NEW MATERIALISM AND GENDER

(RE)CONFIGURING HUMAN AND ROBOTIC EMBODIMENT

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ABSTRACT

Dominant understandings of sex, gender and sexuality align with patriarchal ideology that maintains misogyny, sexism and male supremacy. A critical feature of the aforementioned gender paradigm is strict mutually exclusive binarism and essentialism. By taking a queer feminist perspective on gender (and the gender binary) and using posthuman new materialism (agential realism) as a theoretical framework this study engages with the constitution of myriad binaries, including the male/female, man/woman, heterosexual/homosexual, sex/gender, human/nonhuman and mind/body binaries. Through a diffractive reading of feminist poststructuralist, new materialist, biological, ethnographical and queer theories of sexual difference, sex, gender and sexuality and the binary genderisation of anthropomorphised social technologies – including intelligent assistants and companion and humanoid robotics – the iterative constitution of sex, gender, sexuality, body and human is explored revealing various apparatuses that material-discursively (de)stabilise these binaries. Thinking of gender, the body and the human as dynamic contingent phenomena and taking a non-anthropocentric stance allows a reconsideration of both robotic and human embodiment. Paramount here is the dual possibilities of creating more of the same, reinscribing normative realities or leaving open the potential for the co-creation of dynamic futures.

Keywords: New Materialism, Agential Realism (*Posthumanism*), Queer Feminism (*The Gender Binary, Trans*, Intersex, Sexuality, Bisexuality*), (De)Humanisation (*Anthropomorphisation, Embodiment*), Humanoid Robotics (*Social Technologies, Robotics, Humanoid, Android, Gynoid, Artificial Intelligence*).

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CHAPTER 1
INTRODUCTION

Diffraction is an optical metaphor for the effort to make a difference in the world.
Donna Haraway[1]

1.1 Background and Context

Over the past two decades, digital technologies have become increasingly pervasive, both in personal and professional environments. Present-day innovation in digital technologies increasingly focuses on rapidly developing artificial intelligence (AI) technologies which endeavour to simulate human intelligence (HI) in machines. As a result of anthropocentrism (human exceptionalism), these technologies frequently resemble humans in various symbolic and material ways – including being gendered.[2] Such technologies incorporating AI include virtual personal assistants[3] (VPAs) and social or companion robots, including humanoids.[4] Digital technological developments in AI and robotics, in particular, pose numerous obstacles to gender equality[5] as design and functionality are informed by dominant biases, stereotypes and understandings of gender. The rapid advances and commercialisation of emerging gendered technologies (in the form of VPAs and robotics) require

[1] *Modest_Witness@Second_Millenium.FemaleMan©_Meets_OncoMouse*™ (1997, 16).
[2] There exists a lengthy association between (dichotomous) gender and being considered human, corresponding to patriarchy and white supremacy. See Bederman (1995) and Boag (2011) for discussions on some of the connections as well as Chapter 4.
[3] Software programmes that use predominantly voice requests and replies to perform actions including search, scheduling and reminders for the users of computers, smartphones and other smart devices such as televisions or speakers. AI is used to personalise and individualise the results provided, and actions performed.
[4] Robots build to resemble the human body in morphology. AI technologies including machine learning (ML), deep learning (DL), knowledge representation and reasoning (KR^2), natural language processing (NLP), and computer vision may be used separately or jointly to simulate human intelligence (HI) in these robots that frequently perform or assist in care, hospitality ad service work.
[5] See Whittaker *et al.* (2018) and Crawford *et al.* (2019) for further examples of developments in AI that demonstrate and even intensify prejudice and inequalities.

engagement with their role in rearticulating or disrupting restrictive gender binaries.

Prevailing understandings of sex, gender and sexuality align with patriarchal ideology and essentialism. Patriarchy is predicated on the construction of sex as an immutable binary[6] with associated prescriptive gender appearances, roles and behaviours (including exclusive heterosexual attraction) that maintain misogyny, sexism[7] and male supremacy. Patriarchy forms part of the dominant paradigm and power relations that accompany the intersecting oppressive forces of *white supremacist capitalist patriarchy* (hooks 2000, 52). Whereas patriarchy cannot be divorced from white supremacy and capitalism, neither can its constituents: sex, gender and sexuality, be neatly separated from each other – they are mutually constituted and separating gender from sex and sexuality continues to regard each as singular and permanent, foreclosing opportunities to consider how their separation is enacted and binaries maintained (Latham 2017, 182). Furthermore, attending to sex, gender and sexuality in complete isolation fail to acknowledge the complexities that accompany queer[8] (LGBTQIA+)[9] experiences.

To adequately investigate the enactment or disruption of gender binaries as it pertains to human and robotic bodies it is necessary to avoid anthropocentrism and androcentrism, embrace queer concerns and refrain from falling back on essentialisms. Taking a queer feminist perspective on gender (and the gender binary) and using posthuman new materialism (agential realism) as theoretical

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[6] Sex and gender (and sexuality) as an immutable, rigid and mutually exclusive binary is intertwined with white supremacy. See Bederman (1995) for the changing connections between stark binary gender differences, savagery and civility and white male supremacy.
[7] In addition to discrimination, prejudice and stereotyping of women in general, sexism can also be directed more specifically at people who are intersex, transgender and non-binary and/or gay, lesbian, bisexual and asexual.
[8] Queer is used as an umbrella term to refer to persons who are not heterosexual or not cisgender (or neither), note that although the term is widely used in academia (particularly queer theory) and as a personal identifier it was used as a slur in some parts of the world and thus its use remains controversial.
[9] L – lesbian, G – gay, B – bisexual, T – transgender, Q – queer (and/or questioning), I – intersex, A – asexual (and/or agender). The + acknowledges any and all others who are not heterosexual or cisgender. In addition to personal identifiers bisexual and transgender can also be used as umbrella terms for attraction to multiple genders and a misalignment between gender identity (or experience) and gender assigned at birth (or expected) respectively.

framework an agential realist conception of gender as a material-discursive phenomenon can be advanced and the constitution of patriarchal binaries scrutinised. As we engage with anthropomorphised[10] technologies like VPAs as if they were human assistants, the boundaries between human and nonhuman also call for scrutiny. This requires different ontologies that do not take the 'human' for granted and accommodates 'nonhuman' actors. To this end, posthumanism encourages mutual engagement between science and humanities, particularly regarding technology (Ferrando 2013).[11] Consequently, this study engages with the constitution of myriad binaries, including the male/female, man/woman, heterosexual/homosexual, sex/gender, human/nonhuman and mind/body binaries. Through a diffractive reading[12] of feminist poststructuralist,[13] new materialist, biological, ethnographical and queer theories of sexual difference, sex, gender and sexuality and the binary genderisation of anthropomorphised social technologies – including intelligent assistants and companion and humanoid robotics – the iterative constitution of sex, gender, sexuality, body and human is explored revealing various apparatuses that material-discursively (de)stabilise these binaries. Thinking of gender, the body and the human as dynamic contingent phenomena and taking a non-anthropocentric stance allows a reconsideration of both robotic and human embodiment. Paramount here is the dual possibilities of creating more of the same, reinscribing normative realities or leaving open the potential for the co-creation of dynamic futures.

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[10] Anthropomorphisation refers to the technologies being attributed human (gendered) characteristics, behaviours or physical likeness.

[11] See Herbrechter (2013) and Ferrando (2013) for posthumanism's interest in the historical and ontological dimensions of technology particularly as it relates to the dismantling of the human/nonhuman binary.

[12] Reading through each other and together. See *Methodological Approaches* below for an explanation.

[13] Poststructuralism is influential both in queer theory and new materialism, particularly formative theorists Judith Butler and Michel Foucault. See Gamble, Hanan and Nail (2019, p118) for Butler's postructuralism as failed materialism and Barad (2007, p47-65, 135, 141-151, 169, 189-194, 199-204, 207-214, 229-235) for performative new materialism's recourse to poststructuralist thought (both Butler and Foucault).

1.2 Theoretical Points of Departure

Scholarship organised under the ontological turn – material turn, posthuman turn – offers a useful theoretical basis. New materialism and posthumanism suggest alternative methodological approaches (post-qualitative and non-representational) to humanist methodologies. Posthumanism[14] comes from diverse lineages and is variously classified,[15] nonetheless, it encompasses a critique and deconstruction of the assumptions of humanism and its human exceptionalism/anthropocentrism (Braidotti 2013; Ferrando 2013, 29; Herbrechter 2013, 2). Moreover, posthumanisms generally critique historical binaries such as mind/body, subject/object, culture/nature, male/female, and human/nonhuman (Ferrando 2014, 3; Herbrechter 2013, 79, 90). Posthumanism is heavily influenced by poststructuralism and feminism (and gender and queer theory) both known for their interrogation of binaries. Posthumanism's rejection of the culture/nature and human/nonhuman binaries and its subsequent renewed focus on materiality and the acknowledgement of nonhuman actors is particularly palpable in what is called the new materialisms.

There is no single definition of new materialism (or material feminism).[16] However, all new materialisms, in general, question the anthropocentric and constructivist inclinations of the majority of twentieth-century theory and advocate for greater consideration of the sciences by humanities (Gamble, Hanan and Nail 2019, 111). While new materialisms embrace the ontological in addition to the epistemological like the old materialists did, they differ in so far as the older materialisms rest on the humanist principle of human exceptionalism and consequently considered matter as passive (Gamble, Hanan and Nail 2019, 113-

[14] Also called critical, cultural or philosophical posthumanism (see Herbrechter [2013] and Ferrando [2013]), not to be confused with transhumanism, antihumanism, metahumanism and neohumanism (see Ferrando [2013] and Gladden [2018]).
[15] See Gladden (2018) for a classification of various strands of posthumanism and similarities and differences between them.
[16] See *Material Feminisms* (2008) edited by Alaimo and Hekman, *New Materialisms: Ontology, Agency, and Politics* (2010) edited by Coole and Frost, and *New Materialism: Interviews and Cartographies* (2012) edited by Dolphijn and van der Tuin for definitions of new materialism(s).

114).[17] Regrettably, simply considering matter as active (in one form or another)[18] does not defeat human exceptionalism (Gamble, Hanan and Nail 2019, 118). Christopher Gamble, Joshua Hanan and Thomas Nail (2019, 111-112) identify three divergent new materialist strands:[19] vital new materialism,[20] negative new materialism[21] and performative new materialism.[22] Even though these new materialisms are led by the same motivations (questioning anthropocentrism and the privileging of culture over nature), they diverge significantly in their basic premises and approaches to anthropocentric binaries including matter/meaning, nature/culture, nonhuman/human, and sex/gender (Gamble, Hanan and Nail 2019, 112). Gamble, Hanan and Nail (2019) identify performative new materialism as, in general, the most promising of the new materialisms, given its strong posthumanist proclivity and commitment to matter's activity. It is performative new materialism's principles of indeterminacy and pedesis, ongoing iteration, and relationality that simultaneously preserves matter's activity as immanently self-caused (as opposed to the other new materialisms that rely on external sources for initiating matter's activity) and consistently refrain from falling back on human exceptionalism (Gamble, Hanan and Nail 2019, 125). Hence, I will be taking a performative new materialist approach.

Performative new materialism, largely neglected, misunderstood and conflated with the other types, is principally advanced by Karen Barad and further explored by Vicky Kirby (Gamble, Hanan and Nail 2019, 122). While all new materialisms (like old materialisms) comprise a move from singularly focusing on epistemology

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[17] Critics of new materialisms often take issue with its underlying principles: the recognition of matter's activity and the decentering of humans. Since I draw on new materialism for exactly these features, I do not engage these critiques here.
[18] Matter is variously described by new materialists as 'vital', 'vibrant', 'alive', 'lively', 'dynamic' and 'agentive'.
[19] For key differences between these materialisms see Gamble, Hanan and Nail (2019).
[20] Vital new materialism, the predominant type that eclipses the other two, arose from Gilles Deleuze's reading of Baruch Spinoza and has as its biggest proponent Jane Bennett (Gamble, Hanan and Nail 2019, 119). Notably, vital new materialism is more about the forces of vitalism than materialism: a flat ontology of force (Gamble, Hanan and Nail 2019, 120).
[21] Negative new materialism, which includes Quentin Meillassoux's speculative realism and Graham Harman's object-oriented ontology, rejects any relation between thought and matter and is resolutely non-relational – it is not considered a true materialism by Gamble, Hanan and Nail (2019, 120-121).
[22] Also called pedetic new materialism (Gamble, Hanan and Nail 2019).

to including ontology, only performative new materialism considers them as mutually constituting (Gamble, Hanan and Nail 2019, 122). Barad (2007) proposes an onto-epistemological account of reality called agential realism – a relational materialism that considers matter as generative.

In an agential realist philosophy matter is iteratively materialised through material-discursive intra-actions (Barad 2007). Intra-action (as opposed to interaction) accounts for relations in a way that does not presume the prior existence of independent entities/relata/phenomena (Barad 2011, 125). Furthermore, intra-actions perform agential cuts that create a particular agential separation between objects and subjects,[23] unlike Cartesian[24] cuts that rely on prior fundamental divisions (Barad 2011, 125). Agential realism concerns the iterative materialising practices that produce differences between 'human' and 'nonhuman', 'culture' and 'nature', 'gender' and 'sex', 'male' and 'female' not recognised when starting an analysis where boundaries are assumed as fundamentally determinate (Barad 2011, 125).[25] Agential realism is a "diffractive investigation of differences that matter, where insights from physics and poststructuralist and deconstructivist theories have been read through one another" (Barad 2011, 148).[26] For the sake of clarity, methodological specificities, particularly that of diffraction, are dealt with in the following section.

1.3 Methodological Approaches

A post-qualitative[27] and exploratory approach is taken in this research project while thinking with performative new materialism alongside a methodological

[23] A local resolution of indeterminacy that is never final.
[24] Cartesian dualism assumes an inherent distinction or separation between independent determinate entities, notably meaning (mind) and matter (body).
[25] See *Chapter 2: Barad and Performative New Materialism* for a much more comprehensive overview of agential realism.
[26] For an in-depth exposition of agential realism see Chapter 2.
[27] Using analyses and theoretical tools from the 'posts'; See St Pierre (2014) for a cartography of post-qualitative research possibilities, while MacLure (2013) envisions materially informed post-qualitative research particularly of the non-representational kind.

focus on diffraction and diffractive reading. Donna Haraway (1992, 300) initially devised diffraction as a feminist semiotic tool for researching techno-science. According to Haraway (1997, 273), "diffraction patterns record the history of interaction, interference, reinforcement, [and] difference". It is difference in particular that can be rethought beyond binaries by employing diffraction (Kaiser and Thiele 2014, 165). Diffraction or interference patterns, like those of light bending around an object, being dissimilar to reflection or representation, maps the "effects of differences" (Haraway 1992, 300) and are thus marked by "patterns of difference" (Barad 2007, 71). Barad (2007) employs diffraction as a critical methodology, adding it to posthuman scholarship (Van der Tuin 2014, 234). Diffraction's focus on relationality diverts attention from sameness and mimesis and is very useful in a non-representational analysis.

Barad (2007, 27-30), drawing on Haraway, suggests diffractive reading as a diffractive methodology – "reading important insights and approaches [from multiple texts] through one another". Importantly, diffractive reading should not be understood as akin to conventional comparative readings for similarities and differences; rather it endeavours to seek productive connections and insights. Indeed, Barad (2007, 36) employs such a methodology in developing agential realism, taking Bohr's insights about nature and scientific practice and diffracting them onto science. Barad's (2011, 148) agential realism is a "diffractive investigation of differences that matter, where insights from physics and poststructuralist and deconstructivist theories have been read through one another". Diffractive reading enacts new patterns of engagement and allows for thinking difference beyond binaries (Barad 2010, 243). In Chapter 3, I perform a diffractive reading – reading together and through one another – of gender theories including poststructuralist, new materialist, biological, ethnographical, and queer, bisexual, trans*,[28] and intersex theory while also thinking with performative new materialism to understand gender as a material-discursive

[28] The asterisk is borrowed from its use as a computational wildcard. Trans* then is an umbrella term that refers to (trans)gender (binary) and (trans)sex(ual) including non-binary and other subversive genders (not all of whom embrace the categorisation of transgender).

phenomenon. In Chapter 4, I read anthropomorphised technologies as material-discursive agents[29] entangled in the material-discursive process of gendered meaning-making. Furthermore, as diffraction expresses the entangled relationality between sex, gender, and sexuality, it enables an examination of how patriarchal binaries are maintained through their iterative performance (intra-actively). It also allows exploring strategies for their disruption by thinking difference differently in relation to human and robot embodiment.[30]

1.4 Review of Literature

1.4.1 Gender, Sex and Sexuality

Most theories of sex, gender and sexuality – from early feminist theories on sexual difference to queer theories of sexuality and gender – are rooted in a constructionist and post-structuralist philosophical framework that informs but is not entirely compatible with new materialism. Following Barad (2007), reading feminist and queer theories diffractively, provides a productive avenue for drawing from various existing theories in exploring the materialisation of sex, gender and sexuality. This requires the explicit incorporation of corporeality without succumbing to essentialism, while resisting the urge to privilege either nature or culture (Jagger 2015).

New materialism is concerned with deconstructing dichotomies between nature/culture, sex/gender, heterosexual/homosexual, cisgender/ transgender, and so forth, and thus queer theories are imperative. Queer theory,[31] however, despite its intended extension beyond lesbian and gay sexuality has neglected to comprehensively address bisexuality (Callis 2009), non-binary genders (Taylor *et al.* 2019; Matsuno and Budge 2017), intersex, and even binary transgender/transsexuality. Intersex necessarily challenges minority culture

[29] In addition to 'human' agents. However, neither 'humans' nor anthropomorphised technologies or 'nonhumans' should be considered ontologically prior to any intra-actions that agentially separate the two.
[30] Not as absolute exteriority, but as difference within (Barad 2007; Haraway 1992, 299).
[31] Canonical and influential queer theories.

(Western) conceptions of dimorphic sexual difference (Hird and Germon 2001), while bisexual theory exposes the sexuality schema that relies on such difference (Erickson-Schroth and Mitchell 2009, 298), complicated by both non-binary genders and intersex. Bisexual, intersex and non-binary identities, by their very existence, unsettle the categories of sex, gender, and sexuality and their inter- and intra-relations. In order to explore how the aforementioned binaries are enacted, it is imperative to consider these excluded manifestations and their theoretical import within sex-gender-sexuality onto-epistemologies. An agential realist account should be commensurate with such subject positions and their corporeality, and it also stands to gain theoretical robustness from drawing from these perspectives.

In *Feminist Matters* (2004a), Myra Hird takes a non-linear biological approach to sex, viewing it from a macro and micro material perspective. By considering the majority of living matter, not only humans, it is concluded that the existence of specific sexual differences in humans is anomalous within the larger context of organic life on earth (Hird 2004a, 229). Hird (2004a, 231) thus attests that the immutability of sex and sexual difference within cultural theories, predicated on matter being inert, is belied when employing a (non-linear biological) new materialist approach that considers matter as active. In *Gender's Nature* (2000) Hird also exposes the sexual dichotomous categorisation of 'male' and 'female' to be inaccurate in describing human sexual variation.[32] Importantly the sex/gender binary depends on such a distinction in nature in addition to its reliance on the nature/culture binary and nature's immutability (Hird 2000, 348). Importantly, Hird's (2000, 2004a) take on sexual difference is commensurate with intersex and transsexual experiences as well as new materialism and is, thus, important for this study. I read Hird diffractively with feminist and queer theory in Chapter 3. Hird (2000, 2004a) extensively theorises sexual difference in an arguably new materialist fashion. However, new materialisms have yet to theorise gender and sexuality together with sex comprehensively. Hird (2000) also

[32] Also see Anne Fausto-Sterling's *Sexing the Body* (2000).

provides a keen exploration of the variability of sex, that is inclusive of intersex and transsexual bodies, and a critique of the sex/gender binary that can be drawn from in an effort to theorise the sex-gender-sexuality nexus, since little attention has been afforded to theorising gender and sexuality together with sex outside of the sex/gender binary.

Specifically, considering sex from an intersex inclusive perspective serves to challenge the dichotomous sex binary (Monro 2005, 10). Intersex remains fairly invisible when everybody is classified as either male or female at birth, including people whose genital configurations do not fit those categorisations neatly. The medico-psychiatric reaction to intersex variation reveals how 'sex' is inscribed on the 'unruly' body, often without consent (Hird 2000, 349; Hird and Germon 2001). The sex/gender binary and the supporting illusion of dichotomous sexual difference are maintained at all costs, and so "the *authenticity* of 'sex' resides not on, nor in, the body, but rather results from a particular nexus of power, knowledge and truth" (Hird 2000, 353; emphasis in original). Gill Jagger (2015, 338), who offers an explicit Baradian take on sexual difference, concurs that since the immutability of sexual dimorphism suppresses natural diversity rather than confirming any material binary, it becomes clear that it is rooted in power asymmetries. Viloria and Nieto take a biological approach to intersex with an intersex activist stance in *The Spectrum of Sex* (2020), providing a rich science that I use to explore the many contradictions to sex's multiple binaries when sexual diversity is acknowledged.

While intersex variation opposes these binaries, trans* people – particularly transwomen – challenge the assumption that a particular morphological sexual configuration makes a woman or is necessary to know oneself as female (Hird 2000, 349). Hird (2000, 350) raises questions about how claims of membership to the identity category 'woman' are based on the sex/gender binary to identify the consequences of the reductionism that accompanies the binary. Hird (2000, 259) emphasise that intersex and trans experiences of sex-gender provide invaluable insights as attempts to 'fit' or 'pass' in a two-sex system reveal the

mechanisms that enforce and produce sexual difference, while the refusal of binary sexed identity reveals the fallibility of the sex and gender binaries. Hird (2000, 359) highlights the importance of deconstructing how the divisions between sex/gender, sex/gender/sexuality, male/female, man/woman, and so forth are made meaningful. Jagger (2015, 337) also asserts that the identification of practices that produce the binary construction of sexual difference, that excludes trans and intersex bodies, is paramount to reworking or reformulating such practices.

Many transgender theorists are rightfully critical of queer theory, given its prevalent post-structuralism that stresses the social construction of gender and sex and therefore fails to consider the material body fully. Not surprising then, Butler is critiqued for not addressing the transsexual experience of sex (Monro 2005, 10), while the same can be said of the intersex experience.[33] This has led to the development of transgender studies that have become influential in its own right. Transgender studies have a lot in common with queer theory, both growing out of feminism and lesbian and gay studies, and like bisexual theorising out of a dissatisfaction with the restricted focus of its forerunners. Like queer theory neglected to address transgender (and bisexual and intersex) experiences in its theorising transgender studies have neglected to give much-needed consideration to non-binary genders. Literature on non-binary genders is scant compared to binary transgender literature and not reflective of the recent proliferation of non-binary identification (Matsuno and Budge 2017, 116).

In *(Re)Making Sex* JR Latham (2017) argues against the presumed singularity of transsexuality predominant in transgender studies that follows from clinical narratives. For Latham (2017), sex is ontologically multiple; while the sex or gender clinic reconfigures only some dimensions of sex, those generally regarded as indicative of femaleness or maleness – primary and secondary sex

[33] To Butler's credit it is stated in the preface of the 1999 reprint of *Gender Trouble* that: "If I were to rewrite this book under present circumstances, I would include a discussion of transgender and intersexuality, the way that ideal gender dimorphism works in both sorts of discourses, the different relations to surgical intervention that these related concerns sustain" (xxvi).

characteristics, it also commonly insists on coherence between all the dimensions of sex and gender. Latham (2016, 49; 2017, 180) rethinks sex to "not rely on a pre-existing, definite notion of sex, which limits (and forecloses) certain trans possibilities", but rather as a multiplicity that allows for complexity in the trans, and generally sexed, experience. For Latham (2017, 190-191), transsexuality illuminates the multiplicity of sex since the numerous dimensions of sex do not neatly arrange into 'male' and 'female'. These contradictions are managed in a clinical context where a simple singular ontology of sex seeks alignment between the complex multiplicities of sex. In the clinical setting, it is difficult, if not impossible, to access trans medical interventions should the conventional and dominant narrative not apply (Latham 2017, 197-198). Latham (2017) here identifies one of the practices Jagger (2015, 337) alludes to that produces binary sex in exclusion of trans and intersex bodies. These dominant narratives make intelligible and visible only the binary transgender experience that it describes, while many trans experiences of transmen, transwomen and non-binary people go unacknowledged. Transgender literature, at large, also reflects this dominant narrative and relegates all divergence from it to the category: genderqueer, evidenced by Latham's (2017, 199) difficulty in publishing on transgender-focused platforms. In Chapter 3, I read Latham (2017) diffractively to explore the many contradictions to sex's multiple binaries and how singular binary coherence is maintained from a transsexual perspective.

Sexuality complicates and illuminates sex, gender and the sex/gender binary. While most theories of sexuality rely on gender as an organising principle, bisexual theory is far less dependent. Bisexual scholarship has a lot in common with queer theory; both use numerous theoretical tools from social constructionism, postmodernism, feminism, identity politics, and deconstruction (Callis 2009, 218-219). Nevertheless, queer theory has not readily engaged with bisexuality and continues to neglect it in its theorising (Callis 2009, 219). This seems curious as bisexuality occupies a very deconstructively productive in-between position in relation to homosexuality and heterosexuality (Callis 2009, 219); or maybe not so curious if, after all, like many critics of queer theory state,

queer theory tends to reify boundaries like sex/gender, homosexuality/heterosexuality and normativity/non-normativity (Steinman 2001, Warner 1999). Moreover, this exclusion from queer theorising not only demonstrates a counter-intuitive exclusivity it also weakens queer theory (Callis 2009, 220).

Key texts in bisexual theory[34] include notable bisexual theorist Kenji Yoshino's *The Epistemic Contract of Bisexual Erasure* (2000), demonstrating how the homosexual/ heterosexual binary depends on bisexuality's invisibility. Yoshino's text allows one to explore the many factors operating in maintaining binaries. Additionally, as seen above, April Callis (2009) reveals how the infrequency with which bisexuality is considered within queer theory compromises the arguments queer theorists formulate; moreover, it is demonstrated how the incorporation of bisexual identity may reinforce these arguments. Bisexuality does not follow the same path of historical construction as homosexuality, which can explain many of the current differences between them (Callis 2009, 223). Bisexuality was often considered a stage of development rather than an independent sexual orientation.[35] The theory of 'sexual evolution' posited that everyone starts bisexual, and all human embryos start intersex (Callis 2009, 224). Clare Hemmings (1995, 51) indicates that the reason for allegations that bisexuality does not exist may be that it has not been pathologised into a sexual identity within medical discourse like homosexuality.[36] Thus, Michel Foucault's (1978) theory of sexual identity construction can explain both the construction of lesbian and gay identity, and the invisibility of bisexuality (Callis 2009, 226).

Callis (2009) critiques the absence of any meaningful engagement with bisexuality in Butler's *Gender Trouble* (1990/1999). Importantly Butler (1999, 23,

[34] See Shiri Eisner's *Bi: Notes for a Bisexual Revolution* (2013) for a compilation and discussion of the most influential bisexual scholarship; including Yoshino's text and Miguel Obradors-Campos' (2010) work on biphobia and stereotypes.
[35] Bisexuality initially referred to intersex variation, at the time considered as incomplete sexual differentiation.
[36] Since no doctor could label someone bisexual, bisexuality was not considered a truth and no reverse discourse followed within bisexual communities (Callis 2009, 225).

30-31) cautions against separating sex, gender, and sexuality and illuminates the relations between these that render genders intelligible. Intelligible genders require adherence to patriarchal prescriptions such that male equals masculine, which equals attraction to women, and makes man intelligible. Since heterosexuality is closely tied with masculinity, sexuality forms an important part of gender (Callis 2009, 227). This leads Butler (1999, 23-24) to conclude that identities that do not line up as expected cannot 'exist' since they are not culturally intelligible.[37] Here the theory of inversion (see Foucault 1978) becomes relevant; sexuality is read as gender, so that gender and sexuality stay matched (Hemmings 1997, 17). Callis (2009, 228) emphasizes that bisexuality complicates this as gender cannot be wholly tied with desire or sexual object choice causing 'gender trouble' that cannot be so easily resolved. Sari van Anders offers an interesting perspective on sexuality in *Beyond Sexual Orientation: Integrating Gender/Sex and Diverse Sexualities via Sexual Configurations Theory* (2015). This demonstrates productive alternatives to dominant conceptualisations of sexuality that exclude bisexuality and asexuality. Consideration of often neglected and erased sexes, genders and sexualities and how the people who occupy these positions make sense of sex, gender and sexuality provides great insights into the material-discursive processes at work. This inclusion allows for robustness in examining the material-discursive enactment of pertinent binaries and how this extends to social anthropomorphised technologies.

1.4.2 Anthropomorphised Technologies and Gender

Convergences in gender and technology have been introduced in recent literature in the post-humanities. Such research pertaining to social anthropomorphised technology predominantly concerns virtual personal assistants (Bergen 2016; Piper 2016; Strengers and Kennedy 2020), sex robots (Pope 2018; Kubes 2019) and humanoid robots (Robertson 2010, 2018) and their entrenchment of stereotypes regarding specifically women in both their

[37] Explaining why butch women are/were almost always read as gay and feminine women as straight, or feminine men are/were assumed to be gay.

functionality and responses (Caliskan *et al.* 2017) and the misogynistic mistreatment of them. Most of these studies do not, however, explicitly address the gender binaries or the effects of these technologies on LGBTQIA+ populations. Resultantly queer concerns are neglected and the opportunity for assessing the role these technological artefacts play in maintaining/suspending normative sex-gender embodiment is underutilised.

Chatbots and voice assistants converse with users via text or voice; they are often attributed a specific race and a sex-gender. Assuming text-based assistants to be 'neutral' can imply 'default' identities (such as man and white) and so even they are assigned a race and gender that is likely to influence the interactions human users have with them (Marino 2014, 3). Much more explicitly assigned a gender (and implicitly a race) are VPAs that not only use voice commands to perform tasks but also reply using voice. In *Asking More of Siri and Alexa* (2018) Heather Suzanne Woods points out that VPAs promote patriarchal gender stereotypes through language, form – feminine name and voice, and function – assistive (346). Similarly, Hilary Bergen (2016, 95) addresses the particular patriarchal, profit-driven engineering of symbolic (idealised) femininity in VPAs; as contemporary technologies fail to assist in the dismantling of gendered power relations to the detriment of women's liberation, and instead perpetuates stereotypes, violence and servitude. Bergen (2016, 95-97) writes that VPAs remain sites of power disparity as long as they are created and used within a hegemonic culture where signifiers of binary gender, and in particular femininity, are commodified – they elude gender-neutrality.[38] Most recently, Yolande Strengers and Jenny Kennedy address feminised labour in VPAs in *The Smart Wife: Why Siri, Alexa, and Other Smart Home Devices Need a Feminist Reboot* (2020). Literature on the feminisation of VPAs' voice and responses in relation to the treatment of women proliferates. This literature and mitigating policy recommendations are summarised in a think piece (*The rise of gendered AI and*

[38] Gender-neutrality variously refers to pronoun usage in written language and avoiding assigning or assuming social roles based on sex or gender in policy, institutions and society in general. The purpose is to avoid discrimination on the basis of- and the perpetuation of gender or sex role stereotypes.

its troubling repercussions) in the UNESCO publication *I'd Blush If I Could* (West, Kraut and Chew 2019).

Given that this area of research is well covered, it is not the focus of this study. Furthermore, the existing research focuses on behaviour or actions – how VPAs and women are treated; in this project, I focus on the material-discursive constitution of bodies. Thus, in Chapter 4, the discussion of VPAs is limited to their conceptualisation as disembodied – primarily drawing from Bergen's *'I'd Blush If I Could': Digital Assistants, Disembodied Cyborgs and the Problem of Gender* (2016) – and used to contextualise the feminisation of robotic bodies.

Sex robots, like other kinds of humanoid robots, are still emerging technologies and very few have been marketed. To my knowledge, Realbotix's Harmony is currently the only sex robot on the market. This results in minimal, predominantly speculative research into the societal impact of these technologies; not unlike research on humanoid robots created for other uses. Unfortunately, most of the studies on sex robots, in particular, focus on proving or disproving the logic of dated symbolic-consequences arguments against their production (Danaher 2017), drawing analogies between sex robots and human sex-workers (Richardson 2016), and contemplating whether incorporating anthropomorphised technology into sexual practice constitutes partnered ('real' sex) or solo (masturbation) sex and thus an intimate exchange or cheating (Scheutz and Arnold 2016). Additionally, some focus on arguing for or against people's capacity to form emotional bonds with anthropomorphised technology and fulfil their need for companionship (Levy 2007) and measuring public perception of sex robots and their use value (Scheutz and Arnold 2016). The social and ethical implications of robot-human sexual relationships (Danaher and McArthur 2018; Richardson 2018) is also explored. While this research covers a broad range of topics related to anthropomorphised sex robots, they are predominantly focused on representationalism.

Conversely, in *New Materialist Perspectives on Sex Robots. A Feminist Dystopia/Utopia?* (2019) Tanja Kubes offers a new materialist perspective on sex robots. Kubes (2019, 224-225) firstly acknowledges the many problems sex robots pose: indeed the majority of sex robots are 'female' (being geared almost exclusively to heterosexual male customers) and perpetuate unrealistic patriarchal beauty standards (and pornographic stereotypes), while the objectification of the female body through its representation in sex robot embodiment is easily identified as contributing to the objectification and sexualisation of women and girls – as many such representations in other media forms do. The current design of emerging sex robots like Harmony caters (similarly, albeit differently, to VPAs) to the white male gaze and the fantasy of the subservient feminine with its semantic coding extremely hegemonic in its gender stereotypes, "basically reducing 'robot companions' to large-breasted Barbie dolls with glimpses of artificial intelligence" (Kubes 2019, 226). Kubes (2019, 229) goes on to show that alternatively, through a new materialist lens, anthropomorphised robots can not only be seen to challenge the human/machine and subject/object dichotomy but also exemplify the intra-activity of relations between human and nonhuman actors.[39] Furthermore, by using the theory of diffraction it becomes clear that sex robots, as a type of sex toy, need not have human likeness or be anthropomorphised (Kubes 2019, 230). Kubes (2019, 236-237; emphasis in original) concludes that by exploring diffractive design from a gender-queer standpoint, it becomes clear that "modelling [sex robot] bodies after male pornographic fantasies are *not* the only (and certainly not the best) way to design a sex robot" and that designers "might define what the robot shall be able to *do* (instead of what it shall *be like)".* Given the extent of the existing research on sex robots despite their paucity, I focus on other more neglected anthropomorphised technologies. It is a similar new materialist and diffractive methodology, to the one Kubes demonstrated as effective in investigating sex robot embodiment, that I will be employing in exploring other social anthropomorphised robots, particularly humanoids.

[39] Also see *Sex Robots: The Future of Desire* (Lee, 2017) for the ways in which sex robot reception challenge the human/nonhuman binary.

The majority of research on gender and humanoid robots focuses on how people interact differently with robots gendered as 'male' or 'female' (Siegel, Breazeal and Norton 2009; Stroessner and Benitez 2019; Bernotat, Eyssel and Sachse 2021), and how women and men interact differently with robots (Nomura *et al.* 2006; 2008), leaving the implied understandings of gender unexamined (Robertson 2010, 5). Jennifer Robertson (2010, 28), in *Gendering Humanoid Robots: Robo-Sexism in Japan*, reveals that the gendering of humanoid robots, from purpose through to aesthetics, is informed by biases and stereotypes. Furthermore, these biases and stereotypes may be reinforced through the gendering of humanoid robots (Weber and Bath 2007). Robertson (2010, 4-5) also shows that roboticists rarely examine their understanding of gender, sex, femininity and masculinity in relation to the bodies, roles and performances of humans and their robots; thus, reifying a binary gendered reality uncritically. Robertson (2010, 19) goes on to show that Japanese roboticists, in particular, consider the form of their robots inseparable from its function and use particular sex/gender markers in the embodiment of their robots. 'Female' robots do not reveal their inner workings by displaying any circuitry (alluding to modesty) and are slender or elegant, while 'male' robots reveal their interior by exteriorisation and muscularity, most evident in the design of the 'twin' robots Posy and Pino (Robertson 2010, 19-20). Robertson (2010, 28) concludes that the Japanese humanoid robot industry does not operate towards a vision "for new technologies that facilitate the transcendence of ethnocentrism, paternalism and sexism, and their associated power relations", but rather reinforces patriarchal gender stereotypes and is thus referred to as "'*retro-tech',* or advanced technology in the service of traditionalism". It should be noted that Japan is the world leader, not only in robotics in general, but also in humanoid robotics.

In *Robo Sapiens Japanicus: Robots, Gender, Family and the Japanese Nation* (2018), Robertson expands on this earlier research, originally done at a time when humanoid robotics did not enjoy as much popularity. The aforementioned text is crucial to the exploration of robot embodiment in Chapter 4. While humanoid and other social robots have garnered more interest over the last

decade, they do not enjoy the ubiquity of VPAs – this is particularly true in North American and European contexts. Most social robotics projects in these regions are disparate and have failed to be successfully commercialised and so little attention is afforded to their impact. With regards to social marginalisation and embodiment in the United States of America (USA), Neda Atanasoski and Kalinda Vora's *Surrogate Humanity: Race, Robots and the Politics of Technological Futures* (2019) addresses, primarily, techno-liberalism and race (and labour) in relation to robotics, not gender. Furthermore, the concerns of the English-speaking world in relation to AI and robotics primarily regard AI algorithms used in decision-making software, their impact on labour, and their use in military operations. In contrast, Japan, the world leader in robotics, have, until recently, engaged much more readily with social robotics, partly since military uses were constitutionally precluded (Robertson 2018, 11). Unsurprisingly, most of the social anthropomorphised robots in existence are of Japanese origin or were obtained by Japanese companies after failure elsewhere. Consequently, Robertson's *Robo Sapiens Japanicus* (2018) provides a rare English language glimpse into the contexts within which social robots are created and imagined to exist with regard to gender. Furthermore, it provides additional information, usually found in news publications and press releases (which are in Japanese), on the particulars of these robots' human-likeness. It is relevant to note that the development of social robotics is more structured and coordinated in Japan than elsewhere.

1.5 Problems, Questions, Aims

Human and robot bodies are influenced by the social conditions wherein they materialise. Technological artefacts also play active roles in the continuation or cessation of social inequalities, including gender inequalities.[40] Contemporary

[40] Gender inequalities affect those designated as women and other marginalised genders, sexes and sexualities as well as anyone who do not adequately conform to gender stereotypes in any other ways. This includes, but is not limited to, discrimination in accessing education and employment and prejudice in these environments, obstacles to political and public participation, disparate access to and treatment in healthcare, and sexual and other physical violence.

advances in emerging technologies – AI and robotics – implore engagement with their role in maintaining or eliminating restrictive gender binaries.

On the one hand, literature analysing gender in anthropomorphised technologies largely focus on representationalist assessments of femininity: the machine is a representation of the human female; and associated problems of inequality. This focus fails to address the far-reaching consequences of, and mechanisms involved in, the maintenance of the underlying gender binaries that affect not only (cishet)women but queer people too. To ascertain the role these technologies play in perpetuating or challenging binaries like man/woman, male/female and sex/gender it is necessary to consider their material-discursive relation to such categorisation.

On the other hand, predominant theories (and political movements) of gender[41] (in feminism, lesbian and gay studies and queer theory) are profoundly anchored in the humanist tradition and consequently regularly fall back on human exceptionalism and essentialisms. An examination of the enactment or disruption of gender binaries require (once again) a material-discursive understanding of gender or thinking gender with posthuman new materialism.

Thus, investigating how gender binaries are maintained or disrupted with relation to human and robotic bodies requires novel research approaches. It appears that from the vantage of performative new materialism (a material-discursive understanding of gender and its binaries) the ways in which (non)normative sex, gender and sexuality subjectivities or identities circulate and manifest, and the factors at play in maintaining/suspending normativity and revitalising multiplicity and diversity, can be explored.

[41] Queer and feminist political movements and theories of gender reciprocally inform each other. Political movements often return to essentialisms for their political efficacy.

Consequently, in this project I aim to:

- Expand new materialist theoretical and methodological tools for understanding sex-gender-sexuality as a dynamic material-discursive phenomenon.
- Examine how patriarchal gender binaries may be disrupted by taking a new materialist approach to understanding their iterative constitution.
- Explore the role of social anthropomorphised technologies, particularly (humanoid) robots, in the maintenance or disruption of gender normativity and gender binaries.
- Illuminate opportunities for the resistance of gender binaries through human and robot embodiment.
- Contribute to research on the complex ways in which gender is constituted as humans and technology intra-act in the digital and technological age.

1.6 Overview of Chapters

This introductory chapter has provided the background to the study, the aims, and points of theoretical and methodological departure and presents foundational concepts to orientate the reader. Posthumanism and new materialism are introduced, and diffraction is discussed as the proposed methodology. An overview of the literature on gender and social anthropomorphised technologies is provided to demonstrate gaps and identify imperative texts for further examination.

Chapter 2 offers a more detailed summation of the critical concepts related to Karen Barad's posthuman performative new materialism: onto-epistemology, phenomenon, apparatus, intra-action, agential realism, performativity, discourse, and matter. It concludes with a consideration of embodiment in relation to agential realism, particularly regarding bodily boundaries, entanglement, intelligibility and constitutive exclusions. The remainder of the study thinks with Baradian new materialism in exploring gender and embodiment; thus, Chapter 2 provides the necessary philosophical and theoretical background.

Chapter 3 concerns gender theorising. It offers an overview of key concepts in a short history of sex, gender and queer theorising, such as the sex dichotomy, reproduction, sexual difference, the sex/gender binary, gender normativity and the sex-gender causal structure. While also pointing out where they diverge and converge with new materialism. After that, the many facets of sex, gender and sexuality are explored with a distinct new materialist focus by thinking from intersex, trans* and bisexual perspectives employing a diffractive reading of biological, (auto)ethnographical and queer theoretical texts. This chapter reveals some of the factors at work in gendering human bodies.

Chapter 4 concentrates on social anthropomorphised technologies. The relationship between the human/nonhuman binary and gender, as well as its relevance to anthropomorphisation is briefly explored; serving to establish a preliminary understanding of the ways in which human and robotic bodies intra-act enabling the circulation of gender among them. After introducing virtual personal assistants and robots, including humanoid robots, they are diffractively analysed to identify the locus of their genderisation, and the binaries maintained/disrupted. Here the concurrent liberatory prospects and hegemonic normativities that gendering (anthropomorphising) technologies may sustain are elucidated. Lastly, the significance of conceptualising social anthropomorphised technologies as (dis)embodied and the rhetoric around these technologies enjoys scrutiny.

The conclusion draws the study to a close and offers concluding remarks. Furthermore, this study's contribution is elaborated on, while the limitations thereof are made clear. Suggestions for further research are also included.

CHAPTER 2
BARAD AND PERFORMATIVE NEW MATERIALISM

Dismantling patriarchy [and all other systems of oppression] is relational work. Every system of oppression is strengthened, maintained or dismantled based on how we … relate to ourselves and each other.

Andréa Ranae[42]

2.1 Introduction

Karen Barad proposes a relational onto-epistemology that does not limit "ourselves and each other" to being human only. In this chapter, I unpack the primary points of Barad's posthuman performative new materialism, also called agential realism, as predominantly put forward in *Meeting the Universe Halfway: Quantum Physics and the Entanglement of Matter and Meaning* (2007). Barad elaborates on Niels Bohr's philosophy-physics by exploring the epistemological and ontological issues that quantum physics forces us to confront. While also looking to poststructuralist theories of matter and discourse chiefly propounded by Judith Butler and Michel Foucault to formulate a realism that takes matter and discourse seriously.

This chapter aims to familiarise the reader with Barad's agential realism, its reworking of objectivity, subjectivity, causality, agency and dynamism, and phenomena, apparatuses, and intra-active performativity. I start with Niels Bohr's epistemological framework and Barad's ontological elaboration, after which apparatuses, phenomena and intra-action are introduced. Subsequently, Butler and Foucault's influences are discussed to gain insight into the crux of performative new materialism and its significance for thinking about bodily

[42] Instagram post and tweet on 28 January 2020 and 30 July 2020 respectively, both handles are @andrearanaej.

boundaries. In the last section, preliminary remarks on gender and bodies are made to guide the next chapter.

2.2 Niels Bohr's Epistemological Framework

Physicist Niels Bohr introduced complementarity as an epistemological framework, also presenting his indeterminacy principle – not to be equated with Heisenberg's uncertainty principle (Barad 2007, 115).[43] Bohr's framework is not commensurate with classical or Newtonian physics, which corresponds to Cartesian and Enlightenment philosophy. In fact, it questions some of the fundamental assumptions, which are anchored in representationalism, a metaphysics of individualism, and the inherent separability of knower and known (Barad 2003, 812-813; Barad 2007, 107 & 138). Bohr's philosophy-physics (the two are inseparable to Bohr) is associated with quantum physics that supersedes classical physics (Barad 2007, 110). I outline Bohr's epistemological framework as interpreted by Barad in relation to indeterminacy, the objective-referent and the measurement problem below.

The measurement problem in quantum physics follows from the rejection of Newtonian physics' assumptions that ultimately ensure measurement transparency; that is, objectivity in the observation of objects (Barad 2007, 107). Firstly, it is assumed that there exists (and indeed the world is comprised of) *individual objects*, and that these objects have *determinate boundaries and properties*, and the values of these properties can be *represented* by abstract universal concepts (Barad 2007, 107). Furthermore, the meanings of these concepts are also considered determinate and *independent* of the measurement of the values of the properties (Barad 2007, 107). This first assumption of Newtonian physics is commensurate with classical realism. Secondly, it is

[43] Heisenberg's uncertainty principle states that we are left uncertain about the value of a property of an observation-independent object (a classical physics notion), we cannot know it, because of an unpreventable disturbance caused by measurement, that cannot be accounted for (Barad 2007, 116).

assumed that measurements or observations are determinable (inter)actions to the extent that the values of the properties obtained by measurement *represent* the properties of the objects *independent* of their observation or measurement (Barad 2007, 107). This second assumption is commensurate with Cartesian epistemology and representationalism.

For Bohr, concepts are neither abstract nor universal; they are contextually defined by the "*circumstances required for their measurement*" and thus are also not measurement-independent (Barad 2007, 109; emphasis in original). Therefore, theoretical concepts and their meanings must be understood as "*specific physical arrangements*"; measurement and description are material-discursive and are mutually epistemologically implicated (Barad 2003, 814; Barad 2007, 109; emphasis in original). Importantly then, "*observation* is *only possible* on *the condition that the effect of the measurement* is *indeterminable"* (Barad 2007, 109 & 113; emphasis in original).

Significantly, since measurement interactions are indeterminable, the effect of the measurement cannot be separated and subtracted from the values obtained during measurement to arrive at values assignable to measurement-independent (or observation-independent) objects (Barad 2007, 113). It follows that there are no unequivocal means to distinguish the *object-* and the *agencies- of-observation*, thus, there can be no inherent subject-object separation (Barad 2007, 114). To put it another way, a specific physical arrangement (the measurement apparatus) is necessary for the boundary between the *object-of-observation* (object) and the *agencies-of-observation* (subject) to become determinate, thus a measurement apparatus must be specified that enacts the separation (Barad 2007, 114). Consequently, "for every given apparatus, there is an unambiguous resolution of the distinction between the object and the agencies of observation", but no inherent distinction exists (Barad 2007, 115).

Different apparatuses thus enact different Bohrian cuts (as opposed to deterministic Cartesian cuts) that make different properties determinate. The

most frequently used example to explain indeterminacy and complementarity is wave-particle duality. Using two differently configured apparatuses (two-slit experiments: both original-fixed and modified-movable), photons or electrons that pass through the apparatuses leave marks on the corresponding screens indicative of wave and particle behaviour, respectively (Barad 2007). These outcomes confound classical physicists – when photons are taken to be independent objects understood as particles, they cannot display wave behaviour under any circumstances. However, following Bohr's indeterminacy principle, there exists a reciprocal relation between particle and wave behaviour such that they are complementary – only become determinate when different apparatuses are used (Barad 2007, 118). Bohr, crucially, understands the relation between complementary variables in "semantic and ontic terms, and only derivatively in epistemic terms" – since there exists no measurement- or observation-independent objects with determinate properties, there is nothing definite to know about independent objects (Barad 2007, 118).

Given the critical role that a particular apparatus plays in making a Bohrian cut or resolving indeterminacy, the apparatus must be understood as part of what is *described* (Barad 2007, 118). Bohr uses 'phenomenon' to term the single situation being described; a phenomenon is also a particular instance of "quantum wholeness" – the nonexistence of an inherent separation between the object and the subject (Barad 2007, 118). Hence, a definite account of any phenomenon must, in principle, contain a description of all the features of the experimental arrangement; and thus, includes the apparatus or agencies-of-observation and the Bohrian cut that enables distinction between the object and subject (Barad 2007, 119).

Concepts thus acquire meaning in relation to specific physical arrangements (apparatuses) that enact a Bohrian cut resolving the semantic-ontic indeterminacy (Barad 2007, 120). "*This* resolution of *the semantic-ontic* indeterminacy *provides the* condition for *the* possibility of objectivity" (Barad 2007, 120; emphasis in original). While Newtonian objectivity relies on

observation-independence (founded on a Cartesian-derived subject-object distinction), Bohrian objectivity requires, as an initial condition, a comprehensive description of the phenomenon (Barad 2007, 119-120). “The measured value is neither attributable to an observation-independent object, nor is it a property created by the act of measurement”, the measured properties refer to comprehensively defined phenomena, and thus, the objective-referent is the phenomenon (Barad 2007, 120). Importantly, “a condition for *objective knowledge* is *that the referent* is a *phenomenon*” (Barad 2007, 120; emphasis in original). Reproducibility or repeatability are further conditions for objectivity (common to contemporary scientific practice) (Barad 2007, 174).

Bohr's epistemological framework fundamentally differs from the framework beneath Newtonian physics (Barad 2007, 121). There exists no inherent subject-object distinction, and the objective-referents are (and indeed the world is comprised of) phenomena whose properties become determinate by the exclusion of indeterminate complementary phenomena (and their properties) by the physical arrangement of the apparatus (Barad 2007, 121-127). Furthermore, the apparatus forms part of the particular phenomenon, that enacts a Bohrian cut locally separating the agencies-of-observation from the object-of-observation (Barad 2007, 121-127). Thus, according to Bohr, we cannot know the value of a property of a complementary phenomenon to the phenomenon in question: wave and particle (and position and momentum) are mutually exclusive complementary phenomena. Bohr thus concludes that “*quantum theory exposes an essential failure of representationalism*”, and it is his anti-representationalist approach to understanding descriptive concepts as phenomena that inform his epistemological framework – complementarity (Barad 2007, 124; emphasis in original).

Complementarity can be said to reject the transparency of measurement *and* the transparency of language (Barad 2003, 813). Most importantly, it also rejects the representationalist assumption that language and measurement mediate

between knower and known (Barad 2003, 813). These insights from Bohr's epistemology are crucial to Barad's performative new materialism.

2.3 Introducing a Baradian-Bohrian Onto-Epistemological Framework

Barad (2007, 123) takes some of the insights from Bohr's philosophy-physics in putting forward a consistent framework from which to address epistemological and ontological matters simultaneously. Since measurement practices constitute such an important part of phenomena, Bohr places practice within theory and challenges Cartesian dualisms; therefore, "method, measurement, description, interpretation, epistemology, and ontology are not separable considerations" (Barad 2007, 121 & 125). Unfortunately, Bohr does not present a comprehensive account of the ontological dimensions of his philosophy-physics (Barad 2003, 814; Barad 2007, 125). I briefly outline Barad's interpretation and expansion of Bohr's ontological commitments below.

While Bohr focuses on semantic indeterminacy and the attendant epistemological implications – the absence of an inherent separation between knower and known, Barad (2007, 127) regards the indeterminacies also to be ontic as is apparent in the use of "semantic-ontic". Bohr's rejection of classical metaphysical notions regarding observation-independent objects – that determinate objects with inherent or pre-existing properties exist and that they are described by corresponding determinate independent concepts – requires a specific measurement apparatus to resolve the semantic-ontic indeterminacies (Barad 2007, 127).

Accordingly, "*the* measurement apparatus *is the* condition of possibility *for determinate meaning for the concept … as well as the* condition of possibility for *the existence* of determinately bounded *and propertied* (sub)systems" (Barad 2007, 127; emphasis added). Hence, apparatuses offer the conditions of possibility for objects (or objects-of-observation) with determinate properties and boundaries within phenomena (Barad 2007, 128). Furthermore, there exists

phenomena, not observation-independent objects, and as such "*the term 'physical reality' can be properly attached to phenomena*" (Barad 2007, 127; emphasis in original). I will return to realism in the following section.

Given that individually determinate entities (or objects) do not exist as such, measurements do not involve an interaction between separate entities, and so more precisely, "determinate entities emerge from their intra-action" (Barad 2007, 128). Moreover, phenomena are "*the ontological inse*parability of objects *and apparatuses"* (Barad 2007, 128; emphasis in original). Barad (2007, 128) advances the term "intra-action" to acknowledge the ontological inseparability between the object and the apparatus. A phenomenon, then, is a specific intra-action of an object and apparatus (or object-of-observation and agencies-of-observation) that emerge from the intra-action (as opposed to preceding it) (Barad 2007, 128). For Barad (2003, 815; emphasis in original), phenomena do not only mark the epistemological inseparability of knower and known, as it does for Bohr, "*phenomena are the ontological inseparability of agentially intra-acting 'components'*".

The above ontological view of phenomena is consistent with Bohr's insights and more recent advancements in quantum physics (Barad 2007, 128). To reiterate, Barad (2007, 138 & 141) maintains that the primary ontological units are phenomena, not *things* or *independent* objects with *inherent* boundaries and properties. Furthermore, phenomena "*are the ontological inseparability/ entanglement* of *intra-acting 'agencies'*" (Barad 2007, 139; emphasis in original). Importantly, it should also be noted here that for Barad (2007, 141), the primary semantic units are not *words* (like the ontological units are not *objects*) but rather, *material-discursive practices* "through which (ontic and semantic) boundaries are constituted". This is a dynamic process by which the world is iteratively (re)configured, such that this dynamism is agency: "The universe is agential intra-activity in its becoming" (Barad 2007, 141). Barad puts forth an agential realist elaboration that expands on these ideas; this will be the focus of a later section; I will also return to intra-action in more detail there.

2.4 Apparatuses and Phenomena

Let us turn our attention to phenomena and apparatuses for a moment. For Bohr, apparatuses are *material arrangements* via which *particular concepts* become *defined* (and others do not) and *particular phenomena* (with determinate properties) are *produced* (Barad 2007, 142). Thus, for Bohr, apparatuses are not passive measurement instruments, but active and productive in constituting phenomena as well as part of phenomena (Barad 2007, 142). Unfortunately, Bohr does not comprehensively formulate his notion of apparatuses and "mistakes the apparatus for a mere laboratory setup" (Barad 2007, 142-144). For Bohr a phenomenon is epistemological – the concepts position and momentum – for Barad (2003, 815; emphasis in original), however, phenomena are also ontological (or rather onto-epistemological), it is the "*ontological inseparability of agentially intra-acting 'components*'". How the apparatus is understood is crucial to this distinction between Bohr and Barad's phenomena.

The reader may have noted that throughout this discussion, there has been suspiciously little said of the subject (or agencies-of-observation) becoming determinate, as opposed to the object. While Bohr is clear about the inside boundary of his apparatus within the phenomenon (and its role in the object becoming determinate), he remains imprecise about the outside boundary, or rather takes the outside boundary to be inherent to the apparatus instead of also drawn within the intra-action (Barad 2007, 143-144). In so doing, Bohr revisits and incorporates humanist notions of the subject within the outside boundary of apparatuses and ignores the "dynamism of discursive practices" in the constitution of both objects *and* subjects (Barad 2007, 145).

Barad (2007, 154) emphasises the need to take a posthumanist understanding of the apparatus in endeavouring to expound a coherent onto(epistemo)logy (devoid of anthropocentrism). Posthumanism notably disrupts the human/nonhuman dualism, and as such dethrones the human in constituting

subjectivity. For Barad (2007), the subject also becomes determinate within a particular phenomenon through intra-action (and is not necessarily human), not unlike the object. Firstly, for Barad (2007, 146), apparatuses have no inherent boundaries; apparatuses are *open-ended* boundary-making practices. It is through these *material-discursive* ("formative of matter and meaning") practices that apparatuses produce "differences that matter" (Barad 2007, 146). To rephrase, apparatuses produce the subject/object distinction as the boundaries of both become determinate, and it is of material significance where these boundaries are drawn. Secondly, while apparatuses are part of the phenomena they produce, they are also phenomena themselves, not unlike objects (Barad 2003, 816; Barad 2007, 146). Moreover, they are also "constituted and dynamically reconstituted as part of the ongoing intra-activity of the world", they are not only material configurations but "dynamic reconfigurings *of* the world" not merely positioned *in* the world (Barad 2007, 146; emphasis added).[44] Importantly a specific apparatus is always intra-acting with other apparatuses and phenomena (Barad 2003, 817); therefore, there exists an iterative intra-activity that Barad calls performativity – I return to performativity in a later section. In addition to the previously refigured objectivity, classical notions of subjectivity and dynamics no longer hold.

Importantly, for Barad (2003, 816-817), phenomena are produced through the agential intra-actions of apparatuses, and apparatuses are open-ended practices and are themselves phenomena. Furthermore, "phenomena are constitutive of reality" (Barad 2003, 817). In the following section, I discuss Barad's realism – agential realism, and intra-action in more detail.

[44] That is to say that apparatuses are neither static nor do they simply unfold in space and time (as linear progression) (Barad 2007, 146). "[S]patiality and temporality must also be accounted for in terms … of intra-activity", temporality is also (re)constituted through intra-activity (Barad 2007, 180).

2.5 Intra-action and Agential Realism

Many have called Bohr's philosophical position positivist, instrumentalist and antirealist (Barad 2007, 122). Barad (2007, 122-124 & 129), however, considers Bohr a realist given the extremes he has gone to in finding a conceptual solution to the wave-particle duality paradox (as opposed to the mathematical formalisms his instrumentalist colleagues would find sufficient) and his commitment to objectivity that opposes idealism and relativism. However, Bohr's realism should not be taken in the traditional meaning as it relates to representationalism that he refuses (Barad 2007, 129). I briefly present Barad's argument for Bohr's non-representationalist realism below, and then commence with Barad's reshaped 'agential realist' elaboration.

For Bohr, theoretical concepts do not have a representationalist correspondence to phenomena, "theoretical concepts are not mere ideations but are materially embodied in apparatuses that produce the phenomena being described" (Barad 2007, 129). Importantly, apparatuses are physical arrangements and phenomena are physical entities, although they are not static and intrinsically demarcated (Barad 2007, 129). Therefore, Barad (2007, 129) concludes that Bohr's epistemological framework is consistent with a realism that does not depend on Cartesian dualisms like object/subject, nature/culture or world/word. Barad (2007, 129) consequently considers Bohr's framework a "proto-performative account of the production of bodies". I will return to performativity in a later section.

The inseparability of the object from the apparatus also necessitates the rejection of the classical notion of causality: strict determinism (Barad 2007, 129). Bohr rejects both strict determinism and absolute freedom – two opposites in the dualist view of causality (Barad 2007, 130). Bohr's use of the term 'agencies-of-observation' suggests a different understanding of agency that goes beyond Cartesian dualisms; regrettably, Bohr again did not fully develop this idea (Barad 2007, 130). Barad (2007, 130) stresses that a mere combination of the dualistic options above is probably not what Bohr had in mind as they depend on the very

dualisms contested, as does an interventionist role for humans (or even ascribing agency solely to humans). Notably, some kind of causal structure within intra-actions is required to explain the repeatability of experiments, which is a condition for objectivity within Bohr's framework (Barad 2007, 131 & 174). In question then is not simply who or what *has* agency, but rather what the entanglement integral to intra-actions reveals about the *production* of the distinction between subject and object (culture and nature, non-human and human) and how this informs an understanding of agency (Barad 2007, 131).

For Barad (2007, 139) it is by way of *specific agential intra-actions* that the "boundaries and properties of the components of phenomena become determinate and that particular concepts (that is, particular material articulations of the world) become meaningful". The notion of *intra-action*, as opposed to interaction, entails a conceptual shift (Barad 2003, 815). Importantly, intra-actions involve the greater *material* arrangement that brings about an *agential* (Bohrian) cut between object and subject (Barad 2007, 140). It is this agential cut that enacts a resolution of the fundamental (ontological and semantic) indeterminacies within the phenomenon, and thus "relata-within-phenomena" unfold due to specific intra-actions (Barad 2007, 140). The agential cut thus enacts a *local* resolution of inherent ontological indeterminacy *within* the phenomenon (Barad 2003, 815).

Consequently, the classical ontological condition of inherent separability or exteriority is no longer relevant. It is replaced by *agential separability* or "exteriority-within-phenomena" as the ontological condition for the possibility of objectivity (Barad 2007, 140). Furthermore, the agential cut "enacts a causal structure among components of a phenomenon in the marking of the 'measuring agencies' ('effect') by the 'measured object' ('cause')", so that the measurement is properly described as a *causal intra-action* (Barad 2003, 815; Barad 2007, 140). Intra-action thus entails both a rejection of the classical inherent object-subject distinction and classical causality; such that the object and subject emerge from a causal intra-action where apparatuses are "*boundary drawing*

practices" or "*specific material (re)configurings of the world*" (Barad 2007, 140; emphasis in original).

Agency figures within the causal intra-action. As already established, it is the specific materialising 'effect' (the mark on the screen) that distinguishes the agencies-of-observation as *agentially separable* from the object or 'cause' *within* the phenomenon (Barad 2007, 176). In a scientific context, the above mentioned constitutes a measurement (Barad 2007, 176). Understood more broadly, Barad (2007, 176) speaks of "marks left on bodies", *bodies* thus *differentially materialise* as specific patterns of the world consequent on the specific agential cut enacted. Crucially, when also understood as a phenomenon, the agencies-of-observation includes a casual intra-action. Intra-actions, accordingly, "entail particular exclusions" opening and foreclosing possibilities so that outcomes are neither deterministic nor is "anything and everything possible at any given moment" (Barad 2007, 177). Intra-actions thus *iteratively* (re)configure possibilities (Barad 2007, 177). It may be tempting to consider intra-actions as constraining, but Barad (2007, 177) maintains that this doesn't quite capture intra-actions as possibilities are not so much narrowed as some possibilities are opened while others are excluded: "possibilities are reconfigured and reconfiguring". For Barad (2007, 177), intra-actions refigure causality and agency in "an ongoing refiguring of both the real and the possible".

In Barad's (2007, 177-178; emphasis added) agential realist account, "*matter* is an *agentive factor* in its iterative materialization" so that agency is no longer associated with human subjectivity. Fixing the 'human' so would exclude a whole series of possibilities beforehand, constituting a failure to account for crucial dimensions of how agency figures in the intra-action (Barad 2003, 826; Barad 2007, 178). "[A]gency is a matter of intra-acting; it is an enactment, not something *that* someone or something *has*", it is not a property of (pre-existing) subjects nor objects or even *at all*, "[a]gency is 'doing' or 'being' in its intra-activity" (Barad 2003, 827; Barad 2007, 178; emphasis in original). Barad (2007, 178; emphasis in original) summarises as follows: "Agency is *about changing* possibilities of

change entailed in *reconfiguring material-discursive apparatuses* of bodily production, including the boundary articulations and exclusions *that are* marked by those *practices* in the enactment of *a causal* structure".

The changing possibilities that exist at "every moment" involve an ethical obligation to "intra-act responsibly in the world's becoming", it is through intra-actions that, that which matters and is excluded from mattering is reinforced, reworked or contested (Barad 2007, 178). "The cuts that we participate in enacting *matter*", intra-action does not only call for an ethics of knowing, given that different agential cuts *materialise* different phenomena, it also calls for an ethics of being (Barad 2007, 178; emphasis added). The role of humans in such an onto-epistemology is not one of exceptionalism – humans do not exclusively do the 'choosing' of the cuts and are therefore responsible for them – nor of absolution – humans are not 'chosen' and so elude responsibility (Barad 2007, 178). Humans are incorporated in the "material becoming of the universe" and are consequently (sometimes) *part of* the greater material arrangement that enact the cut (Barad 2007, 178). "Cuts cut 'things' together and apart" iteratively ad infinitum (Barad 2007, 178-179). Furthermore, they are not enacted from an inherent exteriority, the exteriority is within, "'they' and 'we' are co-constituted and entangled" and thus ethics cannot have to do with responding to an inherently exterior 'other' (Barad 2007, 178-179). Since intra-actions enact specific boundaries, they mark the "domains of interiority and exteriority"; as boundaries are reconfigured, so are 'interior' and 'exterior' within a phenomenon (Barad 2007, 181). It is through the agential cut that not only the determinate is differentiated from the indeterminate, but also the intelligible from the unintelligible (Barad 2007, 181). As intra-actions (re)configure what is possible, ethicality – "the call to respond and be responsible" – is part of the 'fabric' of the world (Barad 2007, 182).

"[Agency] is the enactment of *iterative changes* to *particular practices …* through the dynamics of intra-activity": what is at stake is nothing less than the possibilities for change and for iteratively reconfiguring the 'human' and 'non-human' and

other such forms (Barad 2007, 178). Dynamics are about change and the causes that effect change (Barad 2007, 179). Barad's (2007, 179) agential realist reworking of causality, agency and matter advances an entirely different *understanding of* dynamics, not only *a* different dynamics (or different causal structure). For Barad (2007, 179), both the nature of change and the possibilities for change, change unendingly, it is part of the world's "intra-active dynamism". Crucially, this dynamism does not occur *in* time or space (as exterior parameters); instead iterative intra-actions are the dynamics *through* which both temporality and spatiality are produced and (re)configured (Barad 2007, 179). In an agential realist sense, change is not a "mutation of what was" nor an "unravelling of what will be" as it does not occur *through* time; it is the "iterative differentiatings of spacetimemattering" (Barad 2007, 179). Like the boundaries between interior and exterior iteratively changes, so is past and present and future iteratively enfolded and not static – "indeterminacy is never resolved once and for all" (Barad 2007, 182 & 179).

To summarise, intra-actions enact the agential cuts that differentially materialise phenomena. Since differentiation between the subject and object and the determinate and indeterminate occur through the agential cut exteriority is within – no inherent separation exists. Furthermore, the intelligible depends on the unintelligible for its material-discursive articulation, and possibilities for articulating phenomena are iteratively refigured in intra-actions. The relevance of this theory/methodology/philosophy - Barad's agential realist elaboration on Bohr – over and above physics (to social and cultural practices) will become more apparent in the following sections. However, care should be taken not to make Cartesian cuts between the social and scientific, or culture and nature as it forecloses possibilities for comprehensive analyses. The world does not consist of two separate realms – social and scientific – where distinctly separate practices make science and social relations respectively (Barad 2007, 168). The social and scientific are 'co-constituted', 'open-ended', 'entangled', and continuing material-discursive practices (Barad 2007, 168).

2.6 Introducing Performativity, Discourse and Matter

Earlier it was noted that Barad (2007, 129) considers Bohr's framework to be "proto-performative"; Barad's agential realist elaboration then should also be considered performative, and indeed iterative intra-activity is performativity to Barad. For Barad (2007, 133), a performative account is necessarily counter to representationalism; it "insists on understanding thinking, observing and theorizing as … engagement with, and as part of, the world". Performativity unseats representation's uncalled-for classically humanist-derived power over ontologies and is thus not another invitation to turn materiality into discursivity (Barad 2007, 133). Representationalism holds matter at a distance, figuring it as immutable and passive, while in Barad's (2007, 133 & 177-178) performative agential realist account, matter is active: "an agentive factor in its iterative materialization". Poststructuralists, in particular, critique the assumptions and principles that lie beneath humanism and representationalism (Barad 2007, 135). Barad (2007, 135-151) draws on notable social theorists and poststructuralists Michel Foucault and Judith Butler and their notions of discursivity, materiality and performativity while simultaneously critiquing them for ultimately once more getting caught up in anthropocentrism. I shortly discuss these notions and Barad's use thereof below.

To think of discourse as language, grammar or conversations – mere words – is to conform to representationalism (Barad 2007, 146). To Barad (2007, 146-147) drawing on Foucault discourse is "that which constrains and enables what can be said", it is the sociohistorical material conditions that disciplines knowledge practices. It is the contextual circumstances that opens and forecloses possibilities. Discursive practices then "define what counts as meaningful statements", it resolves semantic-ontic indeterminacy (Barad 2007, 146). Importantly discursive practices *produce* the "subjects and objects of knowledge practices" (Barad 2007, 147). Unfortunately, Foucault and Bohr largely considered discursive practices as human endeavours (Barad 2007, 148). For Barad (2007, 148), however, if discursive practices are boundary-making

practices – practices that enact the agential separation between human and nonhuman – 'human' cannot be differentiated prior to the discursive intra-action. Barad (2007, 148) thus insists on a posthumanist understanding of discursive practices.

For Barad (2007, 150), matter, like discourse, should also be understood as productive. Butler (1993), in her performative account of mattering, proposes that feminists pay more attention to matter, and importantly, matter should not be considered pre-discursive. For Butler (1993, 29), matter is a "process of materialization" and "matter is always materialized" in the same productive sense as Foucault's discourse. Barad (2007, 150-151) lists the following as Butler's important points on matter:

- "Matter, like meaning, is not an individually articulated or static entity".
- "Matter is not immutable or passive".
- "Nor is [matter] a fixed support, location, referent, or source of sustain-ability for discourse".
- "[Matter] does not require the mark of an external force like culture or history to complete it. Matter is always already an ongoing historicity".

Matter then cannot be understood as passive nature, awaiting the inscription of culture or discourse; "the relationship between materiality and discourse is not one of absolute exteriority" (Barad 2007, 150). Butler thinks materiality and signification together in their inseparability, but unfortunately, comes to consider materiality as an effect of human agency by drawing on Foucault's discursivity (Barad 2007, 145). Performativity, for Butler (1993), is an iterative citationality, where matter is continually materialised while being disciplined by discourse. Butler's performative account of matter falls back on the captivating representationalist and humanist notions it aims to critique. In so doing, Butler finally returns matter to passivity – "a product of discursive practices"; Barad (2007, 151) ascribes this to an incomplete revision of causality precluding a material-discursive understanding of phenomena. Additionally, Butler's (1993)

account is limited to the “contours of the human body” and, following Foucault, only attends to human social practices, reinscribing the absolute separation of nature and culture and the human and nonhuman (Barad 2007, 151). Once again, Barad calls for a posthumanist understanding of matter (in addition to discourse).

Although critical social theorists – like Foucault, Butler and many others – provide substantial theories of the production of boundaries, meanings and bodies, many of them are either outright humanist or are ensnared in humanism and representationalism to the extent that considerable anthropocentric assumptions underscore their accounts (Barad 2007, 145). Both Foucault and Butler ascribe agency exclusively and inherently to humans. In doing so, they fail to attend to techno-scientific practices: their complex productive effects on human bodies and their role in constituting who or what counts as human and when (Barad 2007, 145). This precludes accounting for the production of the nature/culture and human/nonhuman binaries, sufficiently tending to the relationship between materiality and discursivity, and duly addressing the complexities of power (Barad 2007, 145-146). Barad (2007, 146) maintains that a posthumanist performative account of material-discursive practices that combines insights from Bohr, Butler and Foucault and does away with their anthropocentrism may prove more fruitful in this regard.

I draw on the argument above and expand on the matter-nature culture-discourse relationship as it concerns sex, gender and sexuality in the next chapter. There I also return to Butler’s performativity and contributions to the critique of the nature/culture, matter/discourse and sex/gender binaries. In this chapter, the focus remains on explicating Barad’s agential realism, and so the next section follows on the specific insights Barad takes from Butler on matter, as mentioned above, and Foucault on discourse, in envisioning a posthuman performative new materialism.

2.7 Posthuman Performative New Materialism

Barad (2007, 135; emphasis in original) proposes a "*posthumanist performative* approach to understanding technoscientific and other naturalcultural practices that specifically acknowledges and takes account of matter's dynamism". Agential cuts are made through *material-discursive* practices that form part of a dynamic process that "iteratively reconfigures the world" (Barad 2007, 141). Barad (2007, 151) goes beyond the anthropocentric limitations of Butler's performativity. Barad's agential realism is a posthuman performative new materialism. Below I touch on Barad's understanding of posthumanism and trace the implications of considering discursivity and matter from an agential realist perspective.

For Barad (2007, 136), posthumanism is concurrently about challenging human exceptionalism and accounting for the boundary-making practices by which 'human' gets defined. Furthermore, posthumanism rejects the nature/culture binary and demands accounting for how this boundary is differentially drawn and redrawn (Barad 2007, 136). Importantly then, nature is no longer denied agency or historicity and (the human body) is not the line that separates interiority from exteriority (Barad 2007, 136). Separateness cannot be assumed in a posthumanist account and Barad's (2007, 136) agential realist ontology concurs in refusing separateness as an inherent feature of the world. However, Barad (2007, 136) emphasises that this refusal should not be taken to mean that separateness or difference is an illusion (a product of human consciousness), difference should not be taken for granted; it is difference and the material-discursive practices by which agential cuts are made that matters.

Barad's (2007, 138) posthumanist understanding of discursive practices builds on both Bohr's epistemological framework and Foucault's notion of discursivity. Bohr's framework is interpreted as rejecting both the transparency of measurement and the transparency of language and, most importantly, rejecting the representationalist notion that either performs mediating functions (Barad

2003, 813; Barad 2007,138). Thus, like measurements do not represent measurement-independent objects or "states of being", language does not represent "states of affairs"; discursive practices are agential intra-actions *of* the world (Barad 2003, 813; Barad 2007, 138 & 148-149). Meaning is not a property of words (or groups of words) but an "ongoing performance of the world" in its differential becoming as a part of the world makes itself intelligible to another part (Barad 2007, 149). Crucially, discursive practices are *causal* intra-actions through which a part of the world becomes determinate – propertied and bounded – and accordingly intelligible, while complementary indeterminate parts are unintelligible (Barad 2007, 148-149). Apparatuses thus become associated with discursive practices. With discursive practices (intra-actions) being recognised as causal structures, matter can no longer be said to bear the 'effects' of discursivity passively. 'Effects' are the components of the phenomenon marked by other components, the 'causes', as they become contextually differentiated (Barad 2007, 148). The relationship between matter and discourse is not one of absolute exteriority, "discursive practices are specific *material* (re)configurings of the world through which the determination of boundaries, properties, and meanings are differentially enacted" (Barad 2007, 148; emphasis added). Barad (2007, 139) advocates for a *relationality* between "specific material (re)configurings of the world" or discursive practices and specific material phenomena or the "patterns of mattering".

In Barad's (2007, 151) agential realist or posthuman performative account, matter refers to phenomena. Phenomena are not static nor inherently determinate, and neither is matter: matter is dynamic (Barad 2007, 129 & 151). *"[M]atter is substance in its intra-active becoming – not a thing but a doing, a congealing of agency. Matter is a stabilizing and destabilizing process of iterative intra-activity"* (Barad 2007, 151; emphasis in original). Just as in Butler's account of matter, matter, for Barad (2007, 151), is active in the process of its ongoing materialisation. Unlike Butler, however, Barad reworks causality to the extent that materiality and discursivity remains entangled: "Materiality is discursive … just as discursive practices are always already material" (2007, 151-152). Barad (2007,

183) does not position materiality as a given (fixed or static – nature), nor as an effect of discursive practices (and certainly not exclusively human practices – cultural performances). In so doing, Barad (2007, 138) escapes from the impasse that reinscribes the very nature/culture dualism being contested, so common to representationalist, and even most poststructuralist approaches. Discursive practices (apparatuses or material (re)configurings) that produce material phenomena are also part of the phenomena, and apparatuses are also phenomena – discursive practices are material (Barad 2007, 184). There is no relationship of inherent externality between discursive practices and material phenomena; they are "mutually implicated in the dynamics of intra-activity" (Barad 2007, 152 & 184). For Barad (2003, 822; 2007, 152), discursive practices and material phenomena cannot be explained in terms of the other and cannot be articulated in the absence of the other; additionally, they are not reducible to each other and neither is prior to nor determining of the other. "[M]atter and meaning are mutually articulated", intra-actions are *material-discursive* (Barad 2007, 152). It is through material-discursive practices that semantic-ontic indeterminacies are resolved – meaning and matter are produced, and the agential cut is made – and differences that matter are produced (Barad 2007, 146). This agential realist expansion of performativity – from iterative citationality to iterative intra-activity – recognises matter as agentive and allows for exploring *how discursive practices matter* (Barad 2007, 136).

Changes in the apparatuses or discursive practices matter for ontological, epistemological and ethical reasons: "[D]ifferent material-discursive practices produce different material configurings of the world, different difference/diffraction patterns; they do not merely produce different descriptions" (Barad 2007, 184). Barad (2007, 185) proposes that an "*ethico-onto-epistem-ology* – an appreciation of the intertwining of ethics, knowing, and being" is needed to understand how specific intra-actions matter. Knowing and being cannot be separated, "we know because we are of the world", knowing in being (onto-epistemology) is, therefore, more apt (Barad 2007, 185). Additionally, knowing is not exclusively a human practice, part of the world makes itself intelligible to another part (not a human

consciousness) through intra-action (Barad 2007, 185). The separation of ontology from epistemology compels a philosophy that relies on cartesian dualisms – inherent differences between subject and object, human and nonhuman, matter and discourse (Barad 2007, 185). Furthermore, the "becoming of the world is a deeply ethical matter" (hence ethico-onto-epistemology), responsibility and accountability are integral to agency that figures centrally in intra-actions (Barad 2007, 184-185). Accountability regards what is included and excluded from mattering in the enactment of the causal structure by the "reconfiguring material-discursive apparatuses of bodily production" (Barad 2007, 184 & 178). However, the specific configuration of the apparatus is neither arbitrary nor deterministic, thus, even when apparatuses are predominantly reinforcing, "agency is not foreclosed" as is often the case in constructivist (and even some post-structuralist) accounts (Barad 2007, 184 & 178). Barad's (2007, 139) aforementioned relational ontology (or onto-epistemology) forms the foundation of her posthumanist performative account of material bodies – human and nonhuman.

2.8 Bodily Boundaries

Before I conclude this chapter, I would like to more clearly explicate the implications of agential realism/ posthuman performative new materialism for *bodily boundaries*. Bodies are not objects deterministically bounded, bodies are material-discursive phenomena (Barad 2007, 153). Physicists, postcolonial, feminist, queer, science, and disability studies scholars, all question the habitual understanding of embodiment and the apparently inherent nature of bodily boundaries – in particular those of human bodies (Barad 2007, 155). The examples of phenomena (and apparatuses) discussed in this chapter so far have been mostly limited to physics – wave, particle, momentum, and position. I now shift the attention to examples that may be more familiar to readers in the humanities and social sciences and more relevant to the subsequent chapters.

A frequently used example of shifting bodily boundaries is that of mobility and visual aids: a person's wheelchair is certainly part of them for the purposes of moving/ navigating an environment, just as a blind person's cane is part of them and their senses in navigating an environment (Barad 2007, 155-158). The wheelchair or cane can only be 'objects-of-observation' when they are separated from their 'users', if one as the 'agencies-of-observation' were to inspect the wheelchair or cane one cannot also be using it "as an extension of oneself" (Barad 2007, 156-157). The wheelchair cannot simultaneously be the measured object and measuring instrument, it cannot be "fully characterized and function according to its ('original') purpose simultaneously" (Barad 2007, 161). Thus 'using' and 'inspecting' the wheelchair entails two different phenomena, and "the connection of the two different phenomena would require a third, yet larger phenomenon entailing these" (Barad 2007, 161).

We return to a basic principle of agential realism – there are no intrinsic boundaries (or properties), only intrinsic indeterminacies (Barad 2007, 161). Within a specific phenomenon, the bodily boundaries of the person include the wheelchair or cane. Taking all bodily boundaries of individual people to end at the surface of the skin – 'normal' embodiment, is contingent on ableism and derived from a humanist understanding (Barad 2007, 158). Furthermore, 'able-bodiedness' is not 'natural' but rather a "specific form of embodiment that is co-constituted through the boundary-making practices that distinguish 'able-bodied' from 'disabled'" (Barad 2007, 158). Looking at able-bodies as phenomena, not objects or subjects, clarifies what it means to be able-bodied and emphasises entanglement with disabled bodies (Barad 2007, 158).

The above, however, is not the only insight of agential realism that is relevant to embodiment. Hollin *et al.* (2017, 932) argue that there has been an over-emphasis on entanglement when engaging Baradian onto-epistemology outside of physics and argues for greater attention to constitutive exclusions – that which is excluded from intelligibility as a result of particular agential cuts. It is precisely such a focus on constitutive exclusions together with a challenge to binary

thinking that is employed throughout the subsequent chapters. Recall that agential cuts entail cutting together-apart (entangling-differentiating) by material-discursive practices *differentially* materialising bodies as specific patterns of the world (Barad 2007, 176; Barad 2014, 176). It thus follows that worlds and bodies are created, and excluded, in the process of apparatuses enacting agential cuts (Hollin *et al.* 2017, 931-932). Within an agential realist framework, it is the stability that phenomena acquire from the same apparatuses' iterative production thereof by way of the same agential cuts that is primarily of ethical concern (Hollin *et al.* 2017, 933). In addition to the acknowledgement that different onto-epistemologies have been possible, it is the processes or apparatuses through which particular material-discursive phenomena emerge and others are excluded from becoming that begs scrutiny and accounting for (Hollin *et al.* 2017, 933). It is the continuity of specific agential cuts being made, particularly those based in "vast socio-technical networks", that foreclose possibilities – both as result of their consistence and as result of them rendering alternatives unintelligible (Hollin *et al.* 2017, 935). As concerns, the phenomena dealt with henceforth – sex, gender, sexuality, human, nonhuman, and the body (amongst others) – *homo sapiens* are part of the greater material arrangements (apparatuses) that enact the cuts under scrutiny but are not solely responsible for the cuts made. Furthermore, this not only concerns gender but also differentially (re)configures some bodies as human and others as nonhuman (or less-than-human). Accordingly, in addition to exploring the constitutive exclusions enacted by particular apparatuses of gender, some of the complexities of their relationship to the 'human' are also traced.

2.9 Conclusion

Drawing on Bohr's complementarity – an epistemological framework, Butler's performativity and Foucault's understanding of discourse, Barad proposes an ethico-onto-epistemology that reworks objectivity, subjectivity, causality, agency and dynamism called agential realism. Agential realism, a posthuman performative new materialism, posits that phenomena are the primary onto-

epistemological units and that agential cuts enact contextually specific onto-epistemological separations or boundaries. These boundaries are not fixed, they are iteratively (re)figured in intra-actions among phenomena called performativity. This dynamism perpetually (de)stabilises boundaries by way of particular material-discursive practices, materialising (different) phenomena (differently) by resolving intrinsic indeterminacy contingently. Possibilities are iteratively opened and foreclosed as intra-actions agentially differentiates the determinate or intelligible from the indeterminate or unintelligible.

Agential realism or posthuman performative new materialism informs the rest of this dissertation. In the next chapter, I will be thinking gender with agential realism while performing a diffractive reading of theories and studies on sex, gender and sexual diversity. Importantly, performative or diffractive alternatives to representationalism and reflexivity move the focus away from questions concerning descriptions (concepts) and reality (objects) to practices (Barad 2007, 135). Thus, concepts do not *represent* material-discursive practices, rather concepts *are* the apparatuses (phenomena). Resultantly, there can be no recourse to *an* authentic sex, gender or sexuality out-there or in-here, only a contingently contextually specific determinate gender (de)stabilised through material-discursive practices. Accordingly, gender is both apparatus and phenomenon engaged in intra-active process enacting agential cuts, inclusions and exclusions. Furthermore, diffraction expresses the entangled relationality between sex, gender, and sexuality. These phenomena intra-act in their iterative (de)stabilisation. The question, therefore, becomes how the boundaries between sex and gender, male and female, man and woman, heterosexuality and homosexuality are enacted and re-enacted – stabilised, and what exclusions they entail and what possibilities exist for destabilising these boundaries.

As mentioned earlier, gender is also entangled in the material-discursive process of defining (stabilising) ‘human’ and enacting the boundary between human and nonhuman. It is, therefore important to consider how the destabilisation of gender binaries may function in the (de)stabilisation of the human. I return to this concern

in Chapter 4 while considering how anthropomorphised technologies form part of the apparatuses that (de)stabilise both the human/nonhuman binary and gender binaries and how these phenomena intra-act.

CHAPTER 3
NEW MATERIALISM AND SEX, GENDER AND SEXUALITY

The genetic and physiological mechanisms that underpin life on this planet are elegantly complicated, affording unbridled variation. It seems only sound and natural that our social mechanisms be equally complicated and varied as well.

Hida Viloria and Maria Nieto[45]

Bisexuality has always been sexual identity's most fearful ghost.

Steven Angelides[46]

3.1 Introduction

The complexities of sex, gender and sexuality are obscured by the dominant binary conceptualisations of each and the disavowal of the inherent indeterminacy, unmistakeably obvious from bisexual, intersex and trans* perspectives, is resolved by their stabilisation. In the first section of this chapter, a short history of sex and gender is presented. Here I touch on the main points pertaining to the gender (male-man/female-woman) binary, including the two-sex model, reproduction, the sex/gender and nature/culture binaries and the causal relationship between sex and gender. This illustrates the extent to which dominant theories and understanding-livings[47] of gender (de)stabilise the gender binary. In the second section, the complexities of sex and gender are explored from intersex, trans* and sexuality (particularly bisexual) perspectives. This demonstrates how sex, gender and sexuality are entangled and functions as apparatuses in each other's constitution and reveals opportunities for disruption of binaries bringing more possibilities into the realm of intelligibility.

[45] *The Spectrum of Sex* (2020, 86).
[46] *A History of Bisexuality* (2001, 203).
[47] I use understanding-living here to press the performative new materialist point that being and knowing are not inherently separate, and so common articulations of gender are onto-epistemological.

3.2 A Short History of Sex and Gender

3.2.1 One Sex or Two

The dichotomous two-sex system, contemporaneously well-known and often taken to be self-evident, has a history. Before the seventeenth century, sex was sociological, not ontological, it concerned a position in society but not to be a sex; sex was often considered to be *one* with some variations present (Laqueur 1990, 8). Thus, sex was similar to modern gender, a role or social position. However, it has been the dominant view since the eighteenth century that there are two stable and opposite sexes, and that the ahistorical sexed body is the epistemic foundation of sociological claims (Laqueur 1990, 6). Here sex becomes the familiar *two* and brings with it claims of essential or inherent qualities. Laqueur (1990, 11) points out that sex in both the one-sex and two-sex conceptualisations was situational; that is, contextually specific. Furthermore, the contexts (socio-political climates) within which sex became differentially determinate were also deeply influenced by how sex was understood at the time.

3.2.2 Reproduction and Sexual Difference

Reproductive differences among humans have long remained fundamental to categorising two sexes. Sex, in this sense, is concerned with the different reproductive functions of 'males' and 'females'. Female reproductive function is sometimes construed as *the* ability to sexually reproduce, particularly among the general public, while male reproductive function is effectively erased. In being construed as the essence of sexual difference, it is also often considered to cause societal structural differences between genders. This has led feminists such as Shulamith Firestone (1970)[48] to propose that women should be freed from reproductive labour or childbearing (in this case, through the use of artificial wombs) in an effort to eradicate the distinction between sexes. While second wave feminists like Firestone want to transcend the limits of nature like their male

[48] Firestone's *The Dialectic of Sex* (1970) was an influential precursor to xenofeminism – concerned with overcoming nature.

counterparts, new materialist feminists take a different stance toward similar ends.

Myra J Hird (2002b) argues through non-linear biology for the displacement of (human, specifically female, sexual) reproduction as foundational to sexual difference, and in so doing also problematises the habitual categorisation of humans into male or female. Hird's approach is new materialist in so far as it thinks with material bodies, non-linear science also has a close relationship with new (or neo) materialism by its own recognition, materialism in this context refers to living and non-living matter (Hird 2004a).[49]

Principally, Hird (2002b, 100-102; 2004a, 229-230) argues that human bodies (not unlike other organisms) engage in reproduction in myriad ways,[50] least of which concerns sexual reproduction. Our constant reproduction of our bodies (autopoiesis)[51] is critical to our ongoing survival (Hird 2002b, 102; Hird 2004a, 230). Furthermore, human cells are predominantly intersex (diploid) and so is the majority of our chromosomes, only sperm and egg cells are sexed (haploid) (Hird 2002b, 102). With the majority of the cells in a human body being entirely unrelated to sexual difference but still constantly reproducing themselves, sexed cells are dethroned as the custodians of reproduction (Hird 2004a, 230). Furthermore, for most species, reproduction, as in more-of-the-same-species, does not require sex.[52] The anthropocentric heteronormative assumption that sex must have some evolutionary purpose and is necessary for variation also does not hold (Hird 2002b, 101; Hird 2004a, 228-229). However, the (anthropocentric) myth that sexual reproduction produces greater biodiversity – The Red Queen Hypothesis[53] – remains pervasive. Indeed, exchanges with our environments

[49] As opposed to social and economic relations or the accumulation of goods.
[50] On a cellular level including recombination (of DNA), merging (of cells), meiosis and mitosis (cell division).
[51] For example, we reproduce our skin every six weeks, our stomach linings every five days, and our livers every two months (Margulis and Sagan 1995, 17).
[52] Out of the five classified kingdoms of organisms (bacteria, protists, fungi, plants and animals) most do not require sex; see Hird (2002b, 100; 2004c, 74) and Margulis and Sagan (1997).
[53] Originating from the Red Queen in *Alice in Wonderland* who tells Alice to run very fast in order to stay in the same place in wonderland; see Margulis and Sagan (1997, 120-121).

contribute to variations in sex (and also fertility) without resorting to sexual reproduction (Hird 2002b, 101).[54]

Thus, Hird embraces diversity and matter's activity in dislodging sexual reproduction as primary difference. While 'sexual difference' may be culturally significant, the very term veils the sex diversity among living organisms, not least humans (Hird 2004b, 86). Importantly, this non-linear biological approach demonstrates matter's agentivity. Matter from such a perspective cannot be considered inert, stable or immutable (Hird 2004a, 226). Hird (2002b, 99) goes on to state that: "The most compelling representation of a non-linear system, in which multiple forms of matter-energy (including minerals, biomass and genes) enter into non-linear relationships with uncertain outcomes, is the body". Matter is a "self-organizing, networking, complex system" and so is the body (human and otherwise) in all its diversity (Hird 2002b, 99). The complexity of sexual diversity does not depend on simplified descriptions to reflect it; bodies form and change in various ways without (conscious) human intervention (although human intervention can also facilitate change; see the section on transsexuality).

Firestone understood sex – being male or female and their consequent reproductive roles – as fixed and determined by nature. Hird, on the other hand, understands nature as dynamic and so it cannot follow that the necessities of sexual reproduction (an egg and sperm cell) must have deterministic (social and material) outcomes for the entirety of an otherwise 'intersex' body or complex system. Reproduction is dislodged from underpinning dichotomous sex, and so sex must be understood as far more complex and diverse a process than patriarchal heteronormative stricture allows.

3.2.3 The Sex/Gender Binary

Early feminist definitions of sex and gender posed gender as the cultural companion of natural sex. The sex/gender binary has been instrumental in a

[54] The most influential of which are endocrine disrupting synthetic chemicals; see Hird (2002b, 100-101).

feminist account of women's oppression. According to Kosofsky Sedgwick (1990, 27), establishing this bifurcation "has been one of the most influential and successful undertakings of feminist thought". So much so that it seems common knowledge for sex to mean biological differences between people based on genital configuration (primary sex characteristics), secondary sex characteristics[55] and assumed chromosomes (XX or XY); including the differences in reproductive capacity or role and hormonal function and biological morphology and processes commonly associated therewith. Along with gender to mean the socially pertinent (often normative) roles, behaviours and appearances associated with a specific sex. Using this schema, feminists convincingly argued for the qualities and characteristics previously attributed to sex, considered immutable and fixed, to be credited to gender, considered socio-cultural and dynamic. Under such a conceptualisation gender thus follows from sex: gender is the social roles an individual is expected to fulfil resulting from a specific interpretation of sex. This allowed feminists to address sexism or gender oppression as a cultural phenomenon that can be contested, as opposed to something 'natural'.

However, the distinction between sex and gender is rather tenuous and has been contested in later years by feminists, from philosophers to sociologists and psychologists, to such an extent that in 1996 in *Goodbye to Sex and Gender* John Hood-Williams presented an examination of its 'death'. The emergence of third wave feminism and queer theory, influenced by postmodernism, greatly contributed to the questioning of the sex/gender binary. Moreover, theories of gender (and sex and sexuality) that presuppose a natural sex onto which cultural gender is inscribed consider matter inert and no reciprocity exists between discourse and matter (counter to new materialist philosophy). The dichotomous

[55] Although many sources implicitly privilege chromosomes, and indeed Kosofsky Sedgwick (1990) refers to "chromosomal sex", most people's chromosomes are not known to them or others. Rather sex is assigned (at birth) on the basis of genital configuration at least in cases of little genital ambiguity, and in other cases (intersex) in line with the preservation of the two-sex system (and heteronormativity). Furthermore, in everyday interactions people attribute gender (and sex) to others on the basis of various bodily and behavioural clues, not from a person's genital configuration.

distinction between nature and culture roots gender in sex and produces the sex/gender binary (Hird 2000, 348). Matter is figured as passive in alliance with nature and sex, while culture is active as discourse and gender. The aforementioned reflects a representationalist belief – language reflecting phenomena – associated with social constructionism and philosophical realism (Barad 2003, 802).

Critiques of the sex/gender binary tend to focus on the assumptions underlying it: the nature/culture binary, the immutability of sex, and the existence of only two sexes (among humans and other animals and organisms) (Hood-Williams 1996). Importantly, the sex/gender binary also supposes that sex precedes gender, another point of contestation (Hird 2000, 348). Furthermore, since matter is considered inert as it is associated with nature also considered static (as opposed to culture), sex is also considered fixed. By conflating the biological with the natural constructionist feminisms naturalise material processes (Hird 2004a, 225) and uphold problematic Cartesian dualisms. The assumption that matter is immutable, inert or inactive, and static as opposed to cultural descriptions being dynamic and thus inviting intervention, concentrate the scrutiny of critical analyses on discursive effects of subject-objects without accounting for their materiality outside of cultural representation (Hird 2004a, 224).

While many queer theoretical and postmodernist critiques of the sex/gender binary proliferated during the 1990s, several still succumbed to representationalist lure and inadvertently reinstalled the nature/culture binary. Social constructionism, post-structuralism and deconstruction underscoring such theorising lead to, what critics like Hird (2004a) refer to as, a privileging of language, culture, and representationalism. Within such a framework, the focus rests on the cultural elements of identity/subject formation and negotiation, such as discourse, neglecting to address the material body (Hird 2004a, 223). As discussed in the previous chapter, Barad (2007) identifies influential queer theorist Judith Butler's (1999) performativity as such an instance. This leads

critics to ask: “precisely *how* discursive practices produce material bodies” (Barad 2003, 808; emphasis in original).

Barad (2007) proposes posthumanist performativity (or agential realism) as a way to understand how discursivity and materiality interrelate (or rather intra-relate). Gender can thus be conceived of as a material-discursive process. A new materialist understanding of gender-as-process differs somewhat from the understanding invoked by Butler’s theory of performativity while drawing on it. Gender (and sex as will become clearer in later sections) is neither pure culture nor pure nature as the nature/culture binary has been eliminated.[56] I propose, drawing on Barad (2007), that there exists a reciprocal project between what is commonly understood as nature and culture in both sex and gender becoming determinate (and agentially separated) in various contexts. This is in line with the call for feminist theorising to consider matter as crucial, lest confirming the natural and social as entirely independent realms (Hird 2004a, 225).

In the sections that follow the other assumptions (apart from the nature/culture binary) that underlie the sex/gender binary are variously addressed as these assumptions are not commensurate with new materialism in related ways. The binaries buttressing them enact multiple exclusions within the phenomena of sex, gender and sexuality that they tend to stabilise.

3.2.4 Nature as Benchmark of the Normative

Nature, considered inert, is often employed as the zenith of essentialism. In this logic, nature is natural, natural is normal, and normal is normative. Thus, not only do humans anthropocentrically project normative ideals of sex, gender, and sexuality onto other organisms, the presumed naturalness (read projected normativity) of these organisms’ sexual dimorphism and heterosexual

[56] Importantly, culture and nature are not collapsed into either one, so that culture has been nature all along or vice versa. It is specific material arrangements (or apparatuses) that make the agential cut between nature and culture within specific contexts and time and place that allows the agential separation of nature from culture; these concepts are not fixed, and neither can be reduced to the other.

reproductively focussed relations are used to bolster claims of what is 'natural' and 'unnatural' in humans, often in a moralising manner. Hird (2002b), however, shows that biological variety (across and within species) confounds the insistence on using 'nature' as a benchmark of the normative.

While the focus remains largely on nonhuman animals to bolster such an argument, Hird (2000, 348; 2008, 234) maintains that "[t]he diversity of sex and sexual behaviour amongst (known) species is much greater than (binary) human cultural notions typically allow". Nonhuman animals, for example, engage in a vast assortment of sexual behaviours including sex for pleasure, masturbation, sex while pregnant, pregnancy prevention and termination, and both heterosexual and homosexual sex (Hird 2008, 234-235).[57] Furthermore, almost all plants and many animals are intersex, while fungi have many sexes and bacteria completely defy sex (Hird 2008, 236-237). Many species also change sex (transsex) across their life cycle,[58] while some display behaviours and traits typically associated with another sex without changing sex (Hird 2008, 236).

Indeed, scientists expect to find homosexuality, bisexuality, non-monogamy, same-sex parenting, adoption, sex changing and many sexes in abundance within strong species and ecosystems (Hird 2002b, 101; Hird 2004b, 87). This diversity challenges human cultural ideas about heterosexuality, family, monogamy, fidelity, parental care and sexual difference and stability (Hird 2008, 234). It also renders arguments rooted in the notion that only two distinct immutable sexes and heterosexuality is 'natural' moot as it relies on a cursory and erroneous understanding of organic materiality. Human bodies, not unlike all living matter, materialise sex diversity (Hird 2002b, 103). Moreover, from a performative new materialist perspective, there can be no recourse to a nature out-there for defining 'natural' sex, gender or sexuality. Thus, even if nature is

[57] According to Bagemihl (1999) homosexual behaviour is present in over 450 species of animals across all animal groups, ages, and sexes; while more than half of mammal and bird species show bisexual behaviour (Hird 2008, 235).
[58] The more interesting question for researchers seems to be why more species do not change sex, rather than why some do (Hird 2008, 236). Also see Policansky (1982).

agentially separated in a strategic effort on behalf of normativity, nature fails to support claims of uniformity and likewise the immutability of matter and sex and sex's dichotomy.

3.2.5 Which Came First Sex or Gender

While many theories of gender assume that gender, the socio-political categories (masculine) man and (feminine) woman, follow from sex (male and female), this view is not unchallenged. As should already be apparent, the idea that gender should follow from sex implicitly relies on the nature/culture binary and nature's passivity and indeed presumes the sex/gender binary as fundamental. In critique of this formulation, sociologist Christine Delphy (1993) proposed that gender precedes sex; as did Judith Butler (1993, 1999). A discussion of their arguments follows.

Sex roles were the first phrase to be used in relation to many of the behaviours now understood as gender (Delphy 1993, 2). Delphy (1993, 3) notes three possibilities that were opened up after gender became the more prominent concept: (1) all differences between the sexes considered arbitrary (social) are subsumed under gender, (2) gender as a singular term (not genders like sexes) focuses attention on the act of separation or division, and (3) hierarchy is firmly tied to gender. Despite the first possibility taken to its logical conclusion allowing all genders to become independent of all sexes, gender (social dichotomy) continued to be thought in terms of sex (natural dichotomy) foreclosing important questions (Delphy 1993, 3). The aforementioned includes "why sex should give rise to any sort of social classification", and thus why sex should precede or cause gender (Delphy 1993, 3-4). First, Delphy (1993, 4) returns to sexual reproduction, which was commonly understood to underscore the division into two sexes, and asks why the division of reproductive labour should extend to any other divisions along the same line. Secondly, it is questioned why physical sexual traits should form the basis of binary hierarchical social classifications while others do not (like eye colour) – particularly on the basis that these divisions somehow precede their accrued and contextually specific social significance (Delphy 1993, 4). Sex is not

a singular concept but refers to many things, including chromosomes, genitals, hormones and more.[59] However, it is reduced to genital configuration, or more precisely the presence or absence of a penis, as indicator of reproductive role (Delphy 1993, 5). This reduction Delphy (1993, 5) argues is social, particularly since the presence of a penis is a poor proxy for all those who do not bear children, which should at least include elderly and otherwise infertile persons who do not have a penis. This line of thought leads Delphy (1993) to consider that sex might be 'social' not 'natural'; as dichotomous sex designation (primarily based on the presence or absence of a particularly sized phallus) and division into two classes on that basis serves social purposes not natural (reproductive) purposes.

Judith Butler (1993; 1999) comes to the same conclusion via a different route. For Butler (1993; 1999), sex is always already gender; it is the gender norms (amongst others) through which the subject is interpellated that create the fiction of a 'natural' sex – thus, sex is gender is 'social'. As noted earlier, Butler's, and now Delphy's, theories can be read as collapsing nature into culture, the discursive processes or reductionisms at work lead to 'sex' being understood through the cultural elements of identity/subject formation and sex and gender are conflated wherever necessary to maintain the binary notions each purport. This challenge to the sex/gender distinction and the notion that gender precedes sex has become so prominent that in Europe, juridically, gender defines sex. Furthermore, the terms are predominantly used interchangeably – "Europe has transformed gender identity into legal sex – they are, in effect, the same thing … the body's sex as taxonomical tool … has become redundant" (Whittle and Turner 2016, 41).[60] Performative new materialism cannot entertain such a collapse of

[59] See the sections below on intersex and JR Latham's constituents of sex in the gender clinic for an elaboration.
[60] Note that in Europe the options for sex or gender are predominantly still only male/man or female/woman. While in Austria (and to some extent in The Netherlands) intersex people can access a 'third sex' option and in Germany intersex individuals can have the gender marker removed from their identification documents, trans* individuals are limited to man or woman, and of the European nations only Belgium have removed mention of gender on all identity documents. While South African identity numbers differ according to sex registered at birth (as does some other nations) ID books did not make explicit mention of sex or gender, but the new ID cards do (RSA passports have included an explicit sex-gender marker previously).

sex into gender, or rather nature into culture (or vice versa). Therefore, where these theorists reverse the causal relationship between sex and gender so that gender precedes sex (the binary arguably stands) or sex is collapsed into gender (nature remains passive), agential realism reworks causality so that neither term can be said to precede the other both are contextually stabilised through dynamic material-discursive processes and emerge from intra-actions. Hence, this affords the theorist to think the materiality of the body with sex and gender.

In *Bodies that Matter* Butler (1993, 1-2) clarifies that discourse does not cause sexual difference and "'sex' is an ideal construct which is forcibly materialized through time" and not a "static condition of a body". Accordingly, the body may be regulated by the fiction of sex and still be 'naturally' sexually differentiated, differences do not cease to exist but rather become meaningful (or not) depending on the workings of power. From a Baradian perspective, the regulatory norms are material-discursive apparatuses (phenomena), so that sex and gender iteratively constitute and stabilise the phenomena male and female, man and woman, masculine and feminine and the boundaries between them. Furthermore, viewed within a diffractive approach, difference is not pejoration but rather intra-actions (re)figure which differences matter. Significantly, the agential cuts made between the terms in these binaries and in their intra-actions entail exclusions: male and female exclude intersex. At the same time, the relationship between sex and gender has become stabilised[61] to such an extent that male attaches to man to masculinity (and female to woman to femininity) so fervently that trans* possibilities are opened and foreclosed to the exclusion of those that seek to transcend[62] these binaries and their couplings.

[61] While this stability has been challenged more recently and more possibilities opened up it largely still dominates outside specific trans* contexts and also within the influential trans* movement of the USA. See the sections below for more.
[62] Ekins and King (2006) divides "transgendering tales" into migrating, oscillating, negating and transcending stories. Transcending stories seek go beyond binary divides by redefining sex, gender and sexualities; Ekins and King (2006, 181) mentions Kate Bornstein's *Gender Outlaw* (1994), Leslie Feinberg's *Transgender Warriors* (1996) and Riki Wilchins' *Read My Lips* (1997) together with Susan Stryker's work as notable transcending stories/theories.

3.3 Transcending Binaries

I hope the previous section has made it clear that sex and gender, even when agentially separated, are intricately entwined. Since the 1700s, the binaries between male/female and man/woman and the coupling of male to man and female to woman have been predominantly iteratively stabilised. In the remainder of this chapter, the focus shifts to binary opposing conceptualisations of sex, gender and sexuality. I explore sex and gender and their coupling diffracted through intersex and transgender and the possibilities opened and foreclosed for sexuality below.

3.3.1 Intersex and the Diversity of Sex

In this instance, let sex (the apparatus) enact the designation male or female assigned to a person at birth primarily based on observation of the configuration of their external genitalia. Genitalia here often stands in for a range of sex traits assumed to match genital configuration and, at the minimum necessary for reproductive capability. However, one to two per cent of the human population do not fit neatly within either (male or female) category, these people are called intersex (Viloria and Nieto 2020, 23).[63] Intersex challenges the dichotomous sex binary (Monro 2005, 10). Intersex individuals may be born with what is medically termed 'ambiguous' genitalia – that is a genital configuration that cannot easily be classified as male or female; but regardless are still assigned to either category and often endure unnecessary cosmetic genital surgery[64] as infants to ensure superficial compliance to these categories. Other intersex individuals may only notice differences in sexual development around puberty, as hormone levels and responsiveness may be affected, or when seeking treatment for infertility

[63] Red haired people also account for one to two percent of the population (Viloria and Nieto 2020, 24).
[64] This is frequently referred to as infant or intersex genital mutilation (IGM) and intersex activists across the world are opposing this non-consensual, irreversible, physically and psychologically damaging practice. 'Clitoridectomy' or 'castration' performed on the phalluses of intersex infants result in partial or complete loss of sensation and anorgasmia. Furthermore, this and other surgeries often lead to painful scar tissue and medical complications often resulting in lifelong physical pain. IGM is a violation the rights to bodily autonomy, physical integrity and self-determination.

(some but not all intersex variations result in complete or increased infertility). Still others are unaware that their various sex traits[65] (sex hormone levels and responsiveness, chromosomes, and primary and secondary sexual and reproductive anatomy including gonads) do not align as expected.

It is commonly assumed that if someone looks like a girl/woman they possess XX chromosomes and if they look like a boy/man they possess XY chromosomes and those are the only two options. However, there are many other sex chromosomal variations: some people may have a mix of XX and XY chromosomes or another combination, three sex chromosomes (XXX, XXY, XYY), or only one sex chromosome (XO). None of the above fit within the chromosomal XX(female)/XY(male) binary, although most look female (XO and XXX) or male (XXY and XYY) and are unaware of their chromosomal variations.[66] The most noticeable of these variations is gonadal intersex where one ovary and one testicle or ovo-testes may be present as two zygotes with different chromosomal configurations, commonly XX and XY,[67] merged into one embryo – other differences in genital configuration may also be present (Viloria and Nieto 2020, 27-28). Additionally, these individuals do not fit the ovaries(female)/testicles(male) binary and possibly others.

Moreover, not everyone with XY chromosomes look like boys/men. In the first case, sex hormones play a role. People with androgen (of which testosterone is one) insensitivity look like girls/women and have XY chromosomes. Those with complete androgen insensitivity have typical female external genitalia (vulva, clitoris, vagina) and internal testes[68] with no ovaries or uterus and thus it is not immediately apparent (Viloria and Nieto 2020, 46-47). So-called sex hormones do not adhere to the oestrogen(female)/testosterone(male) binary as people of

[65] See the section below on trans* for comparison.
[66] Individuals with a single sex chromosome (XO also called Turner syndrome) are most likely to know as they commonly do not develop breasts during puberty (Viloria and Nieto 2020, 55).
[67] This is also called mosaicism/chimerism and any of the other chromosome configurations could be present in any of the zygotes that will result in different outcomes.
[68] The removal of the testes is not recommended, even though it is common practice, as it is the source of oestrogen (some of the testosterone is converted) and hormone replacement therapy with oestrogen or testosterone will become necessary (Viloria and Nieto 2020, 47).

all sexes make androgens and oestrogens to varying degrees at various times (these hormones are important for many bodily functions) and not necessarily in an expected fashion in line with the XY(testosterone)/XX(oestrogen) binary. Furthermore, people with XY chromosomes may also have a uterus and fallopian tubes. In this case, the gonads do not develop as a protein called testis determining factor (TDF) is not functional (Viloria and Nieto 2020, 48).[69] Again, this complicates the assumed straightforward binary relationship between sexual and reproductive organs and chromosomes.

A further instance of intersex variation is congenital adrenal hyperplasia (CAH), where enzymes interfere with hormone production and additional testosterone is produced. In people with XX chromosomes, this sometimes results in a bigger than typical clitoris (the 'female' phallus) together with a vulva and vagina or a penis (the 'male' phallus) and no vagina (Viloria and Nieto 2020, 61-64). Accordingly, their genitals are either termed 'ambiguous' or 'male' and they are respectively subjected to unnecessary surgery or raised as a boy. At the same time, a larger phallus in XY individuals with CAH is paid no mind.[70] Viloria and Nieto (2020, 78) state that: "If we acknowledge the fact that some people are born intersex, and that sex organs exist that are not exactly clitorises or penises but a blend of the two, such organs are not ambiguous at all". Once again hormones, chromosomes, and phallus size do not arrange into a tidy binary, phallus size here may not even fit the binary – too big to be a clitoris/too small to be a penis.

Importantly, as should be clear from the above cases of intersex variation, people are commonly classified by others into male or female based on appearance, and at birth that is, primarily, the appearance of their genitals. However, when we meet others, we generally assume a sex or gender and attribute them male/man/boy or female/woman/girl without knowing what their genital configurations or any other of their sex traits, such as chromosomes, gonads or

[69] Also called Swyer syndrome.
[70] People with salt-wasting CAH face a range of health problems as the hormones cortisol and aldosterone are not produced and thus require life-long hormone therapy (Viloria and Nieto 2020, 64).

hormones, are (Viloria and Nieto 2020, 78). There is much greater variation in sex than is culturally acknowledged; “the existence of a socio-biological continuum of sex is still largely ignored and sex diversity suppressed” (Horlacher 2016, 1). Sex as the apparatus that enacts the agential cut between male (equals XY, testes, penis, and testosterone) and female (equals XX, ovaries, vulva and vagina, and oestrogen) to the exclusion of sex diversity operates in concert with the phenomenon gender (gender is part of the apparatus in the iterative constitution of sex and vice versa). This is in line with a reworked understanding of both Delphy’s (1993) and Butler’s (1993) understanding of sex as it functions in the maintenance of a duplicitous sex/gender binary; as well as Hird’s (2004a) observation that notions about sexual difference are naturalised to the same ends. “Sex is a gendered category”, according to Viloria and Nieto (2020, 95). Moreover, the apparatuses that iteratively constitute and stabilise the phenomena sex and gender, male and female, man and woman and the boundaries between them includes the (Western) established medico-surgical customs (the scalpel, the physician and the society that confers power on this industry to assign and enforce sex) that render these categories meaningful by forcing the binaries in refusal and negation of difference. The medico-psychiatric reaction to intersex variation reveals how ‘sex’ is inscribed on the ‘unruly’ body, often without consent (Hird 2000, 349; Hird and Germon 2001).

Rubin (2017, 6) recounts Cheryl Chase’s story of intersex diagnosis: “Biomedical expertise transformed Chase’s ‘small penis’ into a ‘monstrously large clitoris’, yet this transformation occurred ‘without any change in the actual size or appearance of’ Chase’s genitals”. Here the diagnosis of intersex made by a physician changed the onto-epistemology of Chase’s phallus, it was transformed from penis to clitoris. Furthermore, this led to genital surgery to ‘normalise’ Chase’s genitals together with changes in others’ perception of Chase’s embodiment (from male or disordered female to normative female); this material-discursive constitution of Chase’s body, sex and gender was put in motion through the medicalisation of difference. Medicalisation forces the body of the intersex infant to change through non-consensual and harmful surgical practices so that social attitudes

(phenomena) – resulting from the gender binary that limits intelligibility to man/male and woman/female – that dehumanises[71] the intersex individual (and maintains the binary) may remain stable. Dehumanisation and medicalisation, together with erasure, are not uncommon to those that defy sex and gender binaries or challenge normative ideals, as we will see in the sections below.

Chromosomes, hormones, gonads and other sexual and reproductive traits can arrange in any combination with one another, and sometimes even change over time. Güevedoce, which translates to testicles at twelve, is such an instance.[72] Here the absence of a specific enzyme prevents the XY foetus from making a type of testosterone which results in 'female' genitalia, 'ambiguous' genitalia or hypospadias (the urethral opening is on the underside of the 'penis') (Viloria and Nieto 2020, 81). During puberty the increase in testosterone levels result in a typical 'male' puberty in relation to secondary sex traits and the phallus and testicles grow somewhat larger (Viloria and Nieto 2020, 81-82). These individuals thought to be 'female' at birth become 'male' at puberty. As noted earlier, it is also not uncommon in other species to change sex or transsex.

The various properties called sex traits can combine in various ways and change through redefinition (by physicians or individuals themselves) or reconstruction (non-consensual or voluntarily). In the case of intersex individuals these changes are usually medically enforced in infancy in maintenance of sex-gender binaries, while for transgender individuals these changes are actively sought later in life. In the section below, the focus shifts to the constitution of sex from a trans* perspective.

3.3.2 Transsex and the (Im)mutability of Sex

To keep the focus on the material body and in line with usage by some of the authors quoted here, I primarily use the terms transsexual, transsexualism and

[71] Dehumanisation renders particular persons less-than-human. This dehumanisation not only leads to atrocious medical practices but also sometimes to infanticide.
[72] This intersex variation is common in the Dominican Republic where IGM is generally not practiced.

transsexuality (all nouns) in this section. Additionally, the reader will notice the use of transsex, a verb, in the heading. I borrow the term transsex from Myra Hird (2008) to refer to the process of changing sex, of moving (in)between material-discursive constitutions, particularly as it relates to the body. However, it should be noted that transgender or trans* is the more widely accepted terms in contemporary usage.

Hird (2002a, 581) summarises the majority of feminist, queer and transgender analyses of transsexualism from the 1970s to 2000. They tend to focus on either authenticity, performativity or transgression and, in so doing respectively rely on the assumptions that there exists a 'real' sex and gender; or that sex and gender are fictive, and that sex and gender can be/is being disrupted (Hird 2002a, 581). Thus, either sex (notably sexual morphology) is immutable and fixed (sometimes as opposed to gender) or sex and gender are both discursive concepts, and transsexualism purposely infringe on either 'nature' or the naturalisation of sexual difference (Hird 2002a, 581). A new materialist, specifically an agential realist approach, is incommensurate with the assumptions above. Neither sex nor gender is immutable, not because they are purely discursive but because iterative material-discursive intra-actions (de)stabilise them. There can be no recourse to the authenticity of sex or gender, since a specific sex and/or gender are not considered innate properties of a subject/body. Sex and gender are not static concepts, they are phenomena that are iteratively (de)stabilised. Similarly, neither sex nor gender can be considered fictive, they are both real in so far as both phenomena are iteratively stabilised in present societies to such an extent that their regulation often results in violence. The real/imaginary, truth/fiction and authentic/imitation binaries called to support these claims conceal the intra-actions of apparatuses at work to stabilise the phenomena sex and gender. Furthermore, while transsexualism has the potential to disrupt the naturalisation of sexual difference (not 'nature') it is not necessarily transgressive.

Wilchins (2004, 8) argues that feminist and gay movements generally refrain from 'going after gender' at least partly because of the opposition they face from

conservative quarters. These movements primarily fight for access to normativity, they seek inclusion as full humans and full human rights.[73] In so doing, they stress their 'normalcy' and align with (hetero)normative ideals: feminist women look like women and are family minded (are feminine), gay men look like men (are masculine) – this is also called respectability politics.[74] This puts the bulk of the responsibility to address gender rights – the right to look however you want – on transgender people. Gender becomes a queer issue positioning those petitioning for protection from discrimination, equal pay and marriage equality as 'normal', not queer;[75] what these groups want is distinguished from who they are: they are not radical (Wilchins 2004, 20). Interestingly though, when "you scratch the surface of sexism and misogyny [and homophobia], you almost always find gender [stereotypes]" (Wilchins 2004, 11). Those who seek inclusion (read assimilation) into an oppressive binary culture aim to be as imperceptibly different as possible from the expected norm (often as a means to that end and/or to mitigate some of the violence they face).[76] Hence, "*transgender rights* have increasingly come to mean *transsexual rights*" (Wilchins 2004, 27; emphasis in original).

Transsexual refers to a person who seeks or has had medical and/or surgical intervention to alter their bodies. The term transgender emerged during the 1970s as an umbrella term that initially united transexual (sex-changing) and transvestite (cross-dressing). However, those who 'permanently lived' as the 'opposite' sex but did not seek medical intervention were also sometimes

[73] In the earlier stages of each movement (Feminist, Gay Liberation, Trans*) biologic essentialism is often radically challenged, but this radical stance is softened so that the dominant approach frequently includes essentialist elements (commonly renouncing choice and claiming being 'born this way') in order to make civil rights claims within a conservative neoliberal political context (Cover 2019).
[74] The 'good' or 'normal' homosexual is separated from the 'bad' and 'dangerous' queer to gain the favour of the heteronormative majority (Jackson 2006, 112).
[75] Queer regularly defines itself against normality, or rather normativity, not heterosexuality per se (Warner 1993, xxvi) and thus queer stands in opposition to all forms of normativity including homonormativity and transnormativity (in addition to heteronormativity and cisnormativity).
[76] For some individuals, particularly those multiply marginalised in intersectionally oppressive contexts, the threat of violence is so great that survival demands assimilation; however, it is not at all uncommon for those significantly more privileged to seek more privilege through assimilation.

acknowledged (Ekins and King, 2006, 13-14). Once transsexualism gained more recognition medicalisation[77] quickly ensued in full force, and in the 1990s the term transgender was also taken up by physicians and psychiatrists, while simultaneously being used deliberately to express maximum diversity not limited to medical intervention (Ekins and King 2006, 17-20). The remainder of this section will focus on medicalisation, surgical intervention and its role in regulating binary transsexual/transgender phenomena.

It is important to note that "many 'transsexual' people see themselves not as trans-anything, but as misidentified … [they seek] the 'correct' identification … gender confirmation" (Ekins and King 2006, 28-29). This narrative is akin to Harry Benjamin's[78] medicalised transsexual account that led to a very specific understanding of transsexualism: (1) "being born in the wrong body", (2) "always having a feeling of belonging to 'the other sex'", (3) "and hating the genitals, roles and possible futures of one's assigned-at-birth sex" (Latham 2017, 185). The 'wrong body' narrative is very prominent in the influential trans movement of the United States of America (USA) and is leveraged politically for accessing hormones, surgery and rights. However, this approach is widely criticised by the larger transgender community as an instance of assimilation into oppressive hierarchies and respectability politics that shifts the issue of gender onto those who cannot or do not want to pass or be identified as either men or women. While many of the latter group (who by no means all either 'pass' or do not 'pass' as binary gendered) face erasure and dehumanisation they are sometimes collectively said to be more *transgressive* than binary transsexuals (both those who subscribe to essentialist notions and those who do not). However, neither position guarantees politically effective transgression in and of itself and includes many differences among themselves.[79]

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[77] Transsexualism became medicalised akin to the medicalisation of 'female' sexual desire (hysteria) and homosexuality.
[78] Also called The Harry Benjamin Standards of Care.
[79] Transgender individuals from both the binary and non-binary groups are similarly entangled in the intra-actions that constitute genders and the gender binary. See Davy (2018) for an explicit (vitalist and affective) new materialist critique of pitting transsexualism against genderqueer and instituting a transsexual/genderqueer binary.

Gender confirmation treatment (for gender dysphoria) "seek[s] to ensure that identity, social status and biology 'match'. The end result is that the binary structure of gender is maintained" (Ekins and King 1997, 9). For the most part, within the medico-psychiatric establishment, the outcome of treatment must be a person who is unambiguously either male *or* female, man *or* woman. These medical practices produce these very phenomena (male, female, man, woman) while simultaneously assuming that these phenomena as properties are inherent to so-called patients (Latham 2017, 178). JR Latham (2017, 178), in exploring how sex is produced and maintained in the gender clinic, demonstrates that sex is ontologically multiple (not one thing) and dynamic (not static or immutable). Undeniably, "the clinical narrative of transsexuality is both founded on and perpetuates the notion of sex as singular" and binary (Latham 2017, 179).

Sex in the gender clinic[80] is produced and maintained similarly in relation to transsexualism as is the case with intersex; sex is, amongst others, genitals and hormone levels (Latham 2017). Sex may also be chromosomes, but since chromosome testing is expensive, some physicians forgo this testing (done to check for intersex variations) (Latham 2017, 184).[81] Additionally, sex is so-called secondary sex characteristics: breast prominence/ chest shape (and nipple size and position), body and facial hair patterns, and body build (Latham 2017). The aforementioned characteristics are altered through hormone therapy (or surgery in the case of mastectomy) resulting in the redistribution of fat, altered hair growth patterns and sometimes breast growth. Surgery and hormone therapy are assumed to be sought concurrently or consecutively, with hormones preceding surgery, in order to become coherently male or female – the 'opposite' of what one was before (Latham 2017). Importantly, the narrative that must be presented to gain access to any medical or surgical interventions must express a desire for both so that either man = male = flat chest = hairy = wants-a-penis *or* woman = female = breasts = relatively hairless = do-not-want-a-penis/wants-a-vagina.

[80] Latham describes an experience of an Australian gender clinic; however, this experience is not at all uncommon across the English-speaking world and in minority culture areas.
[81] Chromosome testing may result in an individual being diagnosed intersex not transsexual.

Thus, hormones, top-surgery[82] (in the case of female-to-male) and bottom-surgery (if considered viable at the time) must be sought together and in that order. This maintains the male/female binary to the extent medically and surgically possible (not unlike intersex): sex is biological and morphological.

Latham (2017) recounts the difficulty in accessing top-surgery or a double mastectomy when this prescribed narrative does not apply. Furthermore, sex, or rather sex-gender, and transsexuality is enacted in the gender clinic by psychiatrists (in addition to physicians) as a feeling; this feeling should primarily consist of strong cross-gender identification and persistent discomfort[83] in one's assigned sex and with one's genitals (Latham 2017, 185-188). Transsexuality is thus a convincing narrative to the psychiatrist, symptomatic of the diagnosis 'gender dysphoria', sex is thus also diagnosable and an identity (Latham 2017, 185-188). Moreover, the psychiatrist and physician require gender stereotypes and gender roles to cohere with the gender reported by the 'patient', sex-gender is dress, hair style, mannerisms, gait, facial features and height;[84] sex is social status (Latham 2017). Notably, sex-gender is considered a singular coherent phenomenon in this context and the male-man/female-woman binary is considered stable, obscuring its stabilisation and the limitation of trans possibilities by the very medical and surgical practices performed. "If sex is constituted as stable, singular and binary [stereotypical and sexist] (as it is in medicine), then, of necessity, any process of 'changing sex' must conform to a very narrow bridge from 'one sex' to 'the other'" (Latham 2017, 199). However, Latham succeeding in changing only some aspects of sex (getting a mastectomy without taking hormones or pursuing genital surgery) shows that alternative sex-gender and trans onto-epistemologies can be made possible through specifically different material-discursive intra-actions. Transsexualism reveals the material-

[82] Top-surgery is the term commonly used to refer to surgery on the chest/breasts, and bottom-surgery to refer to genital surgery in transsexual/transgender contexts, arguably as a way to lessen the sexualisation of a hypersexualised group by not directly referring to sexualised body parts.
[83] This discomfort is assumed by the medical establishment to be so overwhelming that (changing) gender becomes the most important aspect of a person's life (see Latham 2017, 194).
[84] These are frequently collectively called masculinity or femininity (depending on expression and culture) and are also used to express sexuality as opposed to sex-gender.

discursive practices that realise the gender binary by confounding the multiple factors that constitute sex-gender.

It is not only medical practices (proclamations by 'authorities', hormones and surgeries) that enact sex-gender, but also material resources such as time, money and tests, additionally stress and pressure to conform to a binary (to pass or access hormones or surgeries) also defines transsexual realities (Latham 2017, 179 & 185). Furthermore, sex is administrative and bureaucratised, "enacted across a range of documents and records" such as birth certificates, identity documents, diagnostic criteria, intake forms, and gender-confirmation or sex-reassignment consent forms (Latham 2017,192). The phenomenon of sex and specifically transsexuality requires as part of the complete description of the apparatus all of these factors: so-called gender specialists, psychiatrists, physicians, pathologists, endocrinologists, sometimes lawyers, health insurance, hormonal medicines, paperwork, diagnostic criteria, clinics, consulting rooms, operating rooms, clothes, hair, time, money and importantly transsexuals. These material-discursive phenomena are not static but dynamic, they change across time and intra-act with each other in multiple ways opening and foreclosing transsexual possibilities. Sex-gender can best be understood as non-permanent (as it often is by transsexuals) and thus mutable and multiple, as bodies are (re)configured, so is the meaning made of them. To put it differently, as meaning is re(con)figured, so are the bodies that embody it, as will become clear in the following section.

Before moving on, I would like to address two relevant issues that pertain to transsexualism: that of access to body modification and definitional differentiation. It is at the time of writing still predominantly so that in most parts of the world in order to access body-modifying interventions (hormones and surgeries) that pertain to sexual morphology one requires a diagnosis. As stated previously, diagnosis in turn, requires one to recount a specific narrative, often also including rejecting sexual desire in one's disidentified body (Latham 2016). Allegiance to the medicalised narrative of transsexuality or transnormativity (and

the gender binary) can be construed as that which is primarily assessed by the psychiatrist, although it is purported that the assessment concerns one's ability to give informed consent to the interventions sought. A seeming paradox presents itself when intersex and transsexualism is considered side by side, on the one hand, consent is disregarded; on the other it is figured as imperative, this serves to distract from the actual dominant factor at play: maintenance of the male/female binary. Additionally, both instances exhibit a pleasure-negativity – the possibility for future sexual pleasure of intersex infants is disregarded, as is the possibility of past sexual pleasure for transsexuals, while the possible erotic elements of (any and all) body-modification are ignored.

Many have criticised the medical establishment's many unnecessary requirements to access specifically transsexual body modifications, indeed 'men' with gynecomastia (enlargement of breasts) and 'women' with (premature) menopause, can access the same surgeries and similar hormone replacement therapies with much greater ease. This is also true of similar procedures for purely cosmetic reasons such as some breast augmentations[85] and cosmetic surgeries of the genitals.[86] While criticisms have led to informed consent clinics – where the necessary information regarding effects and side effects, interactions, contraindications and risks and benefits are discussed with 'patients' before prescription of hormonal medications – being established (primarily in parts of the USA)[87] where anyone can access hormone therapy without 'jumping through hoops', to my knowledge there exists no equivalent practice regarding (transsexual) surgeries. Different protocols to access treatment enacts a transgender/cisgender separation in health care to the detriment of transsexuals.

Cisgender is a term devised in the 1990s to facilitate distinction between trans and non-trans people. Cisgender is variously defined as a person whose gender

[85] Breast augmentation is also performed for health reasons including, but not limited to, breast reduction when large breasts lead to back pain.
[86] Note that many cosmetic procedures enact the normalisation of the body.
[87] Anyone can access the publicly available Google My Map called *Erin's Informed Consent HRT map of the US.*

(identity) corresponds to their (assigned) birth sex or whose gender (identity and role) is considered appropriate for their sex (within a given culture), while transgender would be the opposite of those statements. The cisgender/transgender binary necessarily enacts exclusions, notably the exclusion of intersex (while also enacting a separation between sex and gender). Under one definition, an intersex person will require a non-binary gender to qualify as cisgender, while non-binary is simultaneously defined as transgender; under another, intersex people who identify as either men or women in line with their sex assignment at birth are considered cisgender even if they do not physically or otherwise conform to their assigned gender, while still another renders the gender non-conformist transgender (Viloria and Nieto 2020, 121). Clearly, these definitions do not account for the complexities of sex-gender. Furthermore, when non-binary intersex individuals are subsumed under the trans umbrella intersex variation and intersex genital mutilation are veiled and the possibility of non-binary gender to match with (inter)sex is ignored (Viloria and Nieto 2020, 121-122). Since the cisgender/transgender binary is primarily rooted in the male/female binary (and sex/gender binary) sex diversity is obfuscated and the logic of opposites prevail. In addition, erased intersex individuals are often grouped with cisgender and so the social, institutional and other violence shared with transsexuals/transgender goes unacknowledged (Viloria and Nieto 2020, 120-121). As will become even clearer in the following sections, the complexity of sex-gender does not lend itself to easy binarisation.

3.3.3 Trans Beyond Binaries*

Trans* offers an open-ended material-discursive tool of (re)figuration. Trans* is variously associated with transition and transgression across gender norms, but trans* also invokes transformation, transmute, transfer, translation, transmit, transposition, transverse, transcend and transient (this is a non-exhaustive list); trans* is alive with possibility. Ekins and King (2006, 22-23) note that omission of the term ‘gender’ from transgender is a prominent feature of the transgender approach they identify as transcending – “it combine[s] a maximally inclusive approach to transgender … with radical politics” – as it aims to go beyond gender

and thus also the use of the term. In this space, what has contemporaneously become known as non-binary arose.

Non-binary, or sometimes genderqueer, are used as umbrella terms to unite people who report a gender that is neither male/man/masculine nor female/woman/feminine, some combination of the two or both, no gender (agender) or varying degrees of each at different times (gender fluid). While some non-binary individuals still effectively pass as feminine women or masculine men (having transitioned from one to the other or not), others present a more androgynous look. Importantly, there is no way to look non-binary, no prescriptive non-binary stereotypes exist,[88] although gender non-conforming individuals are often presumed to be trans* (or gay) and androgyny is sometimes assumed to correspond with non-binary genders. While a great deal of 1990s queer theory and activism already centred around non-binary genders, at the time called genderqueer, there has been a significant increase in individuals identifying with the terms non-binary or genderqueer fairly recently.

Non-binary genders, in general, are not entirely spared the influence of essentialist, pathologised and medicalised gender narratives. Many non-binary persons seek medical and surgical body-modification, and many conceive of their gender as innate and static, as something to be discovered, not made (Yeadon-Lee 2016, 30). Still, others uncompromisingly reject essentialism and revel in making a gender particularly suited to them while remaining open to change (Yeadon-Lee 2016, 31). Many non-binary individuals have also previously undergone a medical and/or surgical transition from one binary to another but have come to reject the binary later on (Yeadon-Lee 2016, 34). It is not uncommon, for the aforementioned relatively older individuals, that this experience is relational as they explore gender by drawing on their binary experiences and the changes their bodies underwent in the context of their

[88] However, some non-binary individuals may identify as a third gender and seek to create a coherent third category with roles, behaviours and appearances (predominantly androgyny). Arguably this does not transcend categorisation but rather encourages it and so it is not the focus here.

relationships and societal pressures to fit the binary (Yeadon-Lee 2016, 35). Thus, while for some gender exploration is a solitary activity looking for one's own gender within, for others, it is precisely their material-discursive intra-actions that constitute gender as a whole and their personal relation to the phenomenon. For many people who relate to a non-binary idea of gender "[labels] can easily become restrictive, exclusionary, and sites for gender policing … [and] regulation" (Yeadon-Lee 2016, 33). However, the proliferation of gender terms and labels also reflects the culture of redefinition and self-determination that accompanies trans*.

The strategies and "politics of transitivity" (Halberstam 2018, xiii) utilised to make and unmake gender, identity and subjectivity concentrate on transcending and destabilising the binaries and boundaries between male and female, man and woman, masculine and feminine primarily through redefinition (Ekins and King 2006, 39). Notably, redefinition was also an early feature of feminism: various occupations, clothing items and hairstyles (amongst others) were redefined as gender neutral in a bid to expand femininity. Unfortunately, a similar expansion did not follow for masculinity and masculinity remains more rigidly defined and policed. Indeed, an expansion of both categories incorporating more and more from each other (or one entirely incorporating the other) followed to its logical conclusion would lead to them becoming indistinct and thus defunct as either prescriptions or descriptions, they would material-discursively be non-distinct. This may be precisely why greater expansion of either has not been realised. Non-binary, being a wholly expansive grouping, offers the possibility of entirely opting out of the binary and delighting in the fullness of femininity, masculinity and everything else combined. Additionally, since no categorical differences can be assumed, it unites all differences so that difference becomes entirely individual. Taking a micro-level approach, gender can be said to be as many as there are people (gender pluralism). Alternatively, gender may not be meaningful since it no longer serves as a useful phenomenon in enacting separation at a

macro-level (gender abolition).[89] It is these possibilities and everything in between that is opened up by trans*.

As became apparent in the previous sections, the dominant (binary medical) model of sex-gender and transsexualism obfuscates the diversity of intersex and transgender material-discursive realities. Incontrovertibly, many people turn to redefinition to form (personally) coherent or fluid notions of their material-discursive embodiments. Redefinition variously pertains to the body, parts of the body, gendered behaviours and mannerisms, and clothing and hairstyles. As stated earlier, bodies and their meanings are iteratively re(con)figured in ways incompatible with sex-gender normativity – while some modify their bodies together with their embodiment in line with normative ideals others do not or may already be working with a non-normatively sexed body. For instance, genitals may be disassociated with gender or associated with a gender outside normative expectations as Laird (2008, 78) states: ‘‘I have come to an understanding that my genitals don’t have a gender, they are just genitals, part of my body and, since I am a man, my genitals are part of a man’s body’’. Likewise, Stewart (2017) and Latham (2017) express difficulty in reconciling masculinity with an unexpected body and distinct from patriarchal (cis)misogyn(oir)istic norms. Latham (2017, 195) asserts: “I have no idea how one would articulate … feeling [male] without reproducing sexist stereotypes and, in so doing, enact maleness as misogyny”. For Stewart (2017, 299), it is important to (re)conceptualise masculinity as “twinned” with femininity not in an oppositional or hierarchical manner but as interdependent and related. This is commensurate with agential realism that considers difference as within and refuses an inherent separability. Some trans*, notably non-binary, individuals also disrupt the relationship between male, man and masculinity (and similarly female, woman, and femininity). Bradford *et al.* (2019, 162) recount a participant in their study (on genderqueer) stating: “[I]t wasn’t that I feel like a male, but sometimes I am masculine”, for this individual it

[89] While gender pluralism and gender abolition are often pitted against each other, I see them as merely operating on different levels. If gender proliferates to the extent that it becomes individual gender is effectively eliminated.

is that “society’s perceptions of my body are too limiting” as opposed to the normative ‘wrong body’ narrative prevailing. Many also disrupt the relationship between gender expression (clothes, hairstyle, behaviours) and gender identity (gendered sense of self) so the one can no longer reasonably inform, or be taken as signalling, the other (Bradford *et al.* 2019, 164); gender might not be written on bodies in ways commonly assumed (Stewart 2017, 300).

Importantly, in refusing to conform to normative ideals of male and female, man and woman, masculinity and femininity and the binarity of gender, the legitimacy of these ideals and their couplings are challenged (Ekins and King 2006, 182) and their exclusions made visible. Expanding understanding of the exclusions enacted by the gender binary facilitates the realisation that almost everyone is (at least in part) disenfranchised by the gender binary. This enables the political project opposed to gender oppression to include everybody in its struggle. This sentiment is cleverly articulated in Kate Bornstein’s (2013, 85-92) gender pyramid that also demonstrates how multiple vectors of oppression (kyriarchy) can render one’s gender less than normatively ideal.

Furthermore, a trans* perspective enables the conceptualisation of sex-gender as a multi-faceted contextually-specific non-linear open-ended material-discursive process. The prevailing assumption that everyone is either a man *or* a woman and the abundance of (binary) gendered spaces disappears and erases non-binary genders, not unlike similar assumptions with regards to sexuality as we will see below. Affirming genders beyond the binary is imperative in the effort toward a world where people of all genders are socio-politically supported (Bradford *et al.* 2019, 166).

3.3.4 Sexuality Caught Between Sex and Gender

Sexuality variously refers to sexual orientation, sexual preference, capacity for sexual feelings and sexual activity. This definition is quite comprehensive and includes the possibility for innate sexual orientation, sexual preference as choice, asexuality, and sexual activity to be (in)congruent with each. However, the

everyday understanding of sexuality, even when employing these terms, is not so expansive. Sexuality is more commonly understood within the frame of the gender binary. The gender binary regulates sexuality, it is the "gender hierarchy that … underwrite[s] heterosexual relations" (Butler 1999, xii). Butler's (1999) heterosexual matrix exemplifies how gender and sexuality are intra-actively constituted heteronormatively; that is, men are attracted to women and vice versa. The reproductive differences fundamental to categorising two sexes also form the basis of heteronormativity. Additionally, it introduces gender-of-sexual-object-choice as *the* organising factor of sexuality in general which resolves sexuality into the heterosexual/homosexual binary. However, the relationship between sex-gender and sexuality proves more complex as will become apparent below.

Felicity Haynes (2001, 2) writes in the introduction to the edited volume *Unseen Genders: Beyond the Binaries:* "There were people whose performativities were neither male nor female, or were, if you like, both male and female – gay people, lesbians, bisexuals, and transvestites". Here Haynes links gender non-conformity or transgression with sexuality. Undeniably, people often use gender to communicate sexuality (Davis 2015); earlier Latham's (2017) 'masculine' dress, hair style, mannerisms, and gait were read as gender in the gender clinic while it was more closely related to sexuality. While it is often assumed from a heteronormative perspective that masculine women and feminine men are gay, there also exists a norm that lesbians conform to masculinity (Clarke and Spence 2013).[90] Butch has become a distinct lesbian gender, coupled in a binary with femme (Levitt and Hiestand 2004). Participants in Levitt and Hiestand's (2004, 610) study on butch gender identifies with masculinity but do not consider themselves men in any way. Additionally, butch women are frequently misidentified as men and while it is uncomfortable for some, others purposefully

[90] The masculine or butch lesbian aesthetic arose in mid 1900s USA shortly after World War II enabled by access to masculine clothing, particularly pants. The 1960s feminist movement, however, criticised butch presentation and butch/femme dynamics as misogynistic and patriarchal and so a more androgynous look downplaying gender was frequently adopted. By the 1980s the butch/femme aesthetic and culture re-emerged motivated by sexual desire as opposed to earlier political motivations. See Levitt and Hiestand (2004, 605-606) and Faderman (1991).

use it to their advantage (like safety while walking at night) – all while not identifying as men (Levitt and Hiestand 2004, 611). Butch gender, or female masculinity[91] is one of the many ways in which sexuality interrupts the seemingly straightforward relationship between the overarching components of gender – male/man/masculine and female/woman/feminine.

Furthermore, homosexuality is both positively and negatively associated with not being a 'real' man or woman. Falomir-Pichastor and Mugny (2009, 1233; emphasis in original) found that heterosexual men's (but not women's) prejudice towards gay men figures gay men as not masculine – "the very definition of masculinity involves *not* being homosexual" (this is not the case for femininity). Monique Wittig (1992, 57), on the other hand, argues that "[l]esbians are not women" because the definition of 'woman' (and 'man') is circumscribed within heteronormativity – for Wittig this is liberatory. It should be noted that these positions fit neatly within patriarchal hetero-sexism keeping man linked to masculinity and attraction to women and woman linked to femininity and attraction to men rendering queer concepts such as effeminate man and female masculinity oxymoronic. Accordingly, despite these beliefs regarding the relationship between sexuality and gender from both heterosexual and homosexual quarters, the majority of lesbians and gay men see themselves as women and men respectively – additionally evident in the use of the phrases women-loving-women (WLW) and men-loving-men (MLM). The aforementioned is also apparent in defining homosexuality as sexual (and/or romantic) attraction to the 'same' sex and/or gender.

Sexuality thus becomes defined by both the individual's own gender and that of the people whom they find sexuality attractive (also called sexual object choice). Heterosexual attraction occurs between 'opposite' sexes or genders, while homosexual attraction occurs between the 'same' sex or gender. Ambiguity,

[91] For more on female masculinity and specifically the clash between masculinity as gender and masculinity as sexuality see Halberstam's *Female Masculinity* (1998) particularly *Transgender Butch: Butch/FTM Border Wars and the Masculine Continuum* (pages 141-174).

however, exists about what exactly these groups commonly find attractive or what each sexuality is organised around. As discussed earlier, sex-gender may be many things including genitals and secondary sex characteristics (male/female/intersex), clothes and hairstyle (masculine/feminine/androgynous), and a feeling (man/woman/non-binary). Some people may thus arguably organise their own sex-gender and other's sex-gender around any of those facets or any combination thereof informing their sexuality, even agentially separating sex from gender to do so. Most often, sexuality is organised around those aspects most closely associated with the act of sex – the morphological body (or sex) (Van Anders 2015, 1178); however, all facets of sex-gender are frequently conflated wherever necessary maintaining binaries and norms without accounting for diversity. For example, butch women may find femme women attractive and vice versa, commonly recognised as lesbian (same) attraction and not cross-attraction between masculinity and femininity. While this disassociates masculinity and femininity from exclusively men or women some people may better understand their sexuality to relate to femininity and/or masculinity and not sex. The gender attribution made when meeting others may be principally anchored in secondary sex characteristics and informed by prevalent material-discursive intra-actions within a specific context and may or may not inform sexuality. Non-binary genders complicate an easy male/female attribution; furthermore, it may be unclear whether a person is expressing their gender identity, sexuality, or personality in their appearance. Intersex and transsexual persons also disrupt a straightforward attribution of sex-gender and organisation of attraction, particularly when dress and secondary sex characteristics are taken to reference genital configuration directly. Furthermore, since sexuality is defined by both partners' gender and/or sex intersex, transsexual and non-binary genders are not easily accommodated within the heterosexual/homosexual binary.

Sexual orientation flattens the complexities revealed in everyday experiences of sexual and romantic attraction (Van Anders 2015, 1177). In fact, romantic attraction (limerence) is often collapsed into sexual attraction under the rubric of sexual orientation, although it is increasingly separated within LGBTQIA+

contexts. Sexuality may also revolve around number of partners and types of sexual activity, amongst others; and any of these could enjoy primacy over gender (Van Anders 2015, 1178). Conceivably, sexual attraction is a prerequisite for gendered sexual attraction (Van Anders 2015, 1178); and not everyone experiences sexual attraction – called asexuality (although they might experience romantic gendered attraction). Sexuality can also be defined only in relation to possible partners' sex and/or gender and not one's own: gynosexuality and androsexuality. Van Anders (2015) proposes a sexual configurations theory (SCT) that simplifies the complexity of sexuality (and gender) in a way that considers sexuality as multifaceted and dynamic by taking a sexual diversity view that pays attention generalities and particularities. A SCT framework allows for gender and sexuality to be considered separately and interconnectedly (Van Anders 2015, 1189) commensurate with an agential realist approach. While Van Anders' (2015) SCT focuses on partner number and diverse sex-gender many other facets can easily be incorporated under sexual parameters. By not taking an explicitly identarian approach to sexuality multifaceted sexuality may be uniquely mapped onto the sexual configuration landscape for each individual (Van Anders 2015, 1198). The possible configurations are nearly endless and there is no right or wrong combination of parameters (Van Anders 2015, 1199). Sexual interest does not necessitate sexual activity and neither dictates sexual identity – identity becomes lodged in community, politics and self-determination where many argue it belongs (Van Anders 2015, 1200). Van Anders' (2015, 1199-1200) STC has explanatory power beyond narrow heterosexual/homosexual categorisations and can easily explain seemingly contradictory sexualities such as lesbians attracted to non-binary femmes with penises, or gay men who have sex with butch lesbians and lesbians who experience enduring attraction to their previously butch now trans-male partners (to name a few) as branched or co-incident configurations depending on context.[92] Notably, STC does not run into similar problems that underscore the

[92] "Orientations, identities, and statuses, as well as parameters, that are [situationally, locally and contextually] seen as homogenous are labeled co-incident, and those that are heterogeneous are labeled branched" (Van Anders 2015, 1200). These concepts are also useful for thinking about sexual fluidity.

erasure of bisexuality and asexuality and the commitment to binaries as does the widespread heterosexual/homosexual understanding of sexuality.

Bisexuality is defined by Robyn Ochs (2005, 8), a notable bisexual activist, as "the potential to be attracted – romantically and/or sexually – to people of more than one sex and/or gender, not necessarily at the same time, not necessarily in the same way, and not necessarily to the same degree". While bisexuality is sometimes misunderstood to refer to men and women only[93] and thus to align with the gender binary, I take the inclusive approach predominant in bisexual activism from its inception – bisexuality includes all sex-genders and does not assume that there exists only two.[94] Thus, bisexuality challenges rather than reifies the gender binary and is congruous with intersex and trans* liberatory efforts (to challenge the gender binary).

When the phenomenon sexuality or sexual orientation is shaped by the usual exclusive gender focus, as mentioned earlier, it enacts the homosexual/heterosexual binary to the exclusion of bisexuality. Furthermore, the exclusive sexuality categories (straight, gay and lesbian) as well as the gender binary (that excludes intersex and trans*) is stabilised by its iterative invocation. Yoshino (2000, 361-362) maintains that straights and gays have a mutual political interest in the erasure of bisexuality and terms it the "epistemic contract of bisexual erasure". According to Yoshino (2000, 362), both groups have an interest in "stabilizing sexual orientation", "retaining sex as a dominant metric of differentiation", and "defending norms of monogamy". Both groups value distinct and exclusively circumscribed sexuality categories for political mobilisation and retention or pursuit of privilege. Thus both rely on the ability to prove exclusive desire as immutable (Yoshino 2000, 362). Because bisexual desire cannot be disproven even when same-sex or cross-sex desire is evident, it makes proving

[93] It is also sometimes said to refer to same and different sex-genders. Any of the sex-gender facets in Van Anders' STC can structure the same/different distinction here.
[94] Bisexuality is also used as an umbrella term to unite all pluri-sexualities such as pansexuality and omnisexuality under the moniker Bi+.

monosexuality[95] (desire for only one sex) difficult, if not impossible (Yoshino 2000, 362). This also means that bisexuality disrupts the stabilisation of the heterosexual/homosexual binary. Furthermore, both groups rely on dichotomous sex-gender for defining their sexualities and while the heterosexual matrix results in 'opposite' attraction norms valued by straights for defining their genders, gays sometimes operationalise dichotomous sex-gender as the principal factor in structuring both sexual and other social associations (called sex separatism) (Yoshino 2000, 362).[96] Bisexuality significantly reduces the relevance of sex-gender for sexual and social affiliations (Yoshino 2000, 363). It does not limit sex-gender to a dichotomy, thus disrupting the very organising principal of monosexualities – the gender binary. Lastly, both groups have an interest in maintaining the norm of monogamy as it confers current or sought privileges, while not all bisexuals are non-monogamous[97] the stereotype predominates to such an extent that even entertaining the possibility of attraction across genders is strongly associated with promiscuity, disease risk[98] and 'dangerous queers' (Yoshino 2000, 363). Thus, while sex-negativity makes invisible all sexuality and eroticism and homo-antagonism silences same-sex desire, the epistemic contract of bisexual erasure omit specifically bisexuality from discussions of sexuality (when and where they happen) entirely (Yoshino 2000, 365-367). The acknowledgment of bisexuality has not significantly improved over the last two decades, although it has garnered more attention within sexuality studies (Monro, Hines and Osborne 2017, 675), and bisexuals have successfully lobbied to have the 'B' included in the acronym LGBTQIA+.

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[95] An agential separation is strategically made here between monosexuality and plurisexuality for ease of argumentation, however, these categories are contingent and contextually specific and certainly not static or universal.

[96] Interestingly, within the heterosexual/homosexual dichotomy the consequent three distinct sexualities (straight, lesbian, gay) exclusively engage sexually (and often socially) with others of their own sexuality (and in the case of lesbian and gay also their own gender).

[97] People of all sexual orientations and preferences may be non-monogamous. Since cheating in exclusive relationships is not uncommon, ethical non-monogamy (where all partners know that the relationship is not exclusive and take precautions accordingly) can cause less harm and pose lower disease risk.

[98] A common myth circulates that bisexual men are vectors of AIDS into the straight community.

The continued stabilisation of both the gender binary (male/female, man/woman) and sexuality binary (heterosexual/homosexual) continues the erasure of (making invisible and unintelligible) intersex, trans* and bisexuality; however, by seriously considering the diversity of sex-gender and sexuality such stabilisation can be disrupted. Rethinking how sexuality, gender and sex are conceptualised and accounting for complexity may stabilise the phenomena sex, gender and sexuality away from the binaries they currently enact and are informed by towards an embrace of indeterminacy.

3.4 Conclusion

Considering sex, gender and sexuality not as representational reflections of reality, nor inherent properties of bodies or fixed identities offer the opportunity to explore the complexities of the intra-actions that iteratively constitute sex, gender, sexuality and their inclusions and exclusions, while acknowledging their role in each other's constitution. The intrinsic indeterminacy inherent to the complexity, multiplicity, and diversity of sex, gender and sexuality are contingently resolved materialising sex, gender and sexuality in contextually specific ways.

The binaries between sex/gender and nature/culture can no longer be understood as intrinsic nor an artificial split of a singular fact; these binaries are enacted by apparatus-phenomena in a non-linear entangled causal structure that iteratively stabilises sex, gender, nature and culture. Notably, notions of passivity and activity differentially attributed to female and male, nature and culture are also problematised. Nature is not fixed, but a dynamic phenomenon material-discursively (de)stabilised and so it can no longer support essentialist arguments. Besides, biological (often taken as nature) variety confounds using nature to support restrictive norms.

Considering sex-gender and sexuality from the perspective of those excluded by binarism exposes the mutability and multifariousness of sex-gender and the complex contingent relationship between agentially separated sex and gender.

Sex and gender are conflated and separated to maintain the gender binary as necessary with both contextually operating on the levels of anatomical morphology, body chemistry, self-adornment (appearance), self-expression (behaviour and mannerisms), pleasure (including sexuality) and even self-concept (identity). The gender binary dictating that male should correlate with man with manliness and masculinity – however they are temporally and geographically defined – and the same for female, woman, womanliness and femininity, restricts the resolution of the inherent indeterminacy of sex-gender. Many other combinations of female, male, man, woman, womanly, manly, masculine, feminine and any of their facets exist presently and have existed historically even within the same spatio-temporal contexts.

Different apparatuses may resolve the indeterminacy of gender within very similar contexts, a single additional influence is needed to reconfigure the apparatus. Therefore, gender may be resolved differently for people of different races, different sexual desires, different familial and relationship structures in the same geographic location. Indeed, as the individual in question (when gender is considered on an individual level) is a uniquely different phenomenon from any other (and over time from themselves), gender's indeterminacies are likely to resolve differently for each – steering us again to gender pluralism and uncovering gender's very limited usefulness in categorisation.

The factors discussed in this chapter that form part of the apparatuses that stabilise the gender binary can be summarised as follows. First, sex as a category strongly relates to reproduction (having the right parts to reproduce)[99] even though reproduction is more than sex and vice versa, while gender also figures prominently in the constitution of sex, thus "gender [and reproduction] must also designate the very apparatus of production whereby the sexes themselves are established" (Viloria and Nieto 2020, 98). Secondly, the medico-surgical-psychiatric industry and state bureaucracy play an important role in

[99] According to Viloria and Nieto (2020, 99): "[T]he male and female sex categories were created to describe one's potential to embody the socio-cultural roles of mothers or fathers".

(re)configuring meaning and bodies to fit binary ideals and thus form a crucial part of the apparatuses of sex, gender, and sexuality, while the phenomenon of sex (notably in the case of transsexualism and intersex) also includes the apparatus of gender. Thirdly, heteronormativity, cisnormativity, homonormativity, transnormativity and mononormativity (phenomena of normativity) form part of the apparatuses that determine exclusively binary ideals of sex, gender and sexuality as intelligible, to the exclusion of intersex, trans*, asexual and bisexual perceptibility.

Furthermore, as an agential realist perspective entertains a multiplicity of resolutions of the inherent indeterminacies in sex, gender and sexuality, it does not force a choice "between the identitarian and the contingent forms of [sex, gender and sexual] identity" similar to trans* (Halberstam 2018, xiii). Thus, those claiming an innate gender (that aligns or do not align with their assigned gender) or sexuality resolves the indeterminacy of their gendered embodiment by way of a specific set of material-discursive intra-actions that includes mainstream ideas of gender identity and sexuality as fixed and immutable. Others who claim no innate gender or sexuality or choose their gender or sexuality identities for their political relevance do so through another set of material-discursive intra-actions and may acknowledge its contingency in the political context. Many may also strategically present both of these options at different times and places. None of this is counter to an agential realist understanding and with sufficient scope in the (re)figuration of gender apparatuses many possibilities are opened up.

Sex, gender and sexuality are complex and diverse entangled processes. A diffractive reading of sex, gender and sexuality and its consolidation with agential realism offers the opportunity to acknowledge a wide range of gendered embodiment. Moreover, it allows the researcher to read the contingent and situational agential cuts made, the inclusions and exclusions enacted, and the often-overlooked parts of the apparatuses that form part of the phenomenon. In the next chapter, the role that anthropomorphised technologies play as both

apparatus in the constitution of gender and human, and as gendered phenomena are explored.

CHAPTER 4
NEW MATERIALISM, THE (NON)HUMAN AND ANTHROPOMORPHISED TECHNOLOGY

Some of us are not even considered fully human now, let alone at previous moments of Western social, political and scientific history.
Rosi Braidotti[100]

4.1 Introduction

For Braidotti (2013, 2-3) the shared feature of posthumanisms, or what is termed the posthuman condition, is a non-dualistic understanding of nature-culture where the boundaries between them are "to a large extent blurred by the effects of scientific and technological advances".[101] Thus, posthuman theory facilitates re-thinking not only the concept human, but also the material-discursive practices that shift agents between the categories human and nonhuman (Braidotti 2013, 5-6). This chapter engages precisely this re-thinking of the human and its intra-actions by thinking with anthropomorphised social technologies as technological advances.

Firstly, I introduce the human with a focus on the role of anthropomorphisation/ humanisation and dehumanisation on the (de)stabilisation of its exclusions, also touching on the intra-actions between human and gender. Thereafter, a range of technologies (anthropomorphised to various degrees) are introduced in two sections: Virtual Personal Assistants (VPAs) and robots (animaloids, humanoids, androids and gynoids). Then, the most evident disruptions and reifications of binary gender and the human/nonhuman binary through anthropomorphised

[100] *The Posthuman* (2013, 1).
[101] While Braidotti takes a neo-Spinozist vitalist materialist approach to posthumanism and the posthuman subject as noted in Chapter 1, it is not entirely incompatible with Barad's agential realist approach. Indeed Braidotti (2013, 57) speaks of "matter-realism" and matter's self-organisation, and thus I draw on some important insights offered while maintaining a non-vitalist stance.

technologies are discussed as well as their role in opening or foreclosing possibilities of intelligibility. Subsequently, VPAs and robots and their use of Artificial Intelligence (AI) offer the opportunity to inquire into the mind/body split and embodiment as a dynamic process where the body is not only perpetually becoming but also networked. Accordingly, the following section briefly deals with (dis)embodiment in the abovementioned technologies and its role in the (de)stabilisation of various tied binaries – human/mind/male versus nonhuman/body/female. In the last section, attention is on the marketing and public relations efforts around robotics (robot-rhetoric), predominantly humanoid robotics, that demonstrate the role of robotics in the maintenance of the human's various exclusions (dehumanised others), particularly in Japan, where robotics is given a high priority culturally and governmentally.

4.2 Anthropomorphisation and (Post)Humanism's (Non)Human

Human is a historically contextually specific and exclusionary phenomenon. Human can also be understood as a normative convention that relegates everybody[102] outside its normative standard to inhuman, nonhuman or dehumanised other (Braidotti 2013, 26; Marhia 2013, 26). The human/nonhuman distinction is conventionally considered (or at least reinforced) as inherent and so a qualitative distinction is drawn between the human norm and the sexualised, racialised, naturalised others, including technological artefacts (Braidotti 2013, 26). According to Braidotti (2013, 16), it is the convention above, also called (liberal) humanism,[103] and its associated restricted and exclusionary notion of human that enabled a posthuman turn and a re-evaluation of its underlying binarising tenets. Norms around who (or what) counts as human function as material-discursive apparatuses in the constitution of the phenomenon human and its exclusions.

[102] All the bodies concerned, as in every body.
[103] The universalism characteristic of humanism is closely tied to eurocentrism – the hegemonic cultural model that places Europe at the centre of civilisation and reason (Braidotti 2013, 13-14). Central to humanism's binary logic that accompanies identity (self/other) is difference as pejoration that fuels essentialism (Braidotti 2013, 15).

A working circumscription of the humanist human and its exclusions may be useful at this point. At the very core of the definition of human it is an organism that is part of the animal kingdom; already excluding the inorganic and species classified in other kingdoms.[104] Subsequently, human is distinguished from other animals – *homo sapiens* are human – so that the human/nonhuman animal separation is enacted often (at least partially) premised on the culture/nature binary (also delineating knowledge as unique to the human). Once the human/nonhuman separation becomes relatively stable, *homo sapiens* are separated from nonhuman animals and nature to the degree that they are no longer considered animals. This opens up a space of exclusion where some people[105] are strategically aligned with nature and animality so that they may fall into a lesser categorisation, namely the less-than-human or dehumanised other. The parallels between animality, nature and the nonhuman moreover extend to the body/mind binary, rendering the mind uniquely human. A posthumanist new materialist consideration of (thinking with) anthropomorphised technologies – humanised nonhumans – offers an opportunity to explore the apparatuses by which (de)humanisation occurs and the human and its associated binaries are (de)stabilised.

It is human exceptionalism and the human/nonhuman boundary that informs anthropomorphisation as will soon become clear, even when anthropomorphisation seems to blur the boundaries within the initially posed dyad. Anthropomorphisation, in this case, refers to technological artefacts being attributed human[106] likeness both in physical appearance and otherwise – qualities, characteristics, abilities, and behaviours. Epley, Waytz and Cacioppo

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[104] This distinction is largely maintained throughout in my use of *homo sapiens.* This distinction is necessary since gender, the primary phenomenon explored, is primarily associated with *homo sapiens* and cannot be otherwise intelligibly approached. The agential cut made between the organic and inorganic is, however, provisional.
[105] People here refers to *homo sapiens.* For the sake of clarity, where necessary, the term 'people' is used in this fashion instead of the more common term 'human'. This is done, in part, since human as phenomenon frequently, in various contexts, exclude some people.
[106] The human of anthropomorphisation is humans as a species (*homo sapiens*). Note however that the groups of people contextually considered as less-than-human and whose existence is obscured by binaries like the gender binary usually do not form part of the universal human frequently conjured in service of anthropomorphisation.

(2007, 864) point out that a wide variety of scholars, from Darwin to Freud to Hume, have noted that people tend to see nonhumans as human-like and that this happens even with things as simple as geometric shapes (should they seem to act independently).

The tendency to anthropomorphise seems to be a resilient feature of human cognition associated with principally using self-knowledge to inductively reason about others (Epley, Waytz and Cacioppo 2007, 865). People use themselves as a guide to reason about the mental states of others, correcting for difference only when they have the information, capacity, and motivation to do so – when these others are considered humans (*homo sapiens*) it is termed egocentrism and when they are considered nonhumans anthropocentrism (Epley, Waytz and Cacioppo 2007, 868-869). People also tend to attribute human-like intentions to artefacts to communicate about them and interact more effectively, even when they don't believe these artefacts to be capable of intent (Epley, Waytz and Cacioppo 2007, 872). Still, in cases where anthropomorphisation is metaphorical (weak) and not literal (strong) people still behave towards anthropomorphised agents in line with the metaphor – as if they possess characteristics presumed to be uniquely human (Epley, Waytz and Cacioppo 2007, 867). The novelty of emerging technologies, that incorporate AI and robotics, also contributes to anthropomorphisation. Users have little prior experience and information on which to base their assessments of these technological agents, and so they rely more heavily on self-knowledge and anthropomorphisation (Epley, Waytz and Cacioppo 2007, 879). Moreover, Epley, Waytz and Cacioppo (2007, 864) assert that "[a]nthropomorphized agents can act as powerful agents of social connection when conventional human connection is lacking, and anthropomorphizing technological agents appear to aid in effectively learning how to use those agents". It is precisely these motivations that many engineers and roboticists cite for trying to elicit anthropomorphisation through the design of their products.[107]

[107] Social biases that can be elicited through anthropomorphisation is considered necessary to successful HCI and HRI (Fossa and Sucameli 2022, 23). See Brahnam and Weaver (2015) for an argument against anthropomorphisation for believability, and instead for Aristotelian credibility of computerised, roboticised and virtual agents.

The processes and mechanisms involved in anthropomorphisation (humanisation) are also relevant to dehumanisation. Importantly, the degree to which people tend to anthropomorphise or dehumanise also depends on social connectedness (Epley, Waytz and Cacioppo 2007, 877). People who are more socially connected tend to anthropomorphise less as they are less motivated to seek more social connections than those who are lonely and isolated (Epley, Waytz and Cacioppo 2007, 877-880). Inversely, they also tend to dehumanise others more easily, particularly if they do not form part of their in-group or seem difficult to identify with (Epley, Waytz and Cacioppo 2007, 877-880). Thus, perceived differences – including sexual, racial, economic class and nationality – form the line along which dehumanisation and exclusion from the human category occur.

The contextual multifaceted phenomenon human's most notable exclusions are its sexualised, racialised, naturalised and artificialised or technologised others. Evidently, it also intra-acts with the phenomenon sex-gender (amongst others). Consequently, anthropomorphisation cannot be easily disentangled from genderisation, as to be considered human is intricately tied to becoming gendered ('being' a girl/woman *or* boy/man). According to Peterson and Parisi (1998), the gender binary is integral to the (hegemonic liberal) humanist constitution of the human. Furthermore, the gender binary enacts the separation of female/girl/woman from normative humanness (maleness) and places it on the side of sexualised other together with those rendered invisible by the binary's perpetuation. The material-discursive intra-actions that constitute the human are obscured by humanism taking the category of human for granted; while from a posthumanist perspective, "the conditions through which individuals are *recognized* as 'human'" must be accounted for (Marhia 2013, 22; emphasis in original). The notion of recognition or intelligibility is central to Butler's (2004) notion of performativity and is similarly significant to Barad's performative account. Butler (2004, 2) notes that "the terms by which we are recognized as human are socially articulated and changeable". This implies that human is not a static category or an inherent quality, it is a dynamic phenomenon stabilised by

perpetually reinvoked norms. Crucially, “recognition becomes a site of power by which the human is differentially produced”; and thus, not all *homo sapiens* are recognised as human at least not insofar as equitable access to necessities, social recognition, public space, and political participation is concerned (Butler 2004, 2). Furthermore, as will become clear in subsequent sections, recognition within the framework of the human is not strictly limited to (some) people but also extend to anthropomorphised technologies within specific contexts.

Humanisation and dehumanisation as processes of inclusion and exclusion from the human rely on an understanding of human as a contextual dynamic phenomenon. While weak anthropomorphisation generally does not significantly alter the boundaries between human and nonhuman, strong anthropomorphisation has the potential to do so. The two following sections introduce various anthropomorphised social technologies with an initial focus on their explicit and implicit (binary) gendering, the other factors that contribute to their anthropomorphisation, and the effects of that anthropomorphisation on their (de)stabilisation of the human/nonhuman binary.

Before proceeding, it is important to briefly consider the role of human exceptionalism when many anthropomorphised technologies are produced in Asian contexts where the relationship between nature and culture is not considered an absolute binary. While anthropomorphised technologies are considered as objects, unnatural and inanimate in Euro-American contexts, the distinction between object and subject that allows them to be classified as unnatural is not a feature of Asian animist cultures. Animism is a relational epistemology somewhat overlapping with Baradian relational onto-epistemology as both challenge the object/subject distinction and affords agency to materiality. In Japanese Shinto metaphysics robots and other technologies all possess *kami* (a force or power that animates)[108] as do humans (Robertson 2018, 15). This can be taken to imbue robots with a quality (being animate or having a soul)

[108] This is compatible with vital new materialism’s notion of (life) force.

associated in minority culture (Western) contexts primarily with humans (but also other animals). However, all other 'human' qualities, behaviours, likeness and motivations are still attributed to tee human's technologised others through anthropomorphisation. Animism thus greatly tempers human exceptionalism, within this context, but does not render it entirely insignificant.

4.3 Virtual Personal Assistants

Virtual Personal Assistants (VPAs),[109] also sometimes called Intelligent Virtual Assistants (IVAs), are software that interacts verbally with users through pre-programmed responses and AI. While their precursors, chatbots, often had an avatar (frequently human-looking) VPAs have no human-like body. VPAs perform assistive tasks through application integration on cellphones and computers like scheduling, call screening and initiation, retrieving relevant information online (querying) and locating files; tasks that form a small part of what personal assistants – an occupation associated with women – frequently do. Unlike contemporary personal assistants,[110] VPAs also perform their tasks in domestic settings and perform location-specific tasks through integration with applications and devices in smart-home and smart-office networks – like turning on/off music players, televisions, lights and security systems.

The most well-known commercialised VPAs like Apple's Siri (2011) and Amazon's Alexa (2014) are available on selected computers, tablets, cellphones, smart-watches, and earphones, in media boxes and cars, and through smart-speakers and smart-home devices. The functionality of VPAs is continuously revised and in 2019, Microsoft began phasing out Cortana's mobile application. It was shut down in March 2021, integrating it differently in various applications

[109] Not to be confused with virtual assistants who are people who perform professional administrative assistance remotely, often for various clients.
[110] It was not uncommon, in previous centuries, for personal assistants to perform some domestic tasks for their employers. However, current job descriptions for administrative assistants/ managers include only business-related tasks; additionally, some people also hire staff to manage their homes and personal lives.

like their email client Microsoft Outlook and their browser Microsoft Edge. Most VPAs, including Microsoft's Cortana (2014) and Google Assistant (2016), are produced by companies from the United States of America (USA) and support varying amounts of languages in addition to English.[111] The VPA market has been growing since Siri's release in 2011 and companies outside of the USA like Samsung (South Korean) and Huawei (Chinese) have also developed virtual assistants respectively called Bixby (2017) and Celia (2020).

Most VPAs are explicitly gendered, having feminine/female/women's names and responding by default in a feminine voice. Furthermore, as noted in Chapter 1 and above, their assistive functionality aligns with gender stereotypes of 'women's work'. Stereotypical femininity in disembodied VPAs serves as selling point and marketing device while simultaneously obscuring their commodification; and the commodification of femininity and women's bodies (Bergen 2016, 98) – a point to which I return in the section on (dis)embodiment below. The VPA, as a neoliberal commodity and an anthropomorphised gendered and machine other, perpetuates a wide range of interlinked oppressive systems – of which misogynistic sexism is most evident in current research (see Chapter 1). Exaggerated stereotypes of 'feminine' qualities through voice, tone and language use in VPAs is not only detrimental to cisgender women, but also to transgender women, nonbinary individuals and other gender-nonconforming people, including those who use their gender expression to communicate nonnormative sexualities.

Since VPAs are widely commercialised and extensively researched and discussed in popular culture, it is useful to engage them in the contextualisation of other emerging anthropomorphised technologies. Virtual assistants are steadily integrated into more devices as everyday objects gain network

[111] Amazon's Alexa is available in 8 languages in 45 countries, Apple's Siri in 12 languages 32 countries, Google Assistant in 12 languages and Microsoft's Cortana supports 8 languages in 13 countries.

connectivity.[112] One such integration of relevance here is Alexa's integration with the home robot Vector. The trend of feminising VPAs also extends to robotics, particularly Japanese photo-realistic humanoid robots by Hiroshi Ishiguro (Alesich and Rigby 2017, 53). Below I introduce these and other social robots.

4.4 Robots

Robots are mechanical devices enabled to perform multiple sets of operations either simultaneously or consequentially and in any order, either through simple programming or by using AI (Robertson 2018, 13). The majority of robots produced are industrial robots used in manufacturing and logistics and robots for military use. Robots are produced worldwide: in the United States of America (USA), Europe, Israel, Iran, China, South Korea and Japan (Robertson 2018, 142). However, the Asian countries are leaders in robotics, particularly, Japan, which is the world leader in the manufacturing of robotic parts (90%) and robots (50% of industrial robots) (Robertson 2018, 17).

Apart from industrial robots, robots are also created in the overlapping humanoid and consumer robotics fields. In 1998 Japan's national robotics initiative began with the Humanoid Robotics Project, making "Japanese engineers … the first to prioritize the development of humanoid robots" (Robertson 2018, 6 & 29). A humanoid is a type of robot that must resemble *homo sapiens* in general morphology (head and neck, torso, arms and legs) and perform tasks in a human-like fashion in environments designed for able-bodied humans (Robertson 2018, 6). These robots are usually not used in factories or warehouses. Should a robot's resemblance to *homo sapiens* be sufficiently detailed/photo-realistic that the robot may (at least momentarily) be confused with a person, they are called androids[113] or gynoids – respectively referring to male/man/masculine-looking

[112] Frequently called the Internet of Things (Iot) where appliances come with software that enable them to be connected to a network. Many objects are imbued with sensors and the information collected can easily be transmitted over the network.
[113] The term android is also often androcentrically used to refer to photo-realistic humanoids of all sex-genders.

and female/woman/feminine-looking humanoids. Thus, in order to 'pass' as human, these robots must have an intelligible (binary) sex-gender.

According to the Japanese National Institute of Advanced Industrial Science and Technology (AIST), on the website of one of their robots Paro, robots are frequently human-like, nonhuman animal-like (domestic and wild) and artificial animal-like – resembling animals by having faces and sometimes personalities. Commercial, companion, educational and therapeutic robots are often made to elicit anthropomorphisation, even in the case of animaloids (robots that resemble animals). In the remainder of this section robots from all the aforementioned categories are included. It should be noted that this section does not aim to provide a comprehensive list of social anthropomorphised robots; it serves to introduce the robots relevant to later discussion and to give a broad overview of the trajectory of social robotics development.

4.4.1 Animaloids

Apart from the popular Roomba vacuum cleaner, one of the most commercially successful non-industrial robots is the animaloid baby harp seal Paro (Figure 1). Paro is a therapeutic robot primarily used by the elderly, particularly those with dementia. Created by AIST and commercially available since 2004, the therapeutic robot is similar to organic therapeutic animals but does not require care (like feeding). Despite Paro being an animaloid and not a humanoid, people still form emotional attachments with Paro while concurrently very rarely gendering Paro. According to the AIST Paro website, modelling the robot on an unfamiliar animal prevents the prevalent disappointment people experience when humanoids and familiar animaloids don't live up to expectations by differing from their friends and household pets. Unsurprisingly, robots resembling familiar animals or humans too closely may result in high expectations of emerging technologies since highly accessible knowledge structures are foundational to inductive reasoning (Epley, Waytz and Cacioppo 2007, 865). Non-familiar animaloids with a photo-realistic resemblance to real animals seem to be treated more like the unfamiliar creature itself. This, perhaps, mitigates some of the

anthropomorphisation and genderisation prevalent elsewhere. Given that most people don't have personal interactions with seals to draw on, they have few expectations of its robotic counterpart apart from those functions promised by marketing materials.

Figure 1: Paro, robotic baby harp seal (IEEE Robots).[114]

Many robots fall short of the expectations created by marketing hype. So-called household companion robots often suffer this fate, particularly in Euro-American markets where they are marketed as pet-like companions. Many personal or home robots have been introduced since the 1980s, but almost all were short-lived. Recent robots Jibo and Vector 2.0 are among these (Figure 2). Jibo, a social robot companion marketed as 'the World's first family robot' and the brainchild of American roboticist Cynthia Breazeal, first shipped to consumers in 2017, but the company stopped production soon after. Each Jibo robot delivered the news that its servers were going offline only two years later (2019); however, Jibo was acquired by NTT, a Japanese telecommunications company, that kept

[114] Image from the IEEE Robots Website: https://robots.ieee.org/robots/paro/; originally by Carlton SooHoo.

its servers operational. Jibo can take photos, recognise faces and initiate conversations. It also dances by swivelling its head, body and base independently and uses the exact mechanism to communicate using body language. Even though Jibo is considered a commercial failure and never delivered on its marketing hype – largely due to its limited functionalities – people formed emotional bonds with the robot. They were upset and grieving when Jibo was set to 'die', and thus some[115] consider Jibo very successful for its ability to elicit an emotional connection.[116] Autonomous socially interactive motion and morphology contribute to anthropomorphisation as both are crucial to human similarity (Epley, Waytz and Cacioppo 2007, 869). The appearance of possessing emotional states, which Jibo primarily achieved through its spontaneous interaction and body language, is a powerful driver of both anthropomorphisation and the establishment of emotional connections.

[115] For example, Michael Fischer; see his YouTube video here: https://www.youtube.com/watch?v=25bSlY8JkEA&t=2s.
[116] People thought of Jibo as a pet or small child, see Joanna Stern (WSJ) and Marconi Calindas' YouTube videos: https://www.youtube.com/watch?v=XS0Alc7cZ2Q and https://www.youtube.com/watch?v=t1VP2lonf-4.

Figure 2: Jibo (*left*) (IEEE Robots)[117] and Vector 2.0. (*right*) (Digital Dream Labs).[118]

The similar, but far less engaging, Vector (2018) and its predecessor Cozmo (2016) (an EdTech robot) were launched by Anki, an American education and entertainment robotics company. Anki shut down in 2019 (despite integrating Vector with Amazon's Alexa in 2018) and was acquired by Digital Dream Labs (DDL) in the same year. DDL continues production of both Cozmo 2.0 and Vector 2.0. Vector 2.0, without Alexa integration activated, can move around, give the weather, set a timer, take a photo, answer a limited number of pre-programmed questions and play blackjack. It communicates using its screen, sounds and, rarely, a robotic child-like voice. While Vector's voice does not meet stereotypical masculine standards, Vector's name and exteriorised parts allude to masculinity. As noted in Chapter 1, exteriorisation (masculine) and interiorisation (feminine) of robotic parts function as binary sex-gender markers in robotics, particularly influential Japanese robotics (Robertson 2010, 19-20). Consequently, the design practices of social robotics designers are revealed as apparatuses in the

[117] Image from the IEEE Robots website: https://robots.ieee.org/robots/jibo/; originally by Jibo.
[118] Image from the Digital Dream Labs website: https://www.digitaldreamlabs.com/pages/meet-vector.

stabilisation of the gender binary, drawing on binary notions of modesty (feminine) and brazenness (masculine). Additionally, Vector is explicitly identified by the masculine pronoun 'he' on the landing page of its website, cementing 'his' gender as masculine. It is not uncommon for media publications and consumers to refer to similar robots, including Jibo, by the pronoun 'he' even in the absence of gender markers – this may be the result of androcentrism in cultures and languages where the (masculine) pronoun 'he' has historically been considered the default pronoun.

Companion robots are in direct competition with well-established and relatively more affordable VPAs that perform numerous functions in (smart) homes. Even with Vector's Alexa integration, many people still prefer the disembodied VPA over the robot since it offers decreased Alexa functionality and little extra entertainment value. Interesting to note that Euro-American markets do not seem to place a premium on the roboticisation (embodiment) of social technologies.

4.4.2 Humanoids

As stated earlier, robots are also made to resemble humans more closely. One of the most successful humanoid robots has been Pepper (2014) (Figure 3). Pepper was brought to market by French robotics company Aldebaran and was shortly after acquired by Softbank Robotics from Japan in 2015. Once again, as with animaloids, the marketing hype around humanoids creates expectations that cannot be met. This is particularly true when consumers have images of robots "forged by science fiction films, anime, and comic books" and when they resemble humans (Robertson 2018, 8). Pepper's production was stopped in 2020 due to a lack of demand (Nussey 2021).

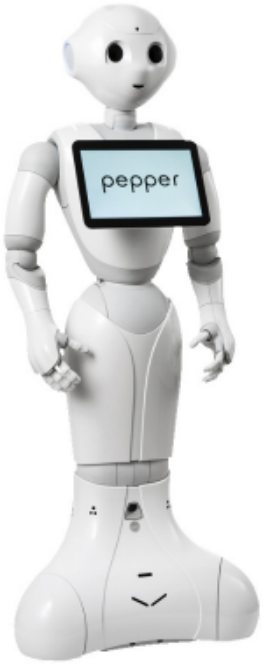

Figure 3: Pepper (IEEE Robots).[119]

Pepper was introduced as a personal emotional robot and was the first humanoid available to Japanese households (Robertson 2018, 9). Pepper had limited functionality in terms of its software despite being marketed as being able to read people's emotions based on body language, facial expressions and tone of voice. Notwithstanding Pepper's slender interiorised body and purported emotional attentiveness that is stereotypically associated with women, it is (like Jibo and Vector) referred to by the masculine pronoun 'he'. Given that Pepper was designed by the French, it may be that interiorisation and exteriorisation as gender markers did not figure prominently in the design process. Despite Pepper's initial introduction in the household market, marketing was eventually aimed at retail, banking, hospitality, education and healthcare. Pepper was typically purchased by businesses as a novel attraction in their stores (Robertson 2018, 9). With its limited functionality, stores tend to limit customer interaction with Pepper to using the tablet on its chest (Robertson 2018, 10). Pepper has "failed in every way to (1) be a companion, (2) recognize emotional cues, (3) be able to converse reliably and intelligently, and (4) provide any level of service

[119] Image from the IEEE Robots Website: https://robots.ieee.org/robots/pepper/; originally by SoftBank Robotics.

other than first-time entertainment" (Tobe 2016). Thus claims of Pepper's emotional intelligence were never fully realised. While a cursory reading of Pepper may indicate that its concurrent feminisation (through morphology and functionality) and masculinisation (through pronoun usage) disrupt gender binaries, it appears that the processes of feminisation are so weakly present that they largely go unnoticed, hence the (default) pronoun usage. Nonetheless, Pepper's gender is left somewhat indeterminate depending on context (there is no mention of gender through pronoun usage or otherwise on the USA SoftBank Robotics' website while the English EU website uses 'his'). Thus, users and marketers attribute gender (primarily androcentrically) as they see fit.

There are many barriers to successfully commercialising humanoids including high cost, limited uses for bipedal robots (most humanoids do not walk) and the risk of falling (Robertson 2018, 7-8). However, initial marketing hype enticed South Korean, North American and European engineers and roboticists to also pursue humanoid robotics, and government funding continues to fuel their development in Japan (Robertson 2018, 10-11). There has also been a move toward creating more photo-realistic humanoids; these robots are discussed in the section below. While the animaloids and humanoids discussed above are subject to weak forms of anthropomorphisation, the androids and gynoids discussed below may be subject to strong anthropomorphisation.

4.4.3 Gynoids and Androids

Hiroshi Ishiguro, a Japanese roboticist from Osaka University, and the Japanese robotics company Kokoro developed multiple androids and gynoids that form part of the Actroid (actor robot) and Geminoid (clone robot) series in the 2000s. Ishiguro and Kokoro's robots were initially meant for commercial use. Several iterations of gynoids were created in the Actroid range, and thereafter primarily androids followed created for telepresence – projecting the physical presence of a person as opposed to only their voice or image through sound and video – called Geminoids, meaning twin (Robertson 2018, 111).

Androids and gynoids are necessarily gendered, and while many are modelled after specific individuals, some rely on stereotypical binary gendered features. Ishiguro and Kokoro's creations include Actriod Repliee Q1 modelled after newscaster Ayako Fujii and Actriod Repliee Q2 (see Figure 4), which combines the facial features of multiple Japanese women into an 'average' (Robertson 2018, 111- 113). Other versions include Actroid DER-1, Actriod DER-2 and Actroid DER-3 'Dramatic Entertainment Robots' (see Figure 5), used at trade shows and available for rent. More recently, Actriod-SIT has been introduced and features better AI than previous iterations. Not only are these robots "overdeterminedly feminine" in appearance, but both their femininity and Japanese ethnicity are highlighted by their high-pitched normative voices (Robertson 2018, 113).[120] Thus, voice is again (as is the case with VPAs) considered an indicator of binary sex-gender that is not only incorporated into robotics but simultaneously serves to stabilise the feminine(high-pitch)/masculine(low-pitch) binary.

[120] Most Japanese women do not actually have such excessively high-pitched speaking voices, it is an essentialising norm of women's and men's language in Japan that make it seem 'natural' (Robertson 2018, 113).

Figure 4: Actroid Repliee Q1 (*left*) and Q2 (*right*) (Robotics Today).[121]

Figure 5: Actroid-DER series (*left to right*) DER1, DER2, DER3 (Kokoro).[122]

[121] Images from the Robotics Today website: https://www.roboticstoday.com/robots/repliee-q1 and https://www.roboticstoday.com/robots/repliee-q2; originally by Osaka University.
[122] Images from the Kokoro Website: https://www.kokoro-dreams.co.jp/english/rt_tokutyu/actroid/.

In the Geminoid range (see Figure 6) androids Geminoid HI is modelled on Hiroshi Ishiguro and Geminoid DK (Denmark) is modelled on Danish former Professor Henrik Scharfe. In contrast, gynoid Geminoid F (Female) is modelled on a woman never mentioned by name.

Figure 6: Humans (*standing*) and their Geminoid clones (*seated*): (*left to right*) unknown woman, Geminoid F, Hiroshi Ishiguro, Geminoid HI, Henrik Scharfe, Geminoid DK (GeminoidDK YouTube Channel 2011).[123]

While most of Ishiguro's robots are life-size and can perform some movements, they are all stationary – none can walk. In 2005 South Korean roboticist Jun-Ho Oh at the Korea Advanced Institute of Science and Technology (KAIST) created a bipedal humanoid platform (a robot meant to be used as starting point for other creations) called HUBO. In 2006 in collaboration with American roboticist David Hanson of Hanson Robotics (registered in China), Albert HUBO (Figure 7) was created in the likeness of Albert Einstein to commemorate the announcement of

[123] Screenshot from Geminoid Summit (timestamp 1:42) on the GeminoidDK YouTube channel: https://www.youtube.com/watch?v=J71XWkh80nc.

Einstein's theory of relativity (Robertson 2018, 21). Albert HUBO was a robotics breakthrough combining the bipedalism of humanoid robotics with the photo-realism and facial movements of androids and gynoids (Robertson 2018, 21).

Figure 7: Albert HUBO (IEEE Robots).[124]

Previously, Hanson Robotics created a robot in the likeness of science-fiction writer Philip K Dick (Figure 8), which debuted at the Wired NextFest in 2005. Hanson robotics is also well-known for its 2016 robot Sophia (Figure 8), modelled after Hanson's wife and Audrey Hepburn. In contrast to Kokoro's whole-bodied robots, Hanson's are usually only a head and shoulders, and while some have arms, most do not have legs.[125] Hanson's robots are also not commercialised and are primarily used for research and publicity.

[124] Image from the IEEE Robots website: https://robots.ieee.org/robots/alberthubo/; originally by KAIST.
[125] In 2018 Sophia received legs also based on the HUBO platform.

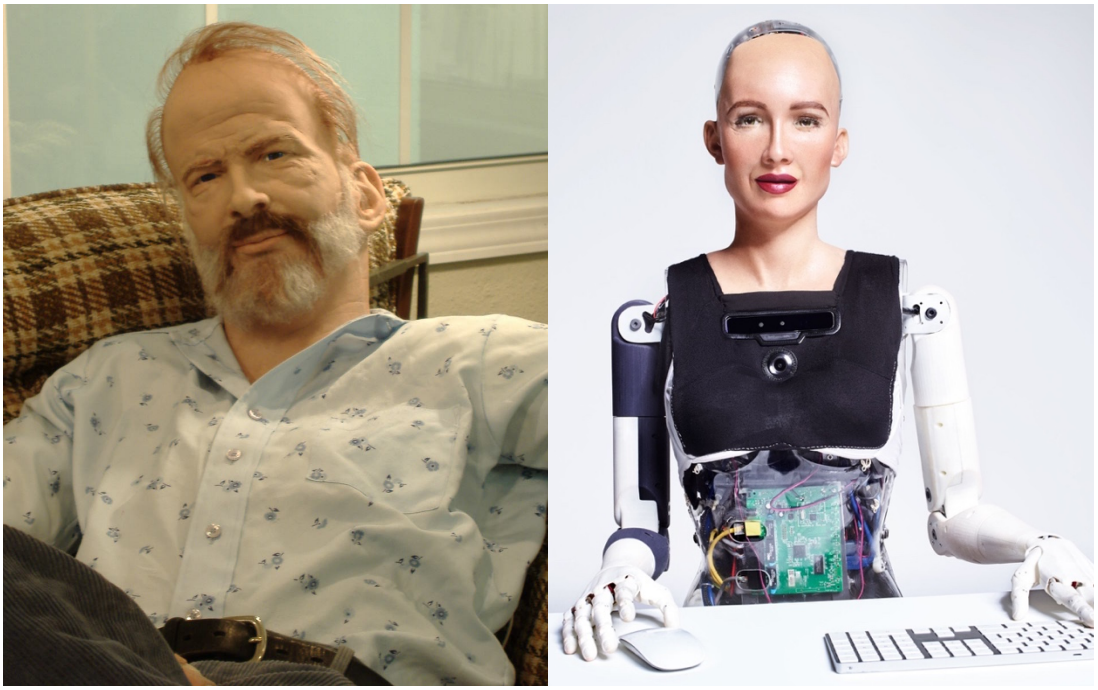

Figure 8: Philip K Dick Android (*left*) and Robot Sophia (*right*) (Hanson Robotics).[126]

In 2009 The Japanese National Institute of Advanced Industrial Science and Technology (AIST) also developed a gynoid – HRP-4C (Humanoid Robotics Project-4th Cyborg), alternatively called Miim (Figure 9) – that can walk. Miim's face is a combination of the faces of five women working at AIST and its body dimensions are the average for women from the Japanese Body Dimensions Database (Robertson 2018, 118). Unlike the other Japanese gynoids, Miim has a metallic body.

[126] Images from the Hanson Robotics website: https://www.hansonrobotics.com/philip-k-dick/ and https://www.hansonrobotics.com/sophia/.

Figure 9: HRP-4C or Miim (IEEE Robots).[127]

4.5 Social Technologies, Gender and the (Non)Human

Notably, all the androids resemble specific well-known men and none of them is commercialised. Concurrently, the gynoids predominantly combine the appearance of many unknown women in line with ideal beauty standards and are often commercially available for hire. Individuality is linked to maleness and typicality is linked to femaleness reflected in averaging 'female' robots' appearance and creating 'male' robots in the likeness of an individual (Robertson 2010, 28-29). Furthermore, "robot gender effectively reproduces a sexist division of gendered labor among humans and humanoids alike" (Robertson 2018, 82), similar to VPAs. The androids are reportedly used in research on human cognition (representing *homo sapiens* in general) and, as is the case with the Geminoids HI and DK, for telepresence to conduct 'less important' tasks (like teaching – often considered a feminine occupation) remotely through a surrogate body. Concurrently, gynoids are predominantly created to look pretty or cute and

[127] Images from the IEEE Robots website: https://robots.ieee.org/robots/hrp4c/; originally by AIST.

for assistance and entertainment. Actroid robots are rented to greet guests and provide helpful information at venues and trade shows. And Miim can dance, sing[128] and model at fashion shows.[129] Consequently, androids and gynoids reify the associations and boundaries between male-man/female-woman and individuality/typicality and contextually normative ideas about gendered labour.

Importantly, by appearing in gendered human-likeness (in the case of humanoids) and performing aligned stereotypically gendered roles, anthropomorphised technologies reinforce the gender binary. As pointed out in Chapter 1, consideration of 'woman' as sexualised other in the anthropomorphisation of technology enjoys considerable consideration in the literature. This tendency is readily observable by considering the appearance and functions of these binary gendered technologies. VPAs and (humanoid) robots reflect dominant binary gender norms, particularly those concerning the othering of femininity (Bergen 2016, 95-97; Robertson, 2010). Since femininity is not considered normatively human in many contexts, the pejoration of women tends to spill over onto feminised technology; such instances include well-documented sexist behaviours, including sexual harassment, towards VPAs like Siri. Consequently, while feminised VPAs and humanoids are anthropomorphised (humanised) they are still often othered and thus also dehumanised. Such dehumanisation may also, in turn, extend to people, as is the case where children (and adults) bully children named Alexa to perform actions for them as the VPA Alexa does. Here, weaker forms of anthropomorphisation in technology may reinforce the human/nonhuman separation. Furthermore, it also perpetuates the gender binary and thus the othering of sexualised (and racialised) others.

Anthropomorphised technologies, particularly humanoid robots, are created to interact with people (as human or human-alike) seamlessly. Thus, they are

[128] See Miim dancing at the Digital Content Expo 2010 held at the Japan Science Museum in October of that year on Kazumichi Moriyama's (2010) YouTube video: https://www.youtube.com/watch?v=xcZJqiUrbnI.
[129] Miim modelled a wedding dress at the 2009 Yumi Katsura Paris Grand Collection fashion show in Osaka in July of that year; see Reuters (2009): https://www.reuters.com/news/picture/tech-watch-idUSRTR26KLR.

included as “subjects of a social order in which they perform a repertoire of roles that maintain the status quo” as far as gender is concerned (Robertson 2018, 89). Alesich and Rigby (2017, 56) highlights the risk that gendered humanoids could reinforce binary gendered stereotypes to such an extent that they “could become the ultimate gendered being”, upholding an unattainable rigid standard of binary gender for robots and humans alike. It seems that strongly anthropomorphised technologies (like androids and gynoids) have the potential to disrupt the human/nonhuman binary by inviting users to interact with decidedly nonorganic systems as if it is in fact human. In doing so, the organic/inorganic binary that informs the human/nonhuman binary, is also disrupted. These technologies thus simultaneously complicate the human/nonhuman binary and maintain gender binaries through their material-discursive intra-actions. It is clear that binary gender stereotypes prevail in the design and reception of these technologies. This is particularly detrimental to those excluded by the reification of binary sex-gender norms and those designated as female or perceived as women, or both.

Among the motivations roboticists cite for the creation of specifically photo-realistic androids and gynoids are the substitution of these robots for humans in research on human-human interaction (HHI) (MacDorman and Ishiguro 2006, 365). This claim rests on the assumption that gynoids and androids disrupt the human/nonhuman binary to such an extent that these robots are treated exactly like people in social contexts. Roboticists maintain that given a high enough degree of photo-realism interaction between a gynoid/android and a person would be indistinguishable from HHI (MacDorman and Ishiguro 2006). Conversely, one argument often used against the creation of too realistic humanoids (gynoids and androids) is that they elicit an eerie or creepy feeling (called the uncanny valley). Thus people will be apprehensive about them impacting interaction. However, Ishiguro (2007, 122) asserts that the so-called ‘uncanny valley’ is of little consequence since it takes only two seconds for a person to realise that they are interacting with a robot and not a human; and so, the uncertainty is resolved, and the eerie feeling passes. Interestingly, the very same finding supports the argument that people will ascertain fairly quickly

whether they are engaging a robot or a human. Presuming that this influences the interaction, robots cannot entirely substitute for humans in the study of HHI. Should a robot be identifiable as such, one would then gain insight into HRI not HHI when humans interacting with (human-like) robots are observed. In this case, these robots, thus, do not effectively disrupt the human/nonhuman binary. Currently, gynoids/androids are generally not considered human, partly due to great difficulty 'passing' as human as a result of their movement limitations. Thus, while they complicate the human/nonhuman binary, they do not entirely disrupt it. Nevertheless, their humanisation enables the circulation of gender norms between them and humans.

Hanson (2011) offers another motivation for creating gynoids and androids. It is argued that human-like embodiment is a prerequisite for safe human-robot interaction (HRI) when artificial general intelligence (AGI)[130] comes about – this argument rests on the assumption that for robots to "express their feelings in ways that *we can understand*" and to be able to "appreciate *our values*" they must look and 'behave' human (Hanson 2011; emphasis added). In addition to relying on human exceptionalism, this claim also relies on universalist notions of 'our understanding' and 'our values' and is, in addition to its eurocentrism and possibly racist and sexist overtones, ableist in its collapse of human diversity.[131] It is uncontestably so that not all people express themselves in similar ways, nor are people's expressions universally understood (cultural and neurological differences are at play) by all others. Furthermore, people hold widely divergent values[132] that cannot simply be collapsed to an abstract notion of 'our' values that robots should somehow come to understand by virtue of their human-like

[130] AGI is the hypothetical future scenario in which an artificially (non-carbon based) intelligent agent will be able to understand and learn on par with humans. Thus, they are envisioned to have, at least, the equal capability of humans to acquire knowledge and the ability to reason given the appropriate resources.
[131] The ableism inherent to this presupposition is specifically directed at those who diverge from the norm in terms of neurology (also called neurodivergence), while physical differences may also be relevant particularly those affecting the senses.
[132] People also do not act in line with their own values without fail, there are many motivations for people to temporarily diverge from their values.

embodiment or sensory experiences.[133] With any other "agent's actual experience [being] forever out of reach and … the nature of another creature … only [deducible] through a process of indirect inference" or outright enquiry (where possible), it is unmistakable that everybody[134] has differing sensory experiences from the same stimuli and that those experiences are differently cognitively integrated (Epley, Waytz and Cacioppo 2007, 880). Consequently, embodied general artificial intelligence, should it come about, are likely to also uniquely integrate their contextually specific sensory experiences with their existing experiences and knowledge (unique to each). Their resultant actions may also differ from the (racist, sexist, ableist) norm – not because their morphology diverges from that of a (able-minded and -bodied) human, but precisely because all creatures, whether similarly embodied, differ from each other to various degrees. Hanson's reasoning, interestingly, reifies the human/nonhuman binary by relying on human exceptionalism; and so, embodiment outside of human norms (the ideal universal humanist human) is rendered dangerous and the conventional exclusions from the phenomenon human stabilised.

As was the case with sex and gender in Chapter 3, anthropomorphised technologies form part of the apparatuses that strategically agentially separates and conflates the human and nonhuman to maintain exclusions from the category human and the continued dehumanisation of marginalised people. Furthermore, since roboticists treat gender as self-evident and binary, they design robots to reflect these binary gender stereotypes so that they may be intelligibly perceived as human-like (Robertson 2018, 85-90). This reinforces the gender binary and maintains dominant cis-hetero-normative ideologies that render gender non-conforming people and those that have trouble to 'pass' as a binary gender unrecognisable as human (Fee 2010, 218). Since the aforementioned persons, amongst others, do not fit the "dominant frame for the human" (Butler 2004, 25), they are dehumanised. This while the very technological artefacts, that operate

[133] See the following section for a brief introduction to sensory ability in robotics.
[134] All the bodies concerned, as in every body.

as part of the material-discursive apparatuses in maintaining the gender binary, are humanised.

It should be mentioned that although mass media insinuates that household and humanoid robots are significantly improving in their capabilities and are already present in many homes (like VPAs), this is not the case. Hitherto humanoid robotics remains an expensive industry with little practical application in most people's everyday lives. It is mostly only present in supervised settings such as museums, showrooms, in exhibitions at malls and some schools, nursing homes and hospitals where it is being tested (Robertson 2018, 18 & 31). Furthermore, the robotics people are likely to incorporate into their homes are appliances like the Roomba, not humanoids (Robertson 2018, 190). However, social, household or humanoid robots and the marketing and public relations endeavours of governments and corporations concerning them reveal the social climates (and binaries) they are envisioned to create or sustain (Robertson 2018, 31). The aforementioned is the focus of a later section. In the succeeding section, I focus on the binaries differentially maintained and disrupted by VPAs and robotics as a result of their conceptualisation as either disembodied or embodied.

4.6 The (Dis)Embodiment of Social Technologies

The social anthropomorphised technologies discussed throughout can be agentially separated into two categories: disembodied and embodied, with VPAs usually conceptualised as the former and robots associated with the latter. However, this distinction is rather crude as VPAs may not possess a (humanoid or animaloid) body, but they still embody gendered meanings associated with the concept of human. Nevertheless, for this section, such a distinction proves a useful starting point for exploring the tensions resulting from this agential separation. It is also practical in revealing the similarities and differences between the binaries maintained and disrupted by anthropomorphised technologies with and without explicitly human-like bodies.

Bergen (2016) conceptualises VPAs as disembodied and addresses this disembodiment in relation to the feminisation of these technological artefacts. Bergen (2016, 95-97) points out that the VPAs' disembodiment and their simultaneous feminisation through the performance of (feminine associated) affective labour plays to male desire while also weaponising the human 'female' body. These assistive technologies are at once demure and obliging, in alignment with the male fantasy of femininity (and the hegemonic status quo), and without the abject threatening female body; strengthening the discursive hold on the gendered (feminine/female) body (Bergen 2016, 97). To put it another way, by invoking feminine embodiment (through voice), while the morphology of the VPA in no way resembles the human body, together with feminine associated labour, the stability of (patriarchal) femininity is, primarily, discursively reinforced.

Here, by obscuring the (human) body – usually closely associated with sex-gender – the VPA can embody gendered meaning in line with sex-gender normativity through voice and behaviour without bothering with an 'unruly' (nonhuman) body that may disrupt the intelligibility of this normative ideal. Furthermore, the nurturing feminine is mobilised in the VPA, the VPA being entirely in the user's possession and control, inviting intimacy (Bergen 2016, 100). This obscures the privacy-concerns related to giving the large corporations behind these technologies access to users' sensitive data (Bergen 2016, 100). Woods (2018, 334) argues that the "traffic[king] in normative gender roles" in VPAs serves to very effectively veil and normalise surveillance-capitalism while encouraging intimate data exchange that contributes to such surveillance. VPAs solicit a high level of intimacy by seemingly blurring the boundaries between human and nonhuman and simultaneously drawing on stereotypes of women as helpful, supportive and non-threatening.

Importantly, the lack of human-like embodiment in VPAs results in an over-compensatory gendered performance that reinforces feminine gender role stereotypes (Bergen 2016, 98). However, the feminisation of VPAs (when considered disembodied) also challenges the connection between

disembodiment, universal knowledge and masculinity – and the body and femininity; with the feminine all-knowing VPA present in homes and pockets all over the world. Moreover, thinking with VPAs as disembodied, as above, reveals a tension in the distinction made between the physical body (material) and embodied meaning (discursive). Conceptualising VPAs as disembodied displaces the (female-feminine) body invoked by their genderisation; thus, it disjoins the body from the (gendered) meaning embodied by it. In so doing, it agentially separates the material from the discursive, obfuscating the (re)configuration of the (human and robotic) bodies associated with the (gendered) meaning it (re)configures in line with hegemonic norms.

In contrast to the attempted erasure of the body in VPAs, the body figures prominently in robotics, particularly social robotics. All of the robots discussed previously, including gynoids and androids, fall within the category of social robotics. Social robotics encompass robots intended to be used primarily in social interaction with humans. Roboticists Cynthia Breazeal (USA) and Hiroshi Ishiguro (Japan) assert that the creation of sociable robots is "a way to explore human social intelligence and the very meaning of *human"* (Robertson 2018, 135; emphasis in original).

Social robots are not intended as a medium through which to communicate, although, they do sometimes facilitate human-human interaction (HHI). Rather, they are intended to be communicated and interacted with (Zhao 2006, 402). Simultaneously, gynoids and androids are used to model human cognition and intelligence. Accordingly, they "are envisioned as human counterparts, to take our place in conversations and experimental procedures" (Alač 2009, 520). To perform this role, they must not only have bodies but human-like bodies. The body and sensory abilities are recognised as critical to cognition in using a robot to model human intelligence (Alač 2009, 492). A humanoid robot thus, in addition to human morphology (head, torso, limbs), requires human-like sensory capabilities.

The previous conceptualisation of cognition and intelligence is called the interactive body perspective (Alač 2009). This perspective on AI does not subscribe to the mind/body split common to earlier intelligence modelling projects based on propositional knowledge and rationalist epistemology (Adam 1995b). Previously prominent AI projects simulated 'hard' intelligence, enacting and reinforcing binaries between hard/soft, intellectual/somatic and mind/body. Since the mind/body binary lines up with the male/female and culture/nature binaries, these projects tended to exclude so-called 'women's knowledge' associated with somatic experiences (Adam 1995a, 414; 1995b, 357). The interactive and distributed body perspective not only destabilises the mind/body binary (and the strict association of women with the body and men with the mind) but is also commensurate with Baradian intra-action.

According to Alač (2009, 496-497), "[t]he details of [the] 'intra-actions' … between human and machine [in social robotics] challenge the idea that the human body primarily belongs to a single individual who exchanges information with the external world". Instead, the body (or body-mind) is considered distributed. Engineers and roboticists draw on their own bodies both to design mechanisms that enable movement and sensory input and to program the movements and gestures of humanoid robots; "[t]he robot's body 'becomes alive' through a series of actions – material and discursive – that practitioners must produce in order to render the robot human-like" (Alač 2009, 506). Thus, the phenomena human and body are dynamic and material-discursively (re)configured across both human and robot (humanoid) bodies. The body does not end at the skin, instead, the phenomenon body (re)configures itself as it "dwell[s] in … actors (human and robotic) that comprise its world" (Alač 2009, 523). As the robotic body is (re)configured, so is the organic body – also with relevance to the phenomenon gender. While Alač (2009, 524) maintains that the treatment of the body in social robotics calls attention to the instability of the human/nonhuman binary, it is also asserted that "distinctions between humans and nonhumans are at play for at least as long as we envisage the technologies built as our counterparts while failing to recognize the interactional complexities at the human-technology

interface". Importantly, roboticists and researchers largely ignore the ways in which explicit anthropomorphisation in the design of technological artefacts (re)configures human bodies; in addition to uncritically gendering these artefacts. Furthermore, it is not only engineering practices that enact body and human in relation to (social or humanoid) robotics, but also standards and the possibilities afforded by technological advances, additionally sex-gender norms, race and nationality, their portrayal in digital media reports and marketing materials, government policies, and conditions of funding define the realities of social (notably humanoid) robotics (Alač 2009, 506).

4.7 Robot-Rhetoric as Apparatus-Phenomena

In Japan government policy and funding is central to developing anthropomorphised technology, particularly robotics. Late former Japanese Prime Minister Shinzō Abe promoted robotics as the industry that would save or rescue Japan by leading a social and industrial revolution aimed at invigorating the Japanese economy (Robertson 2018, 44). In 2006 Abe established the Innovation 25 Strategy Council (*Inobēshon 25 Senryaku Kaigi*), a cabinet-level committee tasked with creating a strategy to roboticise Japanese society and earmarked 3 trillion Yen (over ten years) from the national budget for the promotion of robotics (Robertson 2018, 29 & 34). While the media materials of Innovation 25 initially focused on social household robotics, the proposal was reformulated in 2014 into the Robot Revolution Realisation Council (RRRC) with a focus on industrial, agricultural, corporate and health care robotics (Robertson 2018, 35). Despite this shift in pecuniary focus, government and industry continue to affirm a commitment to the coexistence of robots and humans, ideally in the context of family (Robertson 2018, 141).

Robertson (2018, 35; emphasis added) remarks that "Renovation 25" might be more apt given that the strategy aims to secure "the stability of both the Japanese economy and [old] Japanese *social institutions*" such as the patriarchal extended family (the *ie*) and nationalist ideology. Innovation 25 includes a ten-page

illustrated fictional ethnography of the typical Japanese family in 2025 called *2025: A day in the life of the Inobe family*. The Inobe family includes a male-gendered humanoid robot in addition to the traditional husband, wife, two (differently sexed) children and the husband's parents;[135] this family is a version of the traditional heteronormative patriarchal extended household that the envisioned roboticised society maintains (Robertson 2018, 50).[136] In content, the booklet reinforces a sexist division of labour and stereotypical gender roles, particularly those challenged by Japanese women and have prompted public criticism for being both cartoonish and out of touch with reality (Roberston 2018, 39 & 50 & 61).

In Japan the rhetoric around (humanoid) robots have largely been "retro-utopian"; with robots touted as a technological solution to perceived social problems: the ageing population, the decrease in marriage, the declining birth rate, and the shrinking labour force (Robertson 2018, 36 & 191). Importantly, all of these purported social problems have been blamed on women (given the low birth rate) with Innovation 25 and the trade literature on humanoid robots implying that robots that perform elder-care, child-care and household cleaning and management will relieve women of some of the work that make them reluctant to marry and have (multiple) children (Robertson 2018, 20 & 24). Simultaneously, very little has been done to address the actual shortage of day-care facilities and other impactful policy changes that women have been requesting (Robertson 2018, 24). Many socio-economic factors – high cost of education and limited availability of child-care, frequent unpaid overtime work, job insecurity and single-income family budgets – contribute to the declining birth rate, not so easily solvable by an only marginally useful robot that still requires women to be the

[135] The marketing material for Jibo, the USA's 'first family robot', features a similar family structure, called the nuclear family. Furthermore, all the families depicted in Jibo's promotional video are white, heteronormative and middle-class. In this context the "the white, US middle-class nuclear family form" is normalised (Atanasoski and Vora 2019, 88); not unlike the role social robotics in Japan play in perpetuating the *ie*. Additionally, gendered and racialised support labour or service work is obscured by the implicit advancement of the neoliberal norm that the household is autonomous and self-sufficient (Atanasoski and Vora 2019, 88-89).
[136] No ethnographic research among diverse Japanese families was conducted in the process of formulating the fictional 2025 family (Robertson 2018, 50).

"professional housewife" illustrated in Innovation 25 (Robertson 2018, 19 & 29 & 75). Conventional wisdom might lead one to believe that a robot that takes over explicitly gendered tasks that usually limit the mobility and labour force participation of women will result (in the long term) in decreased gender binarism in terms of sex-gender roles and less sexist labour policies; however, these robots are imagined working in tandem with women and strengthening women's role as mother and wife. Regrettably, the Japanese government thinks of technological development as domestic policy and engages in social "imagineering" through robotics to secure normative social arrangements – natal, marital, corporate and national (Robertson 2018, 29 & 178).

Humanoid robots are also considered preferable to human foreign workers in Japan, particularly in elder-care (Robertson 2018, 19). Unsurprisingly, with high levels of xenophobia and ethno-nationalism in Japan resulting in a shortage of healthcare workers, the development of nursing and other elder-care robots was prioritised in the 2014 RRRC (Robertson 2018, 60). Furthermore, Paro, the robotic harp seal, became the first robot to have a *koseki* – a citizenry document and household registry relevant to civil rights in Japan; demonstrating the convergence of robotics and Japanese ethno-nationalist policy (Robertson 2018, 140-141). People – including Koreans whose ancestors had their Japanese citizenship revoked after Japanese colonialisation – born in Japan who have lived their whole lives in Japan and are married to Japanese citizens, do not have their own *koseki* nor are they included on a spouse's *koseki* under family. The *koseki* system of family registration conflates family with nationality and citizenship and in so doing prioritises the family (*ie*) "over the individual as the fundamental social unit in Japanese society" (Chapman 2012, 3). Paro, a robotic animaloid's, ethnic nationality carries immense weight in it obtaining a *koseki,* being of greater significance than being human (Robertson 2018, 140). This is not an isolated case but reflects a trend of denying permanent residents civil rights while conferring citizenship on robots, cartoon characters, and nonhuman animals (Robertson 2018,123). Hence, in Japan the anthropomorphisation or humanisation of robotics simultaneously functions to dehumanise foreigners.

Instead of addressing racism and xenophobia in Japan, robots are used to perpetuate it since "robots [are] imagined to replace the need for immigrants and migrant workers" (Robertson 2018, 123). The accelerated adoption of robotics in foreign-labour dominant industries reinforces Japanese exceptionalism and limits work opportunities for immigrants and refugees.

Importantly, the *koseki* maintains an idealised image of the Japanese subject (of the state) by disappearing cultural diversity, making linguistic and ethnic differences unintelligible as Japanese and maintaining an ideology of ethnic homogeneity (Roberston 2018, 19 & 124). The *koseki* and *ie* systems are profoundly implicated in national, sexual and racial inequality in Japan by maintaining exclusive family and nationality structures and stereotypical gender roles (Roberston 2018, 124). The *koseki* also functions in regulating sex-gender in Japan in terms of legal sex in addition to, and through, gender roles. As the *koseki* includes people by their relational status to the head-of-household sex-gender is not explicitly indicated on the *koseki* but rather implicitly through gendered relational terms such as wife, husband, daughter, and son (Chapman 2020, 83). This interpellation through the *koseki* not only genders individuals but also makes binary gender roles foundational to families and thus privileges heteronormativity and patriarchy (Chapman 2020, 83). While same-sex marriage is not illegal in Japan, there exists no legal bureaucratic administrative process to register a marriage between two husbands or two wives; the *koseki* does not make provision for family structures outside of the norm (Chapman 2020, 87). Moreover, there exists no scope for intersex or non-binary identification on the *koseki.* For binary trans* people to have their sex-gender acknowledged requires meeting limiting legal provisions[137] and the issuing of a new *koseki* that records such a change having been affected (Chapman 2020, 88).[138]

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[137] Clause 3 of the Act on Special Cases in Handling Gender for People with Gender Identity Disorder (*sei dōitsu sei shōgaisha no seibetsu no toriatsukai no tokurei ni kansuru hōritsu*) specify that the individual must be 20 years or older, presently single, without children of minor age, and have genitalia similar in appearance to that of the sex-gender they want to be recognised as and either no testicles or a persistent lack of testicular function.

[138] Having government documents that confirm one's identity and citizenship effectively outing one as trans* can be dangerous and lead to discrimination in many cases.

The conservative family norm, strongly linked with the *koseki* and *ie,* conflicts with the lived realities of many Japanese causing numerous difficulties for individuals and families reflected in research and activism[139] pertaining to the iniquity and discrimination[140] foundational to and permitted by the *koseki* (Chapman 2020, 83). Yet, former Prime Minister Abe and many leading roboticists seek to roboticise Japan with 'born in Japan' robots to stabilise specifically the *ie* family structure as regulated by the *koseki* (Robertson 2018, 124). Importantly, since the *ie* does not favour biological familial relations, adult adoption is not uncommon and occurs to secure the perpetuity of the individual *ie* primarily by adopting sons-in-law (Robertson 2018, 132).[141] Similarly, robots, particularly humanoids, are imagined becoming such adopted members of the Japanese household and playing a pivotal role in the continuation of both family and national traditions; or traditionalism (Robertson 2018, 132). (Humanoid) Robots thus operate as apparatuses in the maintenance of the *ie* and the *koseki* and the sex/gender binaries as well as the accompanying ethno-nationalist exclusion of foreigners from civil recognition.

4.8 Conclusion

Throughout this chapter, I have explored the role that social anthropomorphised technologies play as apparatus in the constitution of the phenomena gender and human, as gendered phenomenon, and in the (de)stabilisation of associated binaries. Anthropomorphised technologies, from VPAs to humanoid and animaloid robots, materialise sex-gender in line with hetero-patriarchal binaries

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[139] See *Japan's Household Registration System and Citizenship: Koseki, Identification and Documentation* (2014), particularly Part III, for a collection of English language critiques of the *koseki.* Also see Sakakibara (1992), Fukushima (2001) and Sakamoto (2008) regarding, respectively, surnames, children and non-normative family structures (these texts are in Japanese).

[140] In addition to discrimination against intersex and trans* individuals, same-sex couples, and foreign nationals the *koseki* system, Family Law and Civil Code also discriminates against women and children born outside of registered marriage; see White (2018).

[141] "In 2011 there were 81,000 adult adoptions that were transacted to secure the continuity of about the same number of *ie"* (Robertson 2018, 132).

as a result of their design both in function and appearance. Robot bodies differ based on the role or the function a particular robot is created to perform in a specific environment. These tasks or roles are frequently binarily gendered, especially as far as humanoid robots are concerned (Robertson, 2018, 98). Still, most robotics literature does not pay attention to the "operations of gender in the construction of humanoids" (Robertson 2018, 99).

Anthropomorphised robots as participants in material-discursive intra-actions reify the gender binary (largely) uncritically and perpetuate sexualised stereotypes of femininity. Robertson (2018, 120) could not get answers from Japanese roboticists as to why their robots required significant breasts and other heavily sexualised features – being wholly unnecessary to both their functionality and their intelligible gendering. These technological artefacts also participate in the continued dehumanisation of the sexually and ethnically othered. Particularly, when they are feminised, they contribute to the dehumanisation of feminised people; and thus, it is clear that merely augmenting their design to be more androgynous is likely to perpetuate the continued dehumanisation of gender-nonconforming and androgynous presenting persons. Androgynous technological artefacts may also be subject to less anthropomorphisation as result of the centrality of binary gender to the hegemonic definition of human.[142] However, if robot gender is easily changed and appearance, roles and speech patterns need not align, it may emphasise the multidimensionality and changeability of gender (Alesich and Rigby 2017, 56). Such an emphasis could aid in disrupting the gender binary consistent with trans* possibilities.

Furthermore, not all (or maybe any) robots need to be humanoid or explicitly gendered. For example, the robotic seal Paro that provides psychological and emotional comfort (Robertson, 2018, 137) or Jibo, despite not being overly human-like or photo-realistic, is at least equally effective at soliciting emotional engagement as are robots like the Geminoids (Ackerman 2022). Nonetheless,

[142] Many roboticists argue that they must gender their robots for them to be sufficiently anthropomorphised – a necessary condition for seamless interactions with people.

humanoid robotics captures the popular imagination and remains consistently pursued. Although engineer Jonathan Hurst initially designed his robots pragmatically and suited to the task at hand (with bird-like legs), he discovered that investors liked his robots more when they were at least a little human-like and secured him funding more easily (Moore 2015). Roboticists and their funders often pursue technological innovation, particularly the kind that will make headlines for their novelty, instead of considering existing consumer needs and the social implications of designs (Alesich and Rigby, 2017, 55; Robertson 2018, 143). In the SIENNA[143] survey, more than half of those surveyed indicated that they would like robots (particularly in workplaces and public places) to neither look nor behave like humans and that they expect the robotics industry's products to increase existing inequalities and reduce personal autonomy (Van der Velde 2020). Nevertheless, roboticists offer a myriad of reasons for the creation of humanoid robots from ease of use and the modelling of human intelligence, to the study of HHI and the prevention of projected dangers related to AGI. While human exceptionalism is a dominant driving force in the creation of humanoid robotics and other anthropomorphised technological artefacts, particularly in Europe and North America, Japanese exceptionalism additionally guides robotics developments in Japan (Robertson 2018, 142-143).

While some roboticists and designers may be ignorant to the social complexities of the contexts within which their robots are created and used, humanoid robotics can also be intentionally utilised to perpetuate gender normativity (and other unequal power relations). The Japanese government promotes a "nostalgic dream" of a "golden future-past" where the stem-family, the *ie* and ethno-nationalism is perpetually stabilised by the intra-actions between robotics and the *koseki* (Robertson 2018, 78 & 127 & 142). Japanese robot-rhetoric demonstrates

[143] As part of the Stakeholder-Informed Ethics for New Technologies with High Socio-Economic and Human Rights Impact (SIENNA) project the University of Twente commissioned Kantar (an independent research organisation) to survey public awareness and perceptions of, amongst others, AI and robotics. Approximately a thousand adults from each of the following countries were surveyed: France, Germany, Greece, Netherlands, Poland, Spain, Sweden, Brazil, South Africa, South Korea, the United States of America. For more information visit the Sienna Project website: https://www.sienna-project.eu/

that robotics concerns social engineering, in addition to, if not more so than, technological development (Robertson 2018, 62). Since robots are expensive to build, they tend to (deliberately or unconsciously) express the ideologies of the corporations and states that fund their development (Robertson 2018, 82). As seen in Chapter 3, government bureaucracy and policy is a powerful apparatus in stabilising the gender binary, and thus it is not surprising that it continues to do so through robotics. However, as Robertson (2018, 191) asserts, it is crucial that politicians prioritise practical solutions to social problems (like more day-care centres and non-discrimination in employment) and, together with corporations, address the actual needs of families and consumers, not imagined needs that perpetuate inequalities.

Humanoids and other social technological artefacts may be useful apparatuses in disrupting the mind/body binary, particularly when their physical form and its attendant sensors are central to their (artificial) intelligence capabilities. They may also disrupt some linkages between the mind/body and gender binary, like all-knowing feminised disembodied VPAs. However, anthropomorphised technologies tend to facilitate the continued stabilisation of the human/nonhuman binary, the dehumanisation of those humans sexualised and racialised, the maintenance of a strict gender binary and the sustained unintelligibility of deviations from context-specific gender norms. The aforementioned is a result of the limitations within which robotic bodies are created. Importantly, the norms reified (re)configures robot bodies and human bodies similarly, while the embodiment of each in turn influences the other through their intra-actions. With gender stereotypes and biases iteratively circulating between humans and robots they are increasingly normalised and thus the gender binary is stabilised by HRI (Fossa and Sucameli 2022, 7). Recall from Chapter 1 Kubes' (2019, 237; emphasis in original) assertion that the focus should be on "what the robot shall be able to *do* (instead of what it shall *be like)".* Taking this approach might be more fruitful (and less detrimental to marginalised groups) if roboticists consider their robots not as human substitutes but as distinct in their abilities, in addition to considering the impact of their robots' gendered performance.

CHAPTER 5
CONCLUSION

We're in a constant state of becoming, and that is precisely what makes us beautiful.
Alok Vaid Menon[144]

5.1 Summary

The gender binaries have been under scrutiny throughout this dissertation. The categorical division of people into male/female, man/woman and homosexual/heterosexual is closely associated with patriarchal ideology and sexist oppression. The ways in which gender binaries are maintained or disrupted, particularly as it relates to human and robot bodies, are investigated throughout. To provide a coherent theoretical and methodological starting point the critical concepts pertaining to Karen Barad's performative new materialism are summarised in detail in Chapter 2, culminating in a discussion on its relevance to embodiment. Chapter 3 explores the apparatuses that function in the (de)stabilisation of the gender binary with regards to human embodiment and lays the foundation for a consequent similar exploration. In Chapter 4, with the addition of a sustained consideration of the human/nonhuman binary, the (de)stabilisation of the gender binary is explored specifically in relation to social anthropomorphised technologies.

One of the predominant insights gained from Barad's agential realism is that sex, gender, sexuality, and human are dynamic contingent phenomena. They are inherently indeterminate, and the indeterminacy is resolved in specific contexts temporarily. That is to say, they are not static concepts but differ across time and space, whether to a small or large degree. Moreover, the dominant binary understandings of the phenomena sex (male/female and man/woman), gender

[144] From Alok's keynote address at the 35th Annual Creating Change Conference of the [USA] National LGBTQ Task Force held virtually in March 2022. An excerpt including this quote is available on Instagram @alokvmenon posted on 5 May 2022.

(man/woman, masculine/feminine, cisgender/transgender and normal/queer) and sexuality (heterosexual/homosexual and normal/queer) leaves out and consequently renders unintelligible many sexes, genders and sexualities when these binaries are iteratively stabilised. Furthermore, the two terms within the aforementioned binaries are interdependent and thus rely on each other, and the exclusion of other possibilities, for their continued comprehensibility and clear contrasting circumscriptions. Thus sex, gender and sexuality are both apparatuses and material-discursive phenomena engaged in intra-active processes enacting agential cuts, inclusions and exclusions as it regards bodies; they are also the result of intra-active processes that include other apparatus-phenomena such as race, class and ability. It also became evident that sex, gender and sexuality intra-act with each other in their iterative (de)stabilisation. And so, Chapters 3 and 4 explore the material-discursive practices (apparatuses) through which the boundaries between sex and gender, male and female, man and woman, masculine and feminine, heterosexual and homosexual, cisgender and transgender, human and nonhuman, culture and nature, and body and mind are (re)enacted and (de)stabilised.

The diffractive reading of feminist, new materialist, biological, ethnographical and queer theories of sexual difference, sex, gender and sexuality performed in Chapter 3 enables an exploration of the practices that (de)stabilise various gender binaries. A brief history of sex and gender aids in illuminating how the sex/gender binary is (de)stabilised in concert with various understandings of sex, reproduction and the nature/culture binary. Significantly, the causal relationship between sex and gender is rendered reciprocal as an agential realist understanding of causality necessitates that neither term can be said to precede the other, and sex and gender have been historically agentially separated or conflated in the maintenance of the gender binary. Notable exclusions from the various gender binaries are intersex, trans* and bisexuality. Taking these realities into account, the complexities of sex-gender is further explored revealing possibilities for the destabilisation of binaries and the extent to which sex, gender, and sexuality are entangled and function as apparatuses in each other's

constitution. It also becomes clear that sex and gender are not singular concepts but rather refer to many overlapping things including chromosomes, genital configuration, hormone levels and responsiveness, type of gonads, body morphology and proportions, patterns of hair growth, distribution of fat, dress, hair style, mannerisms, gait, facial features, height, identity, sex or gender role, and social status. Importantly many practices that constitute gender as binary (making strict binary groupings of the above factors) or varied are revealed, these include: medical, surgical, psychiatric, bureaucratic, administrative, and personal. Some personal practices include using gender non-conformity to signal sexuality, while sexuality is often defined in relation to gender binaries. How sexuality is understood thus also figures in the reification or disruption of gender binaries. Throughout Chapter 3, it is thus established that sex-gender (and sexuality) is complex and multifarious, and that the prevailing social phenomena of normativity and state-regulated material-discursive practices tend to collapse the diversity of gender into binaries and limit their intelligibility.

Since gender binaries are predominantly stabilised (iteratively enacted as binary) and their couplings reified, at least from the 1700s to the present, it is unsurprising to find gender binarism influencing the design of social anthropomorphised technologies in Chapter 4. Gender binarism is present in social technological design in various forms: voice, sex or gender roles, interiorisation and exteriorisation of roboticism, and suggested functions. Furthermore, gender operates as an apparatus in the stabilisation of the phenomenon human and the enactment of the boundary between human and nonhuman; and vice versa. The ways in which anthropomorphised technologies (de)stabilise both the human/nonhuman binary, mind/body binary and gender binaries and how these phenomena intra-act are considered. Anthropomorphisation functions to humanise agents who are conventionally not considered human (predominantly since they are not organisms), while the same processes operate in the dehumanisation of the human's sexualised and racialised others. It is humanoid robotics, especially gynoids and androids, that are most concerning for their role in the regulation of gender binarism since they are strongly anthropomorphised

and are envisioned to act as substitute human agents in social situations. However, all the social technologies surveyed have the potential to (de)stabilise binaries through their intra-actions. It is revealed that technological design, marketing and government public relations are among the apparatuses that serve to strategically separate and conflate the human and nonhuman through robotics in the maintenance of the gender binary and ethnonationalism (in Japan). Anthropomorphised technologies form part of the apparatuses that stabilise the gender binary, the human/nonhuman binary and, in the case of Japanese robotics, the binaries between Japanese/non-Japanese (ethnically and nationally). With these specific agential cuts repeatedly being made, opportunities are foreclosed for (re)figuring which differences matter. Human exceptionalism (and other centricities), gender normativity and (once again) state-regulated material-discursive practices not only limit the materialisation of robotic bodies, but these robotic bodies also material-discursively (re)configure human bodies and limit their intelligibility to restrictive binaries.

5.2 Contributions

This dissertation expanded new materialist theoretical and methodological tools for understanding sex, gender and sexuality as dynamic material-discursive phenomena. It elaborated on agential realism through application to the gender binary, the human/nonhuman binary and social anthropomorphised technologies, with Baradian agential realism being explicitly engaged in thinking of gender and human as phenomena. By diffractively reading a varied range of literature on gender through a Baradian onto-epistemological lens, the iterative practices by which patriarchal gender binaries are maintained and disrupted – socially, medically, administratively, technologically and bureaucratically – were revealed. This study also offered a rare concurrent consideration of sex, gender and sexuality that aided in uncovering some of the complex ways in which they inform each other reciprocally. Resultantly this is a significant step towards the meeting of queer- or gender theory and posthumanism or new materialist philosophy. New materialist, particularly performative, philosophy is shown as useful in buttressing

queer feminist efforts towards the liberation from restrictive gender binarism; and may be particularly useful to bridge the seemingly opposing identarian- and abolition-of-gender (as a coercive institution) approaches.

Furthermore, an exploration was made into the disruption and maintenance of the human/nonhuman binary, particularly through technological practices concerning social technologies including VPAs and robotics. This contributes to a broader perspective on the phenomenon of human and its contingent exclusions, as well as how social, technological artefacts operate in the (re)configuration of (human) bodies. Accordingly, also contributing to the body of research on the complex ways in which gender is constituted as people and technology intra-act in the digital and technological age.

Ultimately, the following provisional insights regarding emerging social technologies, particularly robotics, are expressed. Given the very strong link between anthropomorphisation and genderisation, and social technologies being revealed as minimally disruptive of the human/nonhuman binary and actively engaged in the perpetuation of gender binarism it was determined that the continued design of social technology in human-likeness is likely to prove detrimental to people of all genders, and to be specifically unfavourable for gender non-conforming persons and women (cisgender, transgender and those perceived as such). Resultantly I propose that explicit (strong) anthropomorphisation and genderisation must be avoided in the design of emerging technologies (particularly humanoids, gynoids and androids) – in line with the majority's wishes in the SIENNA survey – in order to refrain from reifying exclusionary gender binaries. Under the current circumstances, there exists very limited scope for destabilising gender binaries through social technological design as it is conditioned by conservative state and corporate influence. However, should funders and promotors of robotics possess the will to effect change, they might do so by limiting explicit anthropomorphisation and binary genderisation and promoting robotics as a possible alternative way of being – encouraging the rethinking of widespread understandings of being-knowing.

Alternatively, explicitly emphasising changeability and fluidity in robotics regarding gender could prove less detrimental than current rigid, exaggerated and default gendering.

5.3 Limitations

As a result of the qualitative nature of the methodology applied in this dissertation, and since this research is theoretical and exploratory, it remains speculative.

Additionally, due to time and space limitations race, class, nationality, and ability, unfortunately, did not enjoy sustained explicit consideration, and neither did the intersections of gender with the aforementioned phenomena. This should by no means be construed as dismissing their importance. It is vital that research in these areas is conducted, however, given the research level of this project that was not feasible here.

Given the scope, this study is also necessarily partial in its consideration of gender literature and social anthropomorphised technologies. Further insights into apparatuses of gender may be gained from extending this research beyond the selected texts and technologies.

Furthermore, the consideration of social technologies was limited in scope to specifically robotics, an emerging technology, and, to a lesser extent, Virtual Personal Assistants, a more established technology. Other social technologies and socio-cultural artefacts may offer additional and different insights into the practices that (de)stabilise the gender binary and the human/nonhuman binary and may offer alternative perspectives on their design.

5.4 Suggestions for Further Research

Many complementary studies may be performed. A similar diffractive methodological approach within a Baradian onto-epistemological framework can be used to explore the apparatuses that (de)stabilise race, class, nationality and ability across disciplines. The intersections and intra-actions between these phenomena (including gender) could also be explored similarly to those of sex, gender and sexuality.

Researchers may also wish to expand on the insights offered here in empirically investigating the intensity of the effects of binary gendered robotics on adherence to gender role rigidity and the policing of gender roles of others.

Additionally, since vitalist new materialism and animism share an observance of vital force, it could prove interesting to pursue the commonalities of vitalist new materialism and animism in relation to robotics. New materialist (and other) approaches at the intersection of animal studies and technology may also be useful to the further examination of animaloid robotics.

5.5 Concluding Remarks

Social gendered practices and pervasive and emerging AI technologies primarily rearticulate restrictive gender binaries. This is due, in part, to the prevailing patriarchal understanding-livings of gender. Theoretical concepts such as ‘man’, ‘woman’, ‘masculinity’ and ‘femininity’ are materially embodied in human and robotic bodies alike. Bodies materialise consequent on repeated enacted agential cuts – stabilising the gender binary. This forecloses possibilities through exclusion, creating more of the same. However, it is possible to co-create dynamic futures once the apparatuses that enact these cuts are revealed and their iteration interrupted. Alternative material-discursive practices (of practising gender, recognising humanity, designing technology) can bring about different patterns of the world – alternative realities.

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