can be understood as equivalent to the concept of performativity, specifically at the level of



the neuronal subsurface.[4] I argue here that, analogous to performativity, neuronal plasticity has the effect of materiality. Materiality as becoming, materiality as an iterative loop, can be associated in its own performativity with neurobiological plasticity. The notion that the substance of matter is not a thing but a doing (Barad 2007) also corresponds to the concept of a plastic brain.

## (3) Stumbling Across Sex/Gender in an Active Neurobiological Matter

So far, we have dived and delved into the neuro matter of agential neurobiological doing. We have considered the building of networks and how neuronal plasticity becomes manifest. At this point we need to ask: What about sex/gender? How is this "brain-matter-in-the-doing" or "brain mattering" of interest to gender theory? In my opinion, there are two areas of interest in which sex/gender come into play here.

First, "brain-mattering" is relevant in that *sex/gender socialization* comes into effect in an evident manner through neurobiological learning. Binary sex/gender socializations are learned by the brain and—roughly speaking—can result in similar or "typical" sex/gender specific neuronal networks of brain structures. An example for this is sex-/gender-related language lateralization in the brain. Women seem to activate the language centers on both sides of their brains, whereas men tend to show only a left-hemispheric activation (e.g., Philipps et al. 2001; Baxter et al. 2003; Bitan et al. 2010; Phillips et al. 2013). Even though the question of sex/gender-specific language lateralization in the brain is still under debate in cognitive neuroscience (Sommer et al. 2004; Kaiser et al. 2009), as is the further issue whether this sex/gender difference can in fact be generalized beyond the domain of language (Ihnen et al. 2009), this example may illustrate the palpable impact of socialization. It would only be logical that sex/gender differences are represented in our receptive and adaptive brains, considering that we are made into women and men right from birth and that our brains are practicing and learning sex/gender all day, day in and day out—also in terms of neurobiologically dealing with language. From this point of view, social norms are materially embodied in the brain. Such an understanding of *embodiment* is certainly nothing new and has been repeatedly outlined, most

prominently, by Anne Fausto-Sterling (2000) and Fausto-Sterling and colleagues (2012a, 2012b).

Second, "brain mattering" is of interest insofar as the brain tends to remain sexless/genderless at the micro-level of neurobiological intra-active processes of mattering—as regarded from a Baradian perspective. In the depths of neurobiological agency, neurons fire, brain fluids circulate, and synaptic connections and new neural networks form. At this micro-neurobiological level of activity, sex/gender seems to disappear, giving us the impression that sex/gender gets lost deep down in bio-matter. At second glance, however, we *do* find entities that are actually highly sexed/gendered. And they cannot be easily eliminated. When continuing to examine the material life of depths of the brain, we find substances such as hormones and genes, phenomena predominantly signified by the disciplines of biology and neurology, which certainly place a sex/gender on specific parts of brain[5] matter in a quite dichotomous manner. For these substances, as we know from biology, sex/gender not only matters at the level of a person's socialization, but already at a level of unlearned processes of mattering within significant parts of the human brain. While for inorganic physical matter, agency is free from sexed/gendered units such as hormones and genes, the same does not hold true for the bio-material brain. In the hypothalamus and hypophysis, for example, steroids are given a significant role. In a very matter-like way, they are said to form a dichotomous (Swaab et al. 2001; Morris et al. 2004) sexed/gendered neuroanatomical "facticity". Such facticity is in turn inseparably linked to the neurobiological basis of reproductive capacities and to the reproductive function in life.[6] In other words, there are these places in the brain that have, at a high probability, sex/gender neurophysiological and neuroanatomical dimorphic layout, a "difference" that virtually uncontestably originates in its own dimorphic agency. More explicitly, research has demonstrated a clear "distinction" between what we call "female" and "male" neuroanatomical correlates of reproductive properties in (a specific part of) the hypothalamus (e.g., García-Falgueras et al. 2011), and the pituitary gland plays an important role as well. Biologically, this is said to be a material reality, or indeed a "fact." Since biology is the discipline that gives signification here, there is no other approach to understand bio-material processes at this level of neuromaterial depth. Despite this fact, I nevertheless ask: Are there other ways of dealing with this dichotomized character of the hypothalamus and hypophysis? I argue for a diffractive reading, one that addresses this biologically powerful facticity through a materialist but also through a queer, feminist, and constructivist lens.



## (4) How Agentic Can Neurobiological Matter Be?

Barad describes the nervous reactions some people display in response to an account of agency that ascribes agency not only to human subjects (2012, 55). Through Barad's accreditation of agency to the very materialities that make up these subjects, somehow, I personally feel nervous, too. Such alarm is justified by the ways in which some people still use a sex/gender-difference based neurobiology of our brain, in a social context, to justify various forms of purported inability of men to look after children; of denying people in same-sex relationships their rights; or of pathologizing transgender people. For this reason I regard as very productive Barad's notion of agency in a materiality without sex/gender, a notion which she develops in relation to physical bodies. However, in a bio-materiality like the brain and as an example the hypothalamus that is constitutively so strongly crossed by binary power discourses, the situation is a different one. Here the question arises: what type of self-contained, independent, and subversive *agency* do we want to ascribe or attribute to this specific subcortical matter itself? And what should such agency look like so that the very determinisms which deconstructivist approaches over the last decades helped us to get rid of do not sneak in again? To preempt misunderstanding: from a queerfeminist perspective such as mine, the subcortical interplay of some steroids in the hypothalamus and hypophysis cannot and should not be denied.[7] To give an example, after ingesting testosterone for a few months, certain material effects would surely manifest in my brain—they would make a "difference" in my body. This might include effects such as growing facial hair or muscles, which with all probability would be associated with the attribution of being "male." Thus, when recapturing material agency in the body and brain, I want to consider when corporal "differences" are agentic and what we mean by that. And for that we continue with the example of the hypothalamus.

I suggest we understand the hypothalamus (as well as the hypophysis and other brain regions closely embedded in what is called "sexual

difference" and later "sexual categorization") as "dimorphically agentic" insofar as their effects on neurophysiological, neurostructural, and bodily features can be detected, measured, and registered by means of scientific methods. When framing these measurable and quantifiable characteristics in a responsible ethical onto-epistemological context in which matter can materialize itself, I would however hesitate to call their characteristics "dimorphic" or "different." Rather, I suggest to continue searching for new terminologies and to build new onto-epistemological units that do not necessarily correspond one-to-one to existing material items and current entities of signification. Since practices of difference continue to be inextricably interwoven with the purpose of segregation, division, and exclusion,[8] in the field of interdisciplinary queer feminist neuro-research, we have yet to reach a point where we could operate with terms such as "different" from a neutral perspective or with "male" or "female" as coequal—also not in/for the brain. In the same vein, I suggest employing a more fitting term than "male" or "female" when describing neurostructures or the effects that neurostructures can trigger. For instance, the fact that injecting steroids leads to a specific ("different" and "real") neurostructure, which in turn leads to beard growing, should not make queer feminists feel uncomfortable, since there is nothing dismissive about this; rather, it is the moment that a specific brain structure or the beard is signified, labeled, and in the following perceived as only and always "male" (with all implications for the rest of the body and one's behavior) that we should attend to. Again, the problem is not about negating changing or "different" brain structures or functions we can measure using specific scientific methods; the problem is about, for instance, thinking of a larger INAH3 or a beard as being solely "male" expected to be found in a correspondent, complete, and constantly "male" behaving body and mind. This is precisely the point where we need, in the empirical labs, to create new onto-epistemological units and to name them in a new form applying new methodological and statistical tools. This is also exactly the point of scientific production where we could indeed reach out to neuroscientific researchers working on what they still call "sexual differentiation"[9] and work together with them on shifting knowledge. That would indeed be a productive interdisciplinary approach to building new onto-epistemological assemblies. Thus, to me, introducing "agency" into neuromatter urgently needs the



reframing of the very specific signification practices—in each and every step of neuroscientific experimentation. It is not enough to give matter its agency back. At the same time, we need to work on the epistemological aspect of the newly emerging onto-epistemologies.

## (5) Agentic Neuromateriality in Empirical Research?

I see the true value of agency for a queer gender-sensitive neurobiology in empirical, experimental investigations rather than in theoretical analyses. There is an urgent need to include and integrate insights developed in Barad's agential realism approach into *empirical research within the brain sciences.* Similar to Butler, Barad has been claiming that "Epistemology, ontology, and ethics are inseparable" (2012, 69). This raises the question: How are Barad's concepts ethically transmittable into the operationalization of what active material sex/gender *is* within an experimental setting? What would a hands-on bioscientific research praxis on the agency of materiality look like? How can we be "objective" (Barad 2012, 57) so that we can responsibly conduct experiments in which matter can materialize itself in an ethico-ontoepistemological manner? Some of these questions have been touched on in the preceding paragraphs; others still need further reflections and interdisciplinary exchange.

The issue of experiment-based scientific research is crucial in order to avoid what happened to a scientifically approached body against the backdrop of the Butlerian sex/gender deconstruction, i.e., to the role the natural sciences played in Gender Studies of the last decades. This "deconstructed" category made it, casually speaking, to the empirical edge of the neuroscientific laboratory but it was not able to transgress the experimental boundary of scientific research within the *natural* sciences. This means there is for instance research *about* the construction of sex/gender in the Neurosciences, but no research *with* deconstructed sex/gender *in* neuroscientific experiments. So how should we handle Barad's theory in order to already situate it *inside* the empirical and experimental production of gender-related bio-materialities? Or, in provocative terms and to return to the topic of *power* mentioned at the beginning: Why should we not use the power of science to create newly sexed/gendered biology?

NOTES

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1 *Sex/gender* is used here to demonstrate that, in the eyes of the author, we still need to use these two terms together to remind ourselves about their intertwinement when examining matter in the context of science (Kaiser et al. 2007, 2009, 2012).

2 In line with Haraway (1988) and Harding (1991), I would like to position this chapter so as to clarify my theoretical background as well as my original questions and to avoid the illusion of a perspective from nowhere. What was at the bottom of the thoughts I am presenting here? And what are the thematic threads and the significant theories and concepts that inform my questions?

3 With *neurobiological plasticity* I refer here to structural plasticity. It was long believed that the brain can only alter its function in an otherwise structurally stable network. Paradigmatic research a few decades ago opened a completely new view of the brain as an organ capable of changing its constitution, i.e., its structure or anatomy, during all phases of (human) life as an effect to shifting circumstances (see also Rubin 2009).

4 It is not surprising that the neuroscientific concept of *plasticity* and the gender studies-based approach of *performativity* both show similar characteristics. Both Gender Studies and the Neurosciences are relatively new disciplines. Emerging concepts within both fields underlie contemporary zeitgeist, trends, and scientific policies (Kaiser 2010). Others have shown how the emergence of neuronal plasticity can be regarded in a framework of political economy (Malabou 2008), governmentality (Pitts-Taylor 2010), or neoliberal politics of meritocracy (Schmitz 2012).

5 Some researchers argue that there are not only a few specific brain regions (areas predominantly involved in reproduction or sexual behavior) that are dimorphic and that the rest of the brain has not only one unsexed/ungendered form (McCarthy and Arnold 2011). Rather, this research postulates that (chromosomal) sex/gender is everywhere in the brain, and thus plays a crucial role in many or even most brain regions (McCarthy and Arnold 2011; McCarthy et al. 2012).

6 Here, I deliberately come very close to an understanding of sex/gender difference as "unlearned" or "natural" that some regard so much as "biological" and obvious that it has nothing to do with *the* (social) sex/gender of the brain *they* are talking about, or others regard it as "biological" so much that they could appear to be "essentialists" when dealing with it and thus totally omit this question altogether. These two different attitudes toward a final and definite answer to the sex/gender question of the brain are based on the fact that although we have managed to decouple many "gendered" characteristics from the brain by demonstrating how contiguous they are to socialization or context (e.g., Rippon et al. 2014), "sex" differences, i.e., reproduction-based features, still represent and substitute *the* (biological) "sexual difference" (Kaiser 2012) in neuroscience. From this understanding of "sexual difference" as final, reproduction-related difference mandatorily follows a dualistic sex/gender categorization in bio-scientific experimentation. And thus suddenly we not only "admit," "see," "observe" a pure and evident reproduction-based sex/gender difference in the brain and body during empirical reserach, but we are in midst of (scientific) signification practices through categorization. As Ayala and Vasilyeva (2015) have shown, sex/gender categorization is never based solely on differential reproductive roles. The capacity or property of playing one of two (or more) roles in reproduction does not force us to play this role. Reproductive capacities are also rarely really what we are interested in when we signify/call something or someone "male" or "female" in scientific research and society. For instance, when we look for "male participants" in the frame of a cognitive neuroscientific experiment, we are certainly not interested in the (potential or already proved) property of men to produce fertile sperm. In addition, we necessitate many other biological (not to mention the cognitive and social) factors to act successfully in terms of reproduction. Thus, the (potential) property of producing eggs and sperm is in fact not distinctive or specific enough to categorically split (a study's) population and signify them as two groups. At this point, a "female" or "male" categorization does not keep the accuracy or precision such terms should have in the highly complex interdisciplinary endeavor of neuroscience and gender theory.

7 In addition, we should broaden our approach of either "denying" or "negating" sex/gender differences or similarities since things are more complicated than that (see also Jordan-Young 2010, Maney 2016). It is about finding new, empirically measurable units and affording them with new and productive significations.

8 . . . and empirical science is axiomatically bound to practices of difference.

9 McCarthy and Arnold (2011) argue for a new parallel-interactive model of "sexual differentiation" rather than relying on the old linear model. My personal vision of interdisciplinary research is that this type of knowledge and all the knowledge behind could be productively tied to ongoing queerfeminist work in the neurosciences. However, this should be done diffractively, i.e., by using this empirical and measurable data to build new onto-epistemological units in an interdisciplinary exchange. Through this process, some empirical and measurable data that, for instance, McCarthy and others provide may need to be re-captured in a way that allows it to become signified by a new term in dialogue and accordance with queer feminist and gender theory. In this way—rather than through the mere integration of knowledge produced in neuroscience into gender scholarity—I see a possibility of appropriating new materialities and coupling them with sex/gender theories, thereby contributing to the formation of new onto-epistemological knowledge in which "agency" is thinkable and productive.



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