

**CONTEMPORARY APPROACHES TO SEX CATEGORIZATION: A
PRAGMATIC DEFENCE OF THE BINARY MODEL**

MICHAELA THOMPSON
Bachelor of Arts and Science, University of Lethbridge, 2017

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DEDICATION

For Willard Van Orman Quine and Oliver Wendell Holmes Jr., who fill my heart, and for Gottlob Frege, whom I miss every day.

ABSTRACT

There is significant controversy today about the nature of gender and the implications of the views we might take on the subject for trans and non-binary people in both public and academic discourse, including whether gender ought to be conceptualized as distinct from biological sex. Further, the way in which sex categories are conceptualized has important practical implications for how individuals with Disorders of Sexual Development (DSDs) are treated. The model of two diametrically opposed sex categories is increasingly challenged by theorists who are largely motivated by concerns around the treatment of individuals with DSDs. But the alternative models are also problematic. Examining challenges to the binary sex model this thesis argues in favour of a pragmatic approach to sex categorization and holds that a revised binary model may in fact be well aligned with the goals and recommendations of activists and theorists regarding the treatment of DSDs.

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LIST OF ABBREVIATIONS

AIS	Androgen Insensitivity Syndrome
AMH	Anti-Müllerian hormone
CIHR	Canadian Institutes of Health Research
NSERC	Natural Sciences and Engineering Research Council of Canada
DSD(s)	Disorder(s) of Sex Development
HPC	Homeostatic Property Clusters
INSA	Intersex Society of North America
IVF	In vitro fertilization
LGBT	Lesbian, Gay, Bisexual, Transgender (outdated, used by INSA)
3G (Sex)	Genital-Gonadal-Genetic sex
LGBTQIA+	Lesbian, Gay, Bisexual, Transgender, Queer, Intersex, Asexual, and additional non-cisgender identities and non-heterosexual orientations
MRI	Magnetic resonance imaging
NHS	National Health Services (of the United Kingdom)
PGD	Pre-implantation genetic diagnosis
SGD	Sex/Gender Distinction
SRY	Sex-determining region Y gene
SSHRC	Social Sciences and Humanities Research Council
T	Testosterone
UK	United Kingdom

Introduction

Sex is child's play; but gender is serious business.

—Yuval Noah Harari, *Sapiens*

There is a growing public awareness of issues related to gender, along with a quickly developing public discourse on the nature and dimensions of gender itself. Common conceptions of biological sex, however, appear to be less contentious on the surface. The view espoused by a popular non-fiction author above reflects the common notion that biological sex is a relatively simple thing, at least in relation to gender.

Traditionally, debates about gender have been between biological determinist and social constructivist views. The debate between these two views is far from settled and it has become increasingly mainstream outside of academic and feminist circles. The implications of this debate directly impact the lives of women and trans individuals, particularly with regard to the medical and social treatment of trans people and the perceived implications that the support of trans rights has on women and women's spaces. Many facets of the debates discussed throughout this thesis are part of ongoing public discourse, primarily conversations around gender identity as it relates to sex (the protracted debates involving trans competitors in the Olympics, for example (Klosok)). Public and political commentary serves as an important benchmark of social attitudes toward suggestions that current conceptualizations of sex and gender are inaccurate or insufficient.

In opposition to the folk conception of gender—that gender is binary and a coextension of biological sex—the view that gender is non-binary and/or socially constructed is becoming prominent in the West. However, given the conceptual distinction

between sex and gender that has become broadly accepted¹, an argument regarding a particular conception of gender does not necessarily apply to physiological sex. While the conversation around the nature of gender and the social impact our conceptions have has been top-of-mind for feminists inside and outside of academic circles for decades, the conversation surrounding the nature of sex is less prominent.

This project initially arose from work related to the medical treatment of individuals born with conditions that make the identification of sex difficult at birth (Thompson). This topic has been explored at-length by philosophers, biologists, and ethicists. Historically, individuals with such conditions have been identified as *hermaphrodites* and later as *intersex*. Today, the recognized term for such conditions is *Disorders of Sexual Development*, or DSDs². The literature arguing in favour of fewer and less invasive surgeries to correct or normalize bodies with DSDs is vast³. It is widely argued that invasive surgical treatment of such conditions should wait, if it is not medically essential, until the individual is old enough to understand and consent to the procedure and there is now growing medical consensus on this issue (Witchel). This thesis is not concerned with the model of treatment of individuals with DSDs *per se*, though I acknowledge that the way in which sex categories are conceptualized has important practical implications for how individuals with DSDs are treated medically and socially. The concept of *normalcy* in sex development, for example, directly informs physicians in their attempts to normalize a body as male or female, as does the conception of sex as binary. Instead, this thesis is concerned with the way in which the

¹ The Sex/Gender distinction is a conceptual distinction in which “sex” denotes human males or females (Mikkola) who are differentiated on the basis of biological or physiological characteristics (e.g., hormones, gametes) and “gender” denotes human men or women who are differentiated on the basis of social aspects of their identity. The sex/gender distinction has been criticized for a variety of reasons that will be explored in Chapter 2.

² Much of the literature uses the nomenclature “DSD” to abbreviate “Disorders of Sexual Development”, presumably because the plural term is *disorders*, not *development*. I use the abbreviation “DSDs” throughout to improve readability when appropriate.

³ See, for example, Dreger *Intersex in the Age of Ethics*; Kessler; Öçal; Fausto-Sterling *Sexing the Body*.

world is carved up at its joints, so to speak, with regard to sex—what this thesis provides is a critical evaluation of the prominent models of sex categorization and a proposal for a more accurate and rhetorically helpful model sourced primarily from models of species in philosophy of science, in particular Richard Boyd’s model of Homeostatic Property Clusters.

The assumption contained in the quote at the beginning of this section is that sex categorization is simple, particularly in relation to the complexity of gender. Harari writes:

Sex is child’s play; but gender is serious business. To get to be a member of the male sex is the simplest thing in the world. You just need to be born with an X and a Y chromosome. To get to be a female is equally simple. A pair of X chromosomes will do it. In contrast, becoming a man or a woman is a very complicated and demanding undertaking. (153)

In what follows we will see that the process of categorizing individuals as members of the male or female (or other) sex is indeed not so simple, and *gender* as a social concept cannot be understood as wholly separate from the physiological conception of *sex*, particularly with regard to the social conceptualization and the medical treatment of DSDs.

It is proposed by some that DSDs serve as evidence that sex is non-binary. Previously referred to as “intersex conditions” (i.e., “between sex”), individuals with DSDs appear to be, in some sense, neither male nor female. The main objection to this position is the view that DSDs are the exception that proves the rule, so to speak—biological categories generally have fuzzy borders, and male and female categories in sexually reproducing species are no exception to this general rule. Variation naturally occurs in species and is what makes evolution possible: natural selection requires variants grounded in characteristics in which genetics plays a significant role to pick and choose among as environmental conditions change.

The heated social debate around trans identities and the rights and privileges that we ought to afford those so embodied, combined with the ongoing ethical debate surrounding

treatment and diagnosis of DSDs, suggests that a better understanding of the convergence of the nature of sex and gender is an interesting metaphysical project. There is, to be sure, disagreement among the public about what the terms *sex*, *gender*, *man*, and *woman* mean, but there is also disagreement within the academic literature; both arenas influence physicians and policymakers in their decision-making, as well as parental and individual feelings about their children's or their own diagnosis. Concepts and the meanings to which we assign them have important consequences for our behaviour: in this case, our conceptualizations of *sex* and *gender* impact the social treatment all sexed and gendered subjects, but importantly impact those who challenge the notion of normalcy for either concept (e.g., transgendered and non-binary individuals, individuals with DSDs). There are important ethical implications raised by models of sex and gender which rest on considerations of a metaphysical and epistemological nature—does sex, in particular, have a nature, and if so, how could we come to know this?

There are a number of frameworks proposed in opposition to the commonly held view that sex is binary. This opposition is often centered around the view that the binary sex model contributes to the mismanagement of DSDs—the desire to normalize individuals to fit a particular notion of what it means to be male- or female-bodied is directly informed by our social understanding of what it means to *be* male- or female-bodied. Biologist Anne Fausto-Sterling gives a non-binary account of sex in *The Five Sexes* and defends the view that there are as many as five legitimate sex categories. Others argue that sex categories exist on a spectrum and infinite possibilities of sex categorizations exist (Montañez). While I share the motivations of the theorists who put forward such views—namely, to limit surgical intervention in cases of intersex conditions—I will argue that a binary view of sex does not

necessarily commit us to supporting the normalization procedures that such theorists are against.

Examining challenges to the binary sex model, the sex/gender distinction, and the ways in which our social practices give meaning to these concepts, this thesis holds that the binary model may already be consistent with the goals and recommendations of activists and theorists regarding the treatment of DSDs. Current literature generally proposes an interdisciplinary approach to the treatment of individuals with DSDs and that when possible pediatric urologists, endocrinologists, geneticists, neonatologists, and child psychologists should work with the patient and family (Witchel; Bangalore Krishna et al.). The aim of this thesis is not to criticize this approach to gender or sex determination but to critically examine the limits of each framework for categorizing sex with regard to the diagnosis and treatment of DSDs.

To make this case, I first outline the current debates surrounding the nature of gender as well as the emerging and standard views on sex categorization. In the first chapter, I will discuss the conceptual distinction between *sex* and *gender* as described by Mary Mikkola and the standard and emerging conceptions of *gender* in feminist literature. Understanding the ways in which gender as a social concept and sex as a physiological concept are generally understood is central to the debate around how best to carve up sex categories. I will highlight arguments in favour of and against the conceptual distinction between sex and gender. The sex/gender distinction is an important concept in this discussion as the conflation of biological sex with gender identity serves in many instances as a strawman position against arguments for binary biological sex—more pointedly, the argument for non-binary gender identities is not necessarily an argument for non-binary biological categories. I

will ultimately defend the conceptual distinction between *sex* and *gender* and regard it as an imperative of the model of sex categorization that I defend.

In the second chapter, I will describe our current understanding of sexual development in humans and our understanding of Disorders of Sexual Development (DSDs) and provide an overview of the literature on treatment models, which currently propose a multidisciplinary approach to treatment, limited surgical intervention, and a diagnosis as specific as possible with regard to the DSDs. I support the arguments put forward by advocates in favour of limiting surgical intervention at an early age and limiting the need for “normalization” surgical procedures in general when they are not medically necessary for the patient. This conversation is further complicated by the lack of data and available research on DSDs and surgical outcomes.

Clinical studies on DSDs are often single-centre experiences from regional samples with a limited number of unambiguous diagnoses of participants, and many of the studies lack appropriate comparison groups. The comparability of these studies is often impeded because different definitions and study methodologies are used. (Röhle et al. 2).

While guidelines for the management of DSDs are becoming more regulated, there are still discrepancies in understandings of DSDs and the viability of certain treatments and a general lack of follow-up study of patients.

There has been significant research conducted regarding the ways in which sex traits develop and are bifurcated (Joel “Genetic-gonadal-genitals sex”; Joel “Sex Beyond the Genitalia”; Fine; Öçal; Joel and Fausto-Sterling; García-Acero). There is strong evidence to support that what we regard as sex traits (e.g., chromosomes, gonads, genitals, hormones, structural differences in the brain) do not develop in entirely dimorphic ways (Joel “Genetic-gonadal-genitals sex”). Considering this, in Chapter 3 I will critically analyze and evaluate three models of sex categorization: the dimorphic binary model, or ‘folk conception’, which

promotes *male* and *female* as distinct, diametrically opposed categories; the five-sex model proposed by Anne Fausto-Sterling, which proposes as many as five legitimate sex categories; and the emerging spectrum model, which promotes a multitude of categories along a spectrum of *masculine* to *feminine* bodies. I argue that all of these models are insufficient. I will also discuss the possibility of sex as personal identification and argue that this is an inappropriate and unusual way of conceptualizing sex, arguing that sex, as distinct from gender, must be something empirically measurable to have any use in medical or epidemiological studies.

In Chapter 4, I will introduce and evaluate a fourth possible model of categorization based on Richard Boyd's Homeostatic Property Cluster (HPC) kind view of species categorization, a view which he outlines and defends in his 1988 chapter, "How to Be a Moral Realist". I argue that the HPC model aligns with a binary conception of sex categories. I will argue that there is no reason to privilege one particular trait in sex determination but that this conclusion does not commit us to a spectrum view of sex categorization.

In conclusion, I maintain that the binary model as I describe it does not oppose the ethical standards and considerations put forward by intersex advocacy groups, and that to the contrary, the binary model as I propose it is a helpful rhetorical tool against positions that cause and support social punishment for sexual minorities who violate the traditional heterosexual and cisgender social system, including but not limited to the LGBTQIA+ community⁴. The way in which we conceptualize both sex and gender has important implications for the ways in which trans and individuals with DSDs are treated medically,

⁴ The language used to talk about sexual and gender minorities is evolving constantly. LGBTQIA+ Lesbian, Gay, Bisexual, Transgender, Queer and/or Questioning, Intersex, and Asexual and/or Ally. The + (plus) is acknowledgement of additional non-cisgender and non-straight identities (OutRight Action International).

legally, and socially. While the conversation surrounding gender is important, nuanced, and metaphysically interesting, I am interested in the ways in which we carve up the world with regard to physiological sex—what it means to be a member of the male or female sex and what criteria we ought to use to determine membership in either (or neither) category. Public and political commentary serves as important benchmarks of social attitudes toward suggestions that current conceptualizations of sex and gender are inaccurate or insufficient. The tendency to push back against a more nuanced and pragmatic conceptualization of sex (or gender) is often aligned with strong right-wing political viewpoints and popular commentators often use their significant platforms to condemn such narratives (see Shapiro, for example). There is a common association of the binary view of sex with other beliefs and behaviours such as transphobia and sexism—if one holds that a *woman* is defined as an *adult human female* and a *man* is an *adult human male*, it follows that an *adult human male* cannot be a woman. I argue that the binary view does not commit us to this conclusion.

Chapter 1: Sex vs. Gender

“The terms ‘sex’ and ‘gender’ mean different things to different feminist theorists and neither are easy or straightforward to characterise” (Mikkola).

The ways in which we conceptualize sex and gender have important practical implications for the ways in which gendered subjects are treated. Gender is a muddy concept that continues to evolve. In this chapter, I will provide an overview of the standard and emerging views of gender and the social implications of each view. This chapter addresses the following questions:

- 1) What is the sex/gender distinction?
- 2) Is the sex/gender distinction real? and
- 3) Is the sex/gender distinction important?

1.1 What is the sex/gender distinction?

The debate regarding the nature of gender identity is quickly growing in disciplines outside of feminist philosophy and, although it focuses largely on the nature of gender identity, is importantly connected to issues of biological/reproductive sex. The debate is generally between “trans-inclusive feminists” who argue that being biologically female is not a necessary condition of being a woman, and a “trans-exclusionary group”, sometimes referred to as TERFs or “trans-exclusionary radical feminists” who argue that being biologically female is indeed a necessary condition of being a woman (Pearce et al.).

The terms ‘sex’ and ‘gender’ are often used interchangeably. The ‘sex/gender distinction’ (hereafter SGD) is a conceptual distinction between ‘sex’ as a biological concept involving one’s physical attributes (e.g., hormones, chromosomes, secondary sex characteristics, genitalia) and ‘gender’ as a concept involving the social behaviours and norms associated with *men* and *women* (Mikkola). Under this distinction, one’s ‘gender

identity’ as a man, a woman (or other) has to do with the social dimensions of their identity as “masculine” or “feminine” (or otherwise). One’s identity as “masculine” and/or “feminine” is also contingent on their cultural understanding of what it means *to be* “masculine” or “feminine” (Mikkola). Alternatively, one’s sex has to do with the combination of physiological traits that tend to distribute bimodally in humans—hormones, chromosomes, secondary sex characteristics, and genitalia (Mikkola). Under the SGD, it is not necessarily the case that a *woman* is an *adult human female*, or that a *man* is an *adult human male*. For example, a transgender woman born as a typical male (XY chromosomes, testicles, and a penis) has a feminine gender identity (i.e., woman), while most human males have a masculine gender identity (i.e., men) (Statistics Canada, “Technical Report”).

There are generally two camps of thought regarding the nature of gender—biological determinism (sometimes referred to as biological essentialism) and social constructivism. Biological determinism refers to the view that biological influences precede cultural influences and put limits to the effects of culture, or alternatively, that social phenomena are significantly determined by biological factors such as genetics rather than solely determined or caused by social or cultural influences (Mikkola). With reference to gender, biological determinism is the view that gendered behaviour is mainly a result of biological influences and processes and is thus immutable (Mikkola). This view is often used to justify arguments in favour of socioeconomic distinctions in gender roles, such as women being better suited to domestic labour while men are particularly well-suited to physical labour and work outside of the home. Given that the roles women have historically been allocated to, feminists largely reject biological determinism because of its use as a basis for gendered discrimination (Mikkola).

There are many proposals regarding the biological processes that influence gendered behaviour. For example,

[In 1889] Geddes and Thompson... argued that social, psychological and behavioural traits were caused by metabolic state. Women supposedly conserve energy (being ‘anabolic’) and this makes them passive, conservative, sluggish, stable and uninterested in politics. Men expend their surplus energy (being ‘katabolic’) and this makes them eager, energetic, passionate, variable and, thereby, interested in political and social matters. These biological ‘facts’ about metabolic states were used not only to explain behavioural differences between women and men but also to justify what our social and political arrangements ought to be. (Mikkola)

Feminists largely reject the biological determinist view. “It reflects the idea that men are naturally stronger, and rational and thus inherently smarter than women” (Singh). For decades, feminist literature has pushed back against this notion and argued instead that gendered behaviour is a result of social forces (de Beauvoir; Butler *Gender Trouble*; Fausto-Sterling *Sexing the Body*).

The social roles of women have traditionally been undervalued. Though both women and men have been, and are, restrained by norms, roles, and expectations associated with their gender, the roles to which women have historically been confined are socially inferior to the roles of men, resulting in the subordination of women. Although many are becoming increasingly critical of the stereotypes that women are best (or only) suited to domestic labour or that roles of power and influence are and ought to be limited to men, it remains the case that domestic and care labour is disproportionately performed by women and disproportionately undervalued economically when compared to the roles that men tend to occupy. Traits commonly associated with either gender are often used to justify this inequity. The bifurcated claim that women *are* a certain way—sensitive, emotional, caring, nurturing as a result of their biological imperative to take care of young, but also materialistic and prefer physically strong men due to their biological imperative to acquire

the mate with the most resources—and that men *are* a certain way—aggressive, strong-willed, intelligent, analytical, but also driven primarily by sexual motivation—serves to justify the gendered social hierarchy. Apart from a number of other problems, this view is decidedly heteronormative.

In the West, a transgender person is understood as someone whose gender identity—their sense of themselves as masculine or feminine—differs from the sex they were assigned at birth (i.e., a male with a feminine gender identity; a female with a masculine gender identity). Contained in this definition of *transgender* are two conventions: 1) that one's *sex* can be different from one's *gender*; and 2) sex and gender are highly coextensive—human males have masculine gender identities and human females have feminine gender identities except in an estimated 0.35% of cases (Stats Canada “Technical Report”). Trans individuals are those who are sexed, for example, as *male* but have a feminine gender identity, or are sexed as *female* and have a masculine gender identity. The existence of transgender individuals serves as evidence that gender identity and biological sex do not always ‘map’ in a one-to-one way; gender identity, though highly correlated to sex, is not a coextension of sex.

In a Western context, the majority of transgender people operate within the gender binary—they identify as *men* or *women* and exhibit the behaviours and norms culturally associated with either gender—thus they do not necessarily pose a challenge for the binary view of gender. However, the term *transgender* is sometimes used as an umbrella term to capture any individual who does not identify as cisgender (Valentine 37). In Canada, the estimated percentage of the transgender (including non-binary) individuals is 0.35% (Stats Canada “Technical Report”). Limited research on non-binary populations means it is difficult to estimate how many people fall into each of these (or other) categories and how

they experience their gender identity. Gender identity is a complex and nuanced concept that is highly personal in its expression; the ways in which a person is comfortable expressing their gender identity are not consistent across gendered groups. Some non-Western cultures have adopted non-binary views of gender, such as Samoa, which recognizes at least three distinct gender categories—one that correlates to our understanding of *women*, one to our understanding of *men*, and a category called *Fa'afafine*: biological males who occupy a feminine gender role (Vasey and Bartlett). *Fa'afafine* are distinct from Samoan woman and are subject to particular social norms that Samoan women are not, and vice versa (Vasey and Bartlett).

Other examples of third-gender categories include the *hijra* in India (Nanda), *katoey* in Thailand (Guadamuz et al.), and *bakla* in the Philippines (Winter et al.). Examples of non-binary gender from across the world highlight the nuanced and complex nature of gender identity and the significance of social norms in facilitating gendered behavior. For decades, the question of what it means to be a woman has been at the centre of feminist literature and today serves as the basis for a fundamental and intense dispute between trans-inclusionary and trans-exclusionary feminists⁵. Trans-exclusionary feminists generally argue that to count as a *woman* one must be an adult human female and as a result be socialized in a particular way (for example, be subject to the specific cultural gender norms associated with females from birth). Those in this camp would likely argue that an individual such as Caitlyn Jenner⁶, who lived for 60 years publicly identifying (though perhaps not *self*-identifying) as

⁵ The term “Trans-Exclusionary Radical Feminist” (or TERF) is often used as a blanket term to describe individuals who do not believe trans women count as women. It is important to note, however, that not all who hold this view are in fact feminists at all, nor are all who believe trans women *are* women feminists, either. The particular debate I am referring to here is held within feminist spaces, however, and so referring to each camp as either trans-inclusive or trans-exclusive feminists is probably accurate.

⁶ Caitlyn Jenner, formerly known as Bruce Jenner, is a prominent and controversial figure in public discourse. Details on her transition and career are outlined in “Caitlyn Jenner: The Full Story” (Bissinger).

a man—competing in elite men’s sports, living in a highly publicized heterosexual relationship, fathering numerous children, and generally experiencing a wealth of privileges afforded to heterosexual white men in the United States—cannot *identify* as a woman because she hasn’t *lived* as a woman (at least not for any significant amount of time), by virtue of being sexed male at birth and occupying a masculine social role for six decades. Trans-exclusionary feminists also tend to hold, however, that gender is a social construct—that gender norms and behaviours are socialized, not intrinsic. A woman does not *behave* ‘as a woman’ by virtue of some immutable biological imperative, but rather has been socialized in a particular way by virtue of being a female-bodied individual. Theodore Bach proposes that:

The essential property of women, in virtue of which an individual is a member of the kind ‘women,’ is participation in a lineage of women. In order to exemplify this relational property, an individual must be a reproduction of ancestral women, in which case she must have undergone the ontogenetic processes through which a historical gender system replicates women. (271)

In short, one is a woman because one has undergone the “ubiquitous ontogenetic process of gender socialization”. This view, however, has anti-trans implications. Trans women who have not “undergone the ontogenetic processes through which a historical gender system replicates women” do not count as women under this view (see Mikkola 4.2 for a detailed account of this problem). The tension between the view that one must experience a particular kind of social process and the view that gender identity is a deeply held inner feeling manifests in aggressive, politically charged, and sometimes violent ways, particularly in the United Kingdom but increasingly in North America, as well.⁷

Alternatively, Judith Butler proposed that gender is a kind of performance, that people learn to behave in particular ways (their walk, dress, speech, etc.) and “perform” a

⁷ See Stats Canada “Transphobic Hate Crime Reports”; Morris; and BBC News for examples of this tension.

kind of act that we call *gender* (*Gender Trouble*). How a person's gender is performed publicly is a reflection of the social expectations associated with their sex (to behave in feminine- or masculine-coded ways) and is not necessarily a reflection of their *gender identity*. In this way, someone's gender or gender identity is not necessarily determined by their sex but by the ways in which gender is performed. Simone de Beauvoir's famous articulation, "[o]ne is not born, but rather becomes, a woman" (301) reflects this position—one becomes gendered through their performance of feminine-gendered acts. For Butler, "gender identity is a performative accomplishment compelled by social sanction and taboo ("Performative Acts" 520). Gender is "an identity instituted through a repetition of acts" (Butler "Performative Acts" 519).

1.1.1 John/Joan: A case study

The sex/gender distinction is often attributed to John Money. In the 1950s, Money conducted work in psychology and sexology that was profoundly influential; his work continues to be referenced in psychology today and has had a great impact on the treatment of DSDs. Money was a proponent of the view that gendered behaviour is learned, in line with the social constructivist view. In the 1960s Money was presented with a case that allowed him to conduct an elaborate experiment to attempt to prove his theory that a person could be gendered as either a boy or a girl depending on their early socialization.

In 1967, twin boys of Janet and Ronald Reimer underwent routine circumcisions. The boys were slightly older than usual for the procedure, as the Reimers had decided to have them circumcised only after the boys developed phimosis, a condition that affected their urethra and could be easily resolved with circumcision. Bringing the boys to St. Boniface Clinic in Winnipeg, Manitoba, the Reimers had little trepidation about the surgery.

The circumcision of baby Bruce Reimer is detailed in John Colopinto's book *As Nature*

Made Him:

[The general practitioner who performed the circumcision] lowered the needle and touched it to Bruce's foreskin. Whether through temporary mechanical malfunction, user error, or some combination of the two, the needle failed to sever the flesh on the first pass. The hemostat control was turned up.

Once again the instrument was applied to the foreskin; again it failed to cut. The cautery machine's current was increased. The needle was once again brought into contact with the foreskin...

A wisp of smoke curled up from the baby's groin. An aroma as of cooking meat filled the air.

A urologist was quickly summoned. [The organ] appeared oddly blanched in color. [The urologist] felt the penis with his gloved hand and noticed that it had an unusual firmness. [The urologist] took a probe and attempted to pass it through the urinary meatus—the hole at the end of the penis. The probe would not pass through...

It was decided not to attempt to circumcise his twin brother. (12-13)

The infant's penis was damaged beyond repair. Devastated, the Reimers consulted several experts in both Canada and the US regarding possible treatment for Bruce's damaged penis but received little in the way of reassurance or solutions. It may have been possible to construct a phallus from tissue farmed from elsewhere on Bruce's body, but the hospital's plastic surgeon cautioned "[s]uch a penis would not, of course, resemble a normal organ in color, texture, or erectile capability. It would serve as a conduit for urine, but that is all" (Colapinto 15). Dr. G. L. Adamson, head of the Department of Neurology and Psychiatry at the Winnipeg Clinic, provided the following evaluation:

One can predict that he will be unable to live a normal sexual life from the time of adolescence: that he will be unable to consummate marriage or have normal heterosexual relations, in that he will have to recognize that he is incomplete, physically defective, and that he must live apart.⁸ (Colopinto 16).

Dismayed, the Reimers returned home to Canada.

⁸ Contained in the neurologist's assessment are the assumption that Bruce would be heterosexual and the assumption that he would be unable to live a healthy life as a man without a penis; the latter assumption is proven false by Bruce's later adult life and other examples outlined later in this chapter.

Several months later, the Reimers saw a television program in which Dr. John Money, a controversial but prominent sexologist, was being interviewed about his advances in the field of sex-change surgery. He had brought with him a trans woman whose feminine disposition impressed the Reimers. John Money's clear position was "the sex a baby was born with didn't matter; you could convert a baby from one to the other" (Colapinto 22). The Reimers decided to reach out to Money regarding the prospect of raising Bruce instead as a girl.

Money had developed a theory regarding the impact of nature and nurture on gender identity and held that nurture would win out against nature in terms of whether one thought of themselves as a girl or a boy. He argued that in terms of *gender* (as distinct from sex), a person is neutral for the first two years of their life, and that their gender identity forms as a result of the socialization process throughout that time period (Colapinto 33). Money suggested that Bruce undergo sex reassignment surgery, and instead be raised as Brenda, or "as a girl". Money hoped that if successful, the case could be used as evidence that gender is learned and entirely a product of socialization, rather than a biological imperative (BBC "BBC – Science").

Despite extensive hormone treatment and the attempts of the Reimers to treat Brenda as they would a daughter, Brenda still developed into a physically masculine child and displayed interests in stereotypically masculine things (Colapinto 57). Colapinto notes that Janet hoped that she could "train" Brenda to want to be a girl (56) but that annual consultations between Money and Brenda intended to protect "against the psychological hazards' associated with growing up as a sex-reassigned child" (79) did not seem to influence Brenda's preferences. In these meetings, Dr. Money would ask Brenda innocent-seeming questions—for example, which parent she preferred—followed by more suggestive

questions regarding the differences between boys' and girls' genitalia and use provocative language (Colapinto 80).

After being told the truth about the accident and subsequent treatment Brenda chose to become David, later meeting and marrying a woman and helping to raise her child (Diamond and Beh 12). Although identifying happily as a man and living in a heteronormative relationship, David dealt with a prolonged difficult relationship with his parents, probably in part due to the experiences involving Dr. Money. After extensive personal and financial issues in his adult life, David committed suicide in 2004 (The Associated Press).

Unfortunately, the case Money hoped would support the social constructivist view of gendered behaviour, commonly referred to as the “John/Joan Case”, was not successful and is commonly cited as evidence *against* the social constructivist view of gender. Contrary to Money's hypothesis, Reimer rejected their⁹ identity as a girl early on, reportedly solidifying their masculine gender identity between 9 and 11 (Diamond). At 15, they transitioned to living ‘as a boy’ and took the name David. Reimer went public with his story in an attempt to discourage similar medical practices. Although David did not have a DSD, his treatment was similar in kind to the treatment of patients with ambiguous genitalia, and his case is frequently cited as a caution against early surgical intervention; patients who may be otherwise male (e.g., possess XY chromosomes) who have ‘inadequate penises’ have undergone and continue to undergo surgeries that ‘produce’ vulvas and are suggested to be

⁹ “Their” is a pronoun now widely preferred by individuals who reject masculine or feminine gender identities. There is controversy in some academic, political, and social circles about the grammatical legitimacy of using “their” as a singular pronoun—throughout this thesis, I use “their” as a singular pronoun in instances where the individual in reference prefers it (i.e., the individual has expressed a non-binary gender identity), or for the sake of clarity such as in the case of the identity of Brain/Brenda/David Reimer, whose reported or assumed gender identity shifts throughout the timeline outlined.

socialized ‘as girls’, regardless of the likelihood of them feeling comfortable with a feminine gender identity.

The Reimer case, while not outright disavowing the cultural and socialized nature of gender identity, does not provide the evidence Money had hoped that one’s gender identity is completely due to social forces. Combined with the myriad of research available today that shows gender identity is relatively fixed as early as three years old¹⁰ there is strong evidence that gender identity is influenced *at least in part* by biological or physiological imperatives. This, however, does not serve as strong evidence of biological essentialism or determinism.

Social constructivism and biological determinism are at opposite ends of the gender ideological spectrum. At the heart of the political and bioethical debates around the treatment of trans individuals is the deep disagreement among politicians, policy writers, physicians, psychologists, biologists, activists, and parents about the nature of gender. In my view, the available evidence suggests that gender identity is a complex and nuanced part of individual identity, influenced in part by social norms associated with one’s sexual characteristics. The growing prominence of trans identities^{11,12} also seems to support the view that gender identity is not solely a result of biological or physiological imperatives, as individuals who display all the physiological traits associated with females can and do identify as men, and individuals who display all the physiological traits associated with males can and do identify as women. Although it is possible in theory that a physiological

¹⁰ Studies suggest that most children have a strong sense of their gender identity by the time they are four years old (Canadian Paediatric Society).

¹¹ The “growing prominence” of trans identities is a source of controversy. I support the view that the increasing number of individuals identifying as trans (or agender, or gender-queer) is likely a result of increased availability of resources, decreasing social stigma, and increasingly adequate healthcare for such individuals in North America (Nolan et al.).

¹² Though data on the exact number of trans individuals is limited, Statistics Canada estimates that 0.35% of the population in 2019 identified as trans or non-binary (“Experiences of Violent Victimization”). This number (and awareness of this population) increases as the social movement for trans acceptance and access to resources increases. See Nolan et al. for a discussion on the growing number of individuals identifying as trans and non-binary.

trait exists that all individuals who identify as women or men possess, there appears to be no evidence of such a trait. What is more likely is that one's gender *identity*—how one perceives themselves as masculine or feminine—is a complex and nuanced mosaic of biological, physiological, phenotypical, and most probably social influences, as well.

To be sure, this debate is profoundly important. Views on the nature of gender directly impact medical and sociological treatment models for individuals who struggle with their gender identities as well as the access individuals have to such treatments. The ongoing debate about the legitimization of trans identities and whether gender confirmation surgeries are appropriate or warranted impact the mental and physical health of trans individuals in important ways. There are ongoing conversations about the age at which gender identity is fixed and the ages at which hormonal or surgical therapy is appropriate. Upholding the conclusion, for example, that biological males cannot correctly identify with a feminine gender identity limits the available treatment to such individuals causing them undue harm by forcing them to live without their desired treatment or seek dangerous alternatives.

The ethical debate surrounding the treatment of trans individuals, particularly with regard to children, is ongoing and mirrors a similar debate regarding children with DSDs. On the one hand, it seems to be the case that early intervention (i.e., early social gender affirmation, including in some cases hormone therapy) may result in better outcomes in adulthood, as trans individuals who are treated prior to puberty may avoid surgeries later in life (e.g., transmen treated prior to undergoing female puberty may avoid the desire for breast-reduction surgeries later in life). Critics argue that children may not be able to accurately identify themselves as trans at such a young age and should not undergo

treatment, particularly irreversible treatment such as gender confirmation surgery¹³ or hormone replacement therapy until they are old enough to consent; the age at which a child is able to consent to medical procedures is a separate ethical debate. A review conducted in 2019 concluded that “[t]here are significant problems with how the evidence for gender-affirming cross-sex hormone has been collected and analysed that prevents definitive conclusions to be drawn” (BMJ) there is a significant lack of clear evidence to support conclusions for or against early gender affirmation therapy or puberty blockers.

The debate described above closely mirrors the concerns raised by advocacy groups with regard to DSDs treatment—particularly that infants should not undergo irreversible treatments until they are old enough to understand the implications. However, an important difference between the treatment of trans individuals and the treatment of DSDs is the context in which the treatment is performed—with regard to DSDs, physicians are (or were) often imposing a sexual identity onto an ambiguous infant, forcing them to undergo an irreversible surgery that would, physicians thought, define a sex *for the individual*. In the case of trans individuals, the individual—child or adult—is undergoing a particular treatment to have the sex traits associated with their gender. There are cases, however, in which a questioning child is pressured into a particular treatment in hopes the treatment will work to solidify their gender identity or alleviate the distress associated with it¹⁴. In these

¹³ “Gender confirmation surgery”, or “gender affirmation surgery”, is an umbrella-term that refers to surgical procedures that alter a person’s appearance to align with the normal physical appearance of the sex associated with their gender identity (e.g., facial masculinization or feminization, mastectomy, genital reconstruction (American Society of Plastic Surgeons)).

¹⁴ Awareness of “detransitioning” is becoming more widespread—several individuals who have transitioned gender and then “detransitioned” to their gender assigned at birth are speaking out about their experiences with the medical system, and in some cases, the pressures they experienced to undergo transition in the first place. The story of Elle Palmer, for example, involves a young individual who believed she wanted to transition to living as a man after experiencing a traumatic sexual assault—believing the assault happened *as a result* of her being a woman led her to reject her identity as a woman. After transitioning Elle rejected her masculine gender identity and appearance but is left with a distinctly masculine sounding voice and other masculine traits (“Detransition Real Life Experience”). Though Elle’s story (and others) is troubling and deserving of careful

cases, the concerns raised by those concerned about the early treatment of trans or questioning children may be warranted. In any case, both debates and their outcome(s) are profoundly important for each group in question.

1.2 Is the sex/gender distinction real?

Scientific disciplines divide the particulars they study and theorize about into *kinds*. To say that a kind is a “natural kind” is to say that it corresponds to a grouping that reflects the structure of the natural world rather than the interests and actions of human beings. We often think that scientific practices are successful in identifying such kinds, and that the kinds that scientific disciplines study or theorize about are *real* in the sense that they exist outside of our social interests. For example, chemical elements are often taken to be a paradigm case of natural kinds: the elements exist independently of our interest in them (Bird and Tobin 2.2). The existence of these kinds is often assumed in scientific explanations and explanations. Scientific classifications are particularly useful for explaining and predicting phenomena (i.e., they are epistemological distinctions), though there is debate over whether such *epistemological* distinctions (i.e., useful at predicting and explaining phenomena) can be taken as *metaphysical* distinctions (i.e., “natural kinds”) (Khalidi 3). Two major metaphysical camps with regard to natural kinds are *naturalism* and *conventionalism* (Bird and Tobin).

The view that there is a genuinely *natural* way of classifying objects is considered *naturalism*. To group all thing containing carbon together seems natural, as it is a naturally occurring property and a shared property across all things within the classification. However,

analysis, such cases do not indicate that early transition ought to be avoided in all cases (see Butler and Hutchinson). There is significant research to be done in this area to indicate the appropriateness of the suggestion of transition and the nature of treatment for particular individuals, as well as careful training for physicians and mental health professionals working with such individuals.

to group Charles Manson, the colour orange, and ramen noodles together seems arbitrary as those three objects seem to share no common properties. The classification “computers that are manufactured by Apple” is not arbitrary but is also unnatural as the property that is shared across the objects in the classification is not naturally occurring. Naturalists are closely associated with scientific realists, who hold that successful scientific theories represent theory-independent phenomena (Bird and Tobin 1.1). Sex is generally taken to be a natural kind under the common-sense view—a person’s sex is taken, most often, to be a naturally occurring distinction and a fact about them that is independent of our knowing or measuring it.

Among other things, naturalists about natural kinds believe that: members of a natural kind should have some natural properties in common; they should permit inductive inferences; and they should be categorically distinct (Bird and Tobin 1.1.1). If the borders between classifications are not distinct, then perhaps the border between them would not be natural but somehow drawn by us (in other words, non-distinct boundaries may seem arbitrary), and the kinds would not be genuinely natural. Chemistry is considered a paradigm case of natural kinds, as there are no atoms that are intermediate between chlorine atoms and argon atoms, for example (Bird and Tobin 1.1.1).

Juxtaposed with naturalism is *conventionalism*, or *constructivism*. Conventionalists “deny that any of our classifications, including those of science, are naturally privileged forms of classification. The classifications of botanists do not carve nature at its joints any more than the classifications of cooks” (Bird and Tobin 1.1.2). Weak constructivism argues that some of our constructed classifications reflect real divisions, as opposed to strong social constructivism, the view that *none* of our classifications reflect real divisions. “The point of social constructivism is to reveal that some of our classificatory categories and practices

though they may appear inevitable are actually contingent and relative to the practice of classification in the context of social institutions and norms” (Bird and Tobin 1.1.2). Under the SGD, *gender* is often considered a constructed kind while sex is considered a *natural* kind—social constructivists with regard to *gender* often do not argue that biological sex is constructed. Sex categories are epistemologically useful in that the sexes seem to provide a high degree of predictive power, at least in certain contexts. However, there are theorists who argue that sex is at least in some ways socially constructed. For example, Butler argues:

If the immutable character of sex is contested, perhaps this construct called ‘sex’ is as culturally constructed as gender; indeed, perhaps it was always already gender, with the consequence that the distinction between sex and gender turns out to be no distinction at all. (*Gender Trouble* 10–11)

I maintain that the SGD is useful, particularly within the conversation around gender identity and of those whose gender identity does not conform to that normally associated with their sex, although the SGD may not be necessary to defend the phenomena and legitimacy of trans individuals and their gender identities. However, the divide between cultural and biological influences on gender identity is not at all clear, and this is important in the context of the conversation about what it means to be a male- or female-bodied person. We should exercise caution when employing the SGD and the assumption that biological sex is independent of cultural or social factors.

1.3 Is the sex/gender distinction important?

The use of *sex* and *gender* as synonyms is often inadvertent, “perhaps partly due to squeamishness about the word ‘sex’” (Sullivan 521). There is pressure from some politically motivated groups to intentionally conflate the concepts in an effort to promote the legitimacy of trans identities in a social context in which sex and gender are generally viewed as coextensive. However, a conceptual distinction between *sex* and *gender* is important for several reasons. As noted above, it is often used “to draw attention to the thought that

biology is not destiny: the sex we're born with needn't determine the sort of life we live" (Saul 196). However, given that some individuals identify their gender in such a way that seems to oppose their physiological sex, distinguishing conceptually between physiological sex and socialized gender identity allows one to be sexed *female* and have a masculine gender identity, or be sexed *male* and have a feminine gender identity; the SGD, in tandem with rejecting the absolute coextension of sex and gender, supports the legitimacy of trans identities.

The use of *sex* and *gender* interchangeably within the conversation of *gender identity* confuses these concepts even further and has the effect of encouraging fallacious arguments on both sides of the debate. For example, the American Psychological Association refers to "gender identity" as "one's sense of oneself as male, female, or transgender" (American Psychological Association. Their definition is fallible to the criticism that *male* and *female* are terms that refer to a physiological fact about an individual rather than a social identity. With a proper understanding of the sex/gender distinction, *gender identity* is more accurately understood as one's sense of themselves as being *masculine* or *feminine*, distinct from being male or female. Trans identities present a challenge for the traditional view of gender as coextension with sex; under the sex/gender distinction, it is not contradictory to claim one is a *male* and a *woman*, or a *female* and a *man*. Conceptually separating sex and gender also allows for accurate data collection that assists public and medical policy research. Here I will discuss two cases in which SGD is necessary to provide accurate data that influences policy development and research.

1.3.1 Sports

The clarification of the difference between male and female bodies matters outside of medicine. In recent years the issue has become prominent in sports, particularly with regard

to the question of which category trans women ought to compete in. Some states have passed legislation recently banning trans women from competing in women's sports because they are believed to have an unfair advantage over cisgender women, such as Idaho's recently passed "Fairness in Women's Sports Act" ("Gov. Ron DeSantis").

Some studies suggest that trans women do possess an unfair advantage, at least in some sports. A study published in the *British Journal of Sports Medicine* in May 2021 found that trans women retain an advantage in running tests even after taking hormones for two years to suppress their testosterone:

Participants were 26.2 years old. Prior to gender affirming hormones, trans women performed 31% more push-ups and 15% more sit-ups in 1 min and ran 1.5 miles 21% faster than their female counterparts. After 2 years of taking feminising hormones, the push-up and sit-up differences disappeared but trans women were still 12% faster. Prior to gender affirming hormones, transmen performed 43% fewer push-ups and ran 1.5 miles 15% slower than their male counterparts. After 1 year of taking masculinising hormones, there was no longer a difference in push-ups or run times, and the number of sit-ups performed in 1 min by transmen exceeded the average performance of their male counterparts. (Roberts et al. 577).

However, others claim there is no strong evidence to suggest that trans women in general possess a physical advantage over ciswomen (Ivy and Conrad). Instead, researchers opposed to legislation banning trans women from women's sports argue that there is simply not enough evidence to understand how exactly hormone replacement therapy impacts the performance of trans women in sports.

Importantly, there exist a myriad of discrepancies in ability between athletes, many of which are not considered issues of fairness. Michael Phelps possesses an unusually wide wingspan, double-jointed ankles, and produces half the lactic acid of the typical athlete; these genetic advantages are considered gifts that allow Phelps to excel in his sport but not as unfair advantages that ought to be curbed (Hesse). It seems, then, that distinct differences between trans women's and ciswomen's bodies should be accounted for in particular sports

to determine if the set of trans women possess a particular advantage *in general* over cis women, or individual advantages should be written off as discrepancies between individual athletes. In either case, this debate highlights the importance of the distinctions we draw between male and female bodies and why it might be important to do so.

Women's sports exist in part because female athletes cannot, in most cases, compete at a fair level with male athletes. The question of who can compete in a protected category has important implications. The debate is not only about how to deal with trans athletes who wish to compete in a particular category but also athletes who identify themselves as ciswomen (or cismen, to a lesser degree) who are diagnosed with a DSD that impacts a physiological trait considered to be advantageous to their sport. Take, for example, Castor Semenya, a South African middle-distance runner who was assigned female at birth, but who also has XY chromosomes and naturally elevated testosterone levels. Semenya has been at the center of several controversies in her sport involving her status as a woman, as a female, and whether she ought to be allowed to compete in women's sports in light of her perceived chromosomal and hormonal advantage over most adult human female middle-distance runners. Winning two Olympic gold medals and three world titles for the 800m competition, Semenya has been banned from the race after refusing to undergo hormonal therapy (Gregory).

This debate impacts sport at the Olympic, state, and municipal levels today as U.S. states pass legislation preventing trans women from competing in women's sports categories. Dreger refers to two camps in the debate over sex categorization in sports: Anatomists, who believe sex is highly complex and that there is no one single physiological trait that sharply divides males and female bodies, but that we should still base our sex divisions, at least in sports, on some biological feature; and Identifiers, who "believe the line

between men and women athletes ought to be based in self-identity. [They] take the messiness of sex development as a reason to give up on biology as the way to distinguish athletes by sex,” (Dreger, “The Olympic Struggle”)¹⁵.

In Chapter 3, I will discuss research conducted by Joel and colleagues that suggests the sexual dimorphism of hormonal levels (estrogens and testosterone in particular) are not sexually dimorphic, presenting a challenge for those who claim sex categorization, particularly in sports, should be made on the basis of hormone levels. Meanwhile, given that it might be right, in at least some cases, to limit who can compete in what events suggests that it is a mistake to conceptually conflate sex and gender.

1.3.2 Health research and statistical analysis

Conflating sex and gender and defining *sex* in terms of self-identification is also problematic in medical care. In 2019, the U.K. National Health Service (NHS) was criticized for failing to invite transmen to cervical or breast cancer screenings while trans women (despite not having cervixes) were invited for both:

Public Health England guidance currently means that trans people who register with their GP as their birth sex are invited to screenings appropriate to that gender. However, if they register [their sex] as the gender they identify as, they will not be.

It means a trans man, born female but registered as male, will not be invited for either routine cervical or breast screening, putting them at greater risk of the disease being missed. (Pickles)

It is clear in the short excerpt above that the conflation of *sex* and *gender* is highly confusing. What the article is attempting to convey is that individuals who are *born male* and *identify as women* can either register with their GP as *men/male* or *women/female*. This is

¹⁵ During the recent 2021 Tokyo Olympics, transwoman Laurel Hubbard competed in the women’s weightlifting category sparking controversy; Hubbard is the first openly transgender person to compete at the Olympics (Klosok), though transgender athletes have been allowed to compete (openly) in Olympic sports since 2004 (Cavanagh and Sykes). Hubbard has been discussed in contrast to Quinn, a non-binary athlete on the women’s Olympic soccer team. Quinn identifies as non-binary and transgender, but as they are a biological female competing for the women’s team, Quinn has been the subject of less controversy (Hayton).

problematic for a few reasons—trans women are *women* in terms of their gender identity and *male* in terms of their sex, which plays an important role in hormonal development and risk of cancer and other diseases. It is inaccurate to label them as either “men/male” or “women/female” because they are *women and male* in important ways with regard to their medical care. Neither option allowed to them is accurate because of the conflation at the public health level of sex and gender.

Additionally, trans individuals may be at higher risks for certain diseases depending on the hormone or other treatments they have undergone. For instance, a study conducted in 2019 found that “[i]n trans women, the risk of breast cancer increased during a relatively short duration of hormone treatment and the characteristics of the breast cancer resembled a more female pattern,” (Blok et al. 1).

At the same time, there are important differences between male and female bodies that, when ignored, can have serious consequences. Referred to as the “gender data gap” (Buvinic and Levine) there are myriad examples of cases in which the default research subject is male. The “Reference man”, defined by the International Commission on Radiological Protection's is “between 20–30 years of age, weighing 70 kg, is 170 cm in height, and lives in a climate with an average temperature of from 10°C to 20°C,” (Ellis). Research in occupational hazards, transportation safety, drug testing, and safety equipment, is often conducted using male bodies as a standard leaving females, who tend to be smaller and have different hormonal and metabolic systems, at greater risk. For example, the formula to determine standard office temperature was developed in the 1960s overestimates female metabolic rate by as much as 35%, meaning that current offices are on average five degrees too cold for females (Kingma and Marken Lichtenbelt).

Though in many of these cases the population at risk is *female* (i.e., sex-based risk), in some cases the population at risk is *women* (i.e., gender-based risk). For example, in nail salons, where the workforce is almost exclusively made up of women (and largely migrant), workers are routinely exposed to a wide range of chemicals from polishes and other products that are essential to their work but that have also been linked to cancer, miscarriages, lung diseases, and impacts on hormonal functions (Ford and Scott). However, lack of research on female bodies with regard to risks such as occupational hazards, chemical exposure, and cancer development, among others, means it is difficult to determine at all if such risks are associated with social or biological factors, or both. To be sure, certain health risks disproportionately impact males and men over females and women, such as heart disease (Centers for Disease Control and Prevention) substance abuse, and antisocial personality disorder (Alegria et al.). It is important to be able to determine whether certain risks disproportionately impact “women” due to biological factors and therefore unlikely to impact transwomen but likely to impact transmen, or due to social factors and therefore likely to impact transwomen but unlikely to impact transmen. These risks should be studied with the SGD in mind.

All three Canadian Tri-Council research funding agencies—the Canadian Institutes of Health Research (CIHR), the Natural Sciences and Engineering Research Council of Canada (NSERC), and the Social Sciences and Humanities Research Council (SSHRC)—distinguish between sex as biological considerations and gender as sociocultural considerations in research (Canada Research Coordinating Committee). CIHR notes that both “... sex and gender influence a person’s risk of developing certain diseases, how well we respond to medical treatments, and how often we seek health care” (Canadian Institutes of Health Research). Sex, understood as a physiological variable, and gender, understood as

a social variable, have different and complex influences on person's health. Identifying and analyzing the kinds of risks posed to an individual on the basis of their sex (for example, a higher risk of breast cancer in females, risk of testicular cancer in males) versus on the basis of their gender (for example, exposure to higher levels of stress in particular lines of work, or risk of domestic or sexual abuse) is difficult if there is no conceptual distinction between sex and gender.

UK census authorities proposed guidance that in the 2021 UK census the “sex question” (i.e., “what is your sex” (Census 2021)) could be answered according to gender identity, raising a number of issues related to data collection and the measurement of sex and gender (Sullivan). The debate surrounding gender ideology and the nature of gender identity is particularly heated in the UK. Sullivan argues that “culture of silencing and policy capture by gender identity lobbyists uniquely affects this aspect of data collection,” (Sullivan 521). Without accurate data on sex as distinct from gender identity we are unable to “... understand differences and to design evidence-based policies tackling problems facing girls and boys, women and men ... [and the] ability to gain an accurate understanding of issues facing, [sic] trans people of both sexes,” (Sullivan 522). The problem of data collection is particularly important—we currently face a lack of complete and reliable data on trans, non-binary, and other gender-queer populations in part due to the inconsistency and conflation of the usage of the terms *sex* and *gender*.

The issue of sex as self-identification is importantly different from the issue of *gender identity* as a matter of self-identification; *gender identity* as self-identification raises its own implications that I cannot explore here.¹⁶ Sex as self-identification is problematic as biological sex is an important factor in medical and statistical research. The use of the SGD

¹⁶ See “Why self-identification should not legally make you a woman” by Kathleen Stock (Stock 2018) for an interesting discussion on the implications of gender identity as self-identification.

allows us to maintain the use of sex as a factor in statistical analysis while allowing flexibility in terms of social and personal identification; the SGD allows us to conceptualize *sex* as distinct from an individual's self-identification as masculine or feminine.

It is important not only as a matter of legitimizing gender identities that people can accurately identify their sex and gender identity, but that we have information that accurately represents a particular population in terms of policy planning and medical care. If there is no way of accurately determining how many trans or non-binary people exist in a population because we have conflated sex and gender at multiple levels of screening, there is no way to properly understand the needs of the population. The lack of accurate data on trans, non-binary, and DSDs populations is compounded by the lack of understanding and accurate reflection at the government and public health level of the distinction between physiological sex and gender identity.

Some may argue that the distinction between sex and gender is a distinction without a difference, and more to the point, that no naturally discernable difference between “sex” and “gender” exists. I argue that drawing a conceptual difference between social behaviours and norms associated with women and men (“referred to as “gender”) and physiological attributes (referred to as “sex”) are importantly different though not entirely separable and maintain that the SGD is useful conceptually. Using the term *gender* to refer to a set of social and cultural norms and *sex* to refer to a set of physiological and biological characteristics is at the least a pragmatic distinction that allows for clearer research methods and more nuanced social identities. The issues explored above provide examples of why it is important to arrive at a methodology of differentiating between bodies on the basis of sex and why it is important that this methodology be grounded in something measurable. This

thesis is concerned with the ways in which biological sex categories are conceptualized, as distinct from the ways in which people identify with or reject social gender norms.

Chapter 2: Sexual development

Sex is commonly conceptualized as binary; sex-typical traits typically follow one of two developmental pathways. However, Disorders of Sexual Development (DSDs) are a group of conditions caused by variations in the development of sex-typical traits. DSDs raise doubts about the binary model as they highlight variations in sex development that seem to fall outside of the traditional binary model. DSDs range from cosmetic variations in genital development to serious abnormalities, delayed or absent puberty, infertility, and other critical medical conditions (Witchel). This chapter will identify some DSDs and provide a brief overview of historical and current perception and treatment of DSDs to provide context for the social and political weight of the non-binary views of sex.

The term *hermaphrodite* in biology refers to “systems in which male and female sexes exist in the same individual, i.e., a single individual produces both small and large gametes,” (Lehtonen and Kokko 1166). Hermaphroditism is a normal condition in many organisms and enables a form of sexual reproduction in which either partner can act as either the ‘male’ or ‘female’. Humans who exhibit both male and female sex characteristics, such as ambiguous genitalia, have also historically been referred to as *hermaphrodites*, though the term *hermaphrodite* as it refers to humans has fallen out of fashion and has been replaced by the term *intersex*. However, the Intersex Society of North America¹⁷ noted that while “some intersex people seek to reclaim the word ‘hermaphrodite’ with pride to reference themselves (much like the words ‘dyke’ and ‘queer’ have been reclaimed by the LBGT community), we’ve learned over the years it is best generally avoided, since the political subtlety is lost on a lot of people” (“Frequently Asked Questions”). The term ‘hermaphrodite’ can confuse

¹⁷ The Intersex Society of North America (ISNA) was a non-profit advocacy group founded in 1993 “in an effort to advocate for patients and families who felt they had been harmed by their experiences with the health care system” (“Dear ISNA Friends and Supporters”). The ISNA organization closed in June 2008, and has been succeeded by a number of organizations including interACT and the Accord Alliance.

clinicians, cause panic to parents, and further stigmatize patients. It is now recommended that the specific name of a condition be used in practice (Délot and Vilain 365), though intersex is often used as an umbrella term in much of the literature.

Levels of sex designation are standardly understood as genetic sex, chromosomal sex, gonadal sex, hormonal sex, ductal sex, external genitalia, secondary sex characteristics, legally assigned sex (García-Acero et al. 170). Disorders of Sexual Development (DSDs) can present at every level of sex designation and are classified according to the level at which they present an alteration.

Understanding the development of sex differences has informed and been informed by the advances in the molecular dissection of genes responsible for disorders of sex development (DSDs). New genes have been identified, allowing for rapid diagnosis, understanding of the pathophysiology, and prediction of future fertility. In parallel with the progress in the biology of sexual development, the management of individuals with disorders of sexual development has started a gentle revolution. The clinical approach to DSDs is slowly entering the era of evidence-based medicine, under the pressure of patient advocacy groups, who have been highly instrumental in establishing a dialogue between practitioners and their patients. (Délot and Vilain 365)

The clinical approach to DSDs has been a source of controversy, but due to the contributions of theorists that will be discussed in this chapter, clinical management has begun a reform toward a patient-centered approach (Délot and Vilain). Though much of the literature regarding treatment of DSDs is focused on cases of ambiguous genitalia (Fausto-Sterling “The Five Sexes”; Kessler), there are various conditions that can be encompassed by the terms ‘intersex’ or ‘DSDs’.

During embryonic development, sex development in humans occurs in two main stages: *sex determination* and *sex differentiation*. Human embryos begin as sexually undifferentiated; genetic sex is determined by whether the embryo inherits an X- or Y-chromosome from the father. In the first phase of sexual development, the presence of a Y-chromosome, which contains the SRY gene, triggers the transformation of the bipotential

gonad into a testis; if the Y-chromosome is absent, the bipotential gonad develops into an ovary (Délot and Vilain 366). The significance of the SRY gene in this process was discovered in 1947 through a series of experiments that showed "...that all mammalian embryos that are castrated early in development and reimplanted into the uterus develop into females, regardless of their genetic sex. Unilateral grafting of a testis in the embryo results in ipsilateral masculinization of structures, demonstrating that testis-specific factors trigger development of male internal genitalia" (Délot and Vilain 366). This discovery formed the basis of our current paradigm of sex development in mammals: 'sex determination' refers to whether the bipotential gonad develops into an ovary or testis (Délot and Vilain 366).

In the second phase, *sexual differentiation*, either the developing testis secretes hormones that trigger the development of Wolffian structures, the growth of a phallus, and the descent of the testicles; or the absence of a testis (the presence of an ovary) allows the development of Mullerian structures and female external genitalia (Délot and Vilain 368). Testes secrete testosterone (T) and anti-Mullerian hormone (AMH) which encourages the development of male external genitalia and the descent of the testes. An ovary, alternatively, is not exposed to T or AMH and the development of the female external genitalia is encouraged (Délot and Vilain 368)¹⁸.

2.1 Disorders of sexual development

Disorders of Sexual Development (DSDs) are complex conditions that involve deviancy in sexual differentiation and sexual development (Hughes et al. "Consensus"). Previously referred to as "intersex conditions", the move toward the terminology "DSDs"

¹⁸ Feminist criticism of science often point out that literature and studies often tend to focus on male-centered analysis (see section 1.3). In the case of sex development, there is strong evidence to suggest that the trigger of sex differentiation is, in fact, the Y-chromosome and SRY gene. However, "[t]here is evidence in animal models of pregonadal sexual differentiation independent of determination by SRY expression. The results of analysis in vitro of fertilized embryos show early evidence of sexual dimorphism" (García-Acero et al. 170).

was in part due to a desire to accurately reflect the conditions in a medical context and to avoid confusion with transgender and homosexuality (Hughes “Consensus”). However, the term “disorder” also carries a stigma, particularly with regard to something as socially significant as sex. Part of the suggestion of the current recommendations is to give a diagnosis as specific as possible to avoid generalization and confusion regarding the implications of the condition in patients and practitioners (Hughes “Consensus”). Although current treatment models are increasingly considering in patient-centered care and take into consideration the recommendations of ethicists, theorists, and activists, it is still difficult to measure the frequency of DSDs. Estimates vary; Fausto-Sterling commonly cites the prevalence as 1.7 in 100 (*Sexing the Body* 153), while others estimate the prevalence is 1 in 4,500 to 5,500 live births (García-Acero et al.169).

The clinical classification in patients is difficult because the phenotypes are similar or almost identical and may have several etiologies. Due to the lack of clarity of the term, there is no certainty of the incidence of the conditions included. It has been estimated that its individual incidence is approximately 1 in 4,500-5,500 newborns and when considering all genital congenital anomalies... the incidence can be from 1:200 to 1:300. (García-Acero et al. 169)

The conditions that are denoted by ‘intersex’ and the conditions that are denoted by ‘DSDs’ are not necessarily identical. In 2006, the Chicago Consensus defined DSDs as “congenital conditions in which the development of chromosomal, gonadal and anatomical sex [i.e., genitals] is atypical” (García-Acero et al. 169). Genes, gonads, and genitals taken together are sometimes referred to as ‘3G sex’. There is strong evidence to suggest that the features of 3G sex correlate 99% of the time (Joel “Genetic-gonadal-genitals sex” 1), meaning that in about 99% of people the presence of a vulva indicates the presence of ovaries and XX chromosomes (female-type), and the presence of a penis indicates the presence of testicles and XY chromosomes (male-type). For this reason, it is reasonable for physicians to make a sex determination at birth based on an infant’s genitalia. In most cases, genitals are not

ambiguous, and in most cases, the presence of either a vulva or penis indicates the presence of the rest of the 3G group associated with it. Thus, it is a fair assumption that the 3G sex of an individual is either the male- or female-type based on a genital inspection (although, the observation that the 3G sex of an individual is male- or female-type is not evidence that the individuals “psychological sex” (or gender identity) will be masculine in the presence of a penis or feminine in the presence of a vulva).

In 2006 the Pediatric Endocrinology Society, Lawson Wilkins and the European Society of Pediatric Endocrinology proposed three classifications by which clinical management is currently carried out: 1) DSDs sex chromosomes, 2) DSDs 46,XX and 3) DSDs 46,XY¹⁹ (García-Acero et al. 170) However, despite this classification, not all conditions fit into one of these categories, and some may belong to more than one (García-Acero et al. 170).

DSDs can present at various life stages. A fetus or newborn with ambiguous genitalia can be identified before or at birth, but gonadal dysgenesis and internal genitalia that are incongruous with the sex chromosomes (e.g., the presence of internal testicles and female external genitalia) are often only identified later in life (Witchel). Androgen Insensitivity Syndrome (AIS) is a condition that is typically diagnosed closer to puberty. Individuals with AIS have male sex chromosomes and have androgen receptors that completely or partially do not respond to testosterone. As a result, the Wolffian duct does not develop into the male reproductive system, and the embryo develops the lower third of the female-type reproductive system. “Long-term psychosexual outcome in complete androgen insensitivity syndrome suggests a trajectory of female-typical development, with the assimilation of a

¹⁹ 46,XX DSD is a karyotype in which individuals with two X chromosomes in each cell (normally found in females) have a male appearance and male external genitalia (Genetic and Rare Diseases); 46,XY DSD is a karyotype in which an individual with one X and one Y chromosome (normally found in males) has feminized or undermasculined genitalia (T. Li et al.).

female identity and female-typical behaviour, and psychological wellbeing similar to that of other women” (Hughes “Androgen”).

Micropenis and clitoromegaly are conditions in which the genitals fall outside the statistical norm. Most neonate penises measure between 2.8 and 4.5 cm and are about 0.9-1.3 cm wide (Kessler 40). Though there is some debate on how exactly to measure the penis (flaccid, stretched, etc.), “[a] micropenis is... defined as having a stretched length of less than two and a half standard deviations below the mean for age or stage of sexual development,” (Kessler 40). A penis of this size is statistically smaller than 99.4% of the population (Kessler 40). Clitoromegaly and micropenis themselves pose no health risks to an individual, though clitoromegaly is often a sign of Congenital Adrenal Hyperplasia (CAH)²⁰. There are various health risks associated with underlying causes of DSDs, including gonadal tumors (García-Acero et al. 170). See Hughes (“Consensus”) for the 2006 consensus statement on management of intersex disorders, including proposed revised nomenclature of DSDs and examples of conditions in each classification.

2.2 Treatment and diagnosis of DSDs

There is some demand for a moratorium on early genital surgery in cases of DSDs (Diamond). To determine whether DSD patients expressed dissatisfaction with early genital surgery to the degree critics maintained, in early 2021 Bennecke et al. conducted a multicentre survey by cross-sectional questionnaire in 14 European clinics. The study comprised 459 individuals who had been diagnosed with a DSD diagnosis and studied the level of agreement with given statements regarding genital surgery, including clitoris

²⁰ “CAH occurs when there is a broken genetic ‘recipe’ for making cortisone in the adrenal glands (the glands on top of the kidneys that make various hormones and add them to the blood stream [sic]. Because the recipe is broken, the adrenal glands, while trying to make cortisone, may make an unusually high level of other hormones that are ‘virilizing’. That is, they can make XX embryos have larger than average clitorises, or even a clitoris that looks rather like a penis, or labia that look like a scrotum” (Intersex Society of North America “Congenital Adrenal Hyperplasia”).

reduction, vaginoplasty, and hypospadias repair. The study found that individuals who had undergone early genital surgery were more likely to approve of it, but outcome data failed to support a general moratorium on early elective genital surgery due in part to the varied responses by diagnosis, gender, history of surgery, and contact with support groups. Researchers concluded that a case-by-case approach at this time is preferable (Bennecke et al.).

The majority of literature criticizing the traditional medical approach to the treatment of DSDs has been focused on DSDs that result in ambiguous genitalia (Fausto-Sterling “The Five Sexes”; Kessler). The traditional approach to treatment has been to create genitalia that ‘match’ the sex of rearing to influence a gender identity that matches the assigned sex, provide a positive psychological adjustment, and allow heterosexual sexual intercourse (Kessler; Dreger “Ambiguous Sex”). Fausto-Sterling describes the position of many physicians as “... a rhetoric of tragedy. ‘One can only attempt to imagine the anguish of the parents. That a newborn should have a deformity... (affecting) so fundamental an issue as the very sex of the child... is a tragic event which immediately conjures up visions of a hopeless psychological misfit doomed to live always as a sexual freak in loneliness and frustration’” (*Sexing the Body* 47). In *Lessons from the Intersexed*, Kessler discusses various surgical procedures performed on infants with ambiguous genitalia. The term ‘genitioplasty’ refers to surgery on the genitals; surgery on the phallic tissue (the penis on males, the clitoris on females) is referred to as phalloplasty and clitoroplasty, respectively (Kessler 47).

According to Kessler, the cultural understanding of gender norms influence the ways in which sex determination was made in cases where it was ambiguous and resulted in the “production of girls” (i.e., more female sex determinations) based on the notion that “it is easier to dig a hole than build a pole” (Gearhart qtd. in Gurney 633). In other words, the

surgical production of a vulva was less complex than the surgical production of a penis. The *function* of the surgically produced vulva, under this assumption, is simply aesthetically conventional with a hole large enough to accommodate an average-sized penis, while a functional penis needs to become sufficiently erect and be adequately sized to be accommodated by an average vaginal canal.

Prosthetics are required to ‘create’ a penis and testicles from skin around the labia majora sometimes leading to infection, erosion, dysfunction, or leak (Hoebeke et al. 334), “One of the goals of total phallic construction is the achievement of a rigidity that allows penetrative sexual intercourse” (Hoebeke et al. 340), and due to the complexity and related complications, it is easier for a physician to create a vaginal canal as opposed to lengthening a micropenis resulting in the ‘creation’ of more vaginas in such cases. In addition to the logistical challenges, in the case of phallic construction “there remains an implicit privileging of the phallus, a sense that a “real one’ can’t be made, but only born” (Garber 149). Alice Dreger notes in her highly influential 2012 paper, ““Ambiguous Sex”—or Ambivalent Medicine?: Ethical Issues in the Treatment of Intersexuality”:

For a constructed vagina to be considered acceptable by surgeons specializing in intersexuality, it basically just has to be a hole big enough to fit a typical-sized penis. It is not required to be self-lubricating or even to be at all sensitive, and certainly does not need to change shape the way vaginas often do when women are sexually stimulated. [When a surgeon who treats intersexuality] was asked, “How do you define successful intercourse? How many of these girls actually have an orgasm, for example?” [they] responded, “Adequate intercourse was defined as successful vaginal penetration.” All that is required is a receptive hole. (“Ambiguous Sex” 29)

Thus, the creation of a female body (defined by a body with a vaginal opening large enough to accommodate an average penis) is relatively simple, compared with the task of creating a penis required for “successful malehood” (Dreger “Ambiguous Sex” 29).

There is currently no medical consensus on how small a clitoris needs to be considered acceptable, but it should be hidden by the labia in order to “...produce a more

satisfactory appearance,” (Kessler 47). Aside from the notion that a satisfactory appearance with regard to genitals is subjective, the practice is also criticized for centering the achievement of heterosexual sexual intercourse as the goal given the high risk of loss of sexual sensation for the patient. In 2003, a cross-sectional study obtained data from 39 adults who had ambiguous genitalia and identified as women through a questionnaire that included a validated sexual function assessment inventory (Minto et al. 1252). The study aimed to assess sexual problems related to surgical history compared with a control group. Of the women in the study, 18 had undergone clitoral surgery (Minto et al. 1252). Women who had undergone surgery reported higher rates of non-sensuality and of inability to achieve orgasm than did the women who had not, though all 39 women had what they described as “sexual difficulty” and only 28 women identified as sexually active (Minto et al. 1252).

Drawing on follow-up consultations, conversations with trans people about their surgeries, and data from women who have received treatment for genital cancers, Kessler was able to draw conclusions about the goals, results, and medical opinions about such surgeries (53-54). Kessler observed that the appearance of the genitals is the top priority to surgeons; some reported “excellent” results if the appearance was “normal or near normal,” and unsatisfactory if “...the persistent phallic enlargement... was embarrassing or offensive or incompatible with... feminine presentation or adjustment,” but no actual measurements are offered (54). Furthermore, there is no indication that the girls in the studies gave feedback on how they felt about their results, and most girls “were unaware of the nature or function of their clitoris and had little comprehension of the nature of their corrective surgeries” (Kessler 55).

A 1989 study in the *Journal of Urology* concluded that “[A] small penis does not preclude normal male role [sic] and a micropenis or microphallus alone should not dictate a

female gender reassignment in infancy” (Reilly and Woodhouse 571). Interviewing and examining 20 patients including 12 post-pubertal (17 to 43 years old) who had been diagnosed with micropenis in infancy, Reilly and Woodhouse found that parental influence played a strong role in the social and psychosexual adjustment and well-being of the patients. Parents who were well-informed about their child’s diagnosis were more supportive and encouraged “normality”, while interviewees who were “poorly adjusted all emphasized their resentment toward parental attitudes” (571). Among the post-pubertal interviewees, all had heterosexual interests, erections and orgasms, and 11 had ejaculations (571). Nine had engaged in heterosexual intercourse and reported “satisfactory” experiences for both themselves and their partners; all patients described feeling satisfied with their gender identity and participating in “normal male activities” (Reilly and Woodhouse 571).

Contrary to the view that individuals with DSDs are destined to a life of anguish (*Sexing the Body* 47), even in cases where early intervention does occur individuals with DSDs can and do grow up with healthy psychosexual identities and positive feelings toward their bodies with full knowledge of their diagnosis. Today, due in part to patient testimonials and advocacy groups, “...physicians are beginning to understand the difficulties involved in defining normalcy, as well as the ethical dilemma of acting medically on children before they reach an age of consent,” (Délot and Vilain 365).

However, it is not the case that such surgeries do not occur today in North America. In Canada, the Criminal Code allows surgical procedures to be performed “for the benefit of the physical health of the person or for the purpose of that person having normal reproductive functions or *normal sexual appearance or function*” (Criminal Code; emphasis added). “Normal sexual function” presumably refers to heterosexual sexual intercourse in which a vaginal canal must accommodate a penis. While the traditional approach to the

treatment of ambiguous genitals was motivated in part by the belief that unambiguous sex is required for healthy gender identity development, advocacy groups argued that this rationale is primarily concerned with the comfort of others, including physicians, peers, and parents, not necessarily the well-being of the patient (Kessler; Fausto-Sterling *Sexing the Body*). Currently, a patient-centered approach is widely recommended and there is a growing consensus that DSDs should be treated with a cautionary approach to genital surgery with strong consideration of the consequences of surgery later in life, that surgery before puberty should only be considered in extreme cases, and that only surgeons with specific training in the care of DSDs should perform genital surgeries (Délot and Vilain 390). Further, careful analysis of networks of gene regulation and their contribution in the phenotype of patients with DSDs is recommended to improve diagnosis and treatment for patients and their families (García-Acero et al. 175). Hughes and colleagues highlight the importance of a multi-disciplinary approach to the treatment of DSDs particularly in complex situations, as cultural and social factors as well as religious and philosophical views can influence how a patient and/or their parents respond to their diagnosis and treatment (Hughes “Androgen”).

2.3 PGD and “interphobia”

Individuals with DSD have been subjected to social ridicule and ostracization, as well as to mismanagement by the medical fraternity for failing to fit the traditional binary model of sex (Fausto-Sterling *Sexing the Body*; Kessler). Advances in Preimplantation Genetic Diagnosis (PGD) technology have led theorists to question the possibilities and ethical implications of the use of PGD in regard to DSDs.

PGD is capable of detecting some DSDs variations in embryos; it is possible, then, for prospective parents undergoing in vitro fertilization (IVF) to select embryos that are not disposed to DSDs. Developed to avoid life-threatening genetic diseases, PGD is also used to

test non-fatal conditions such as Down syndrome, deafness, and blindness (Orr 26).

Embryos can thus be screened for culturally devalued morphologies in addition to life-threatening diseases, leading bioethicists to debate the ethical limitations of PGD.

The use of PGD to detect DSDs is legal in Canada and remains unregulated (O'Neill and Blackmer 10). Celeste Orr expresses concerns that the availability of PGD to detect DSDs is "interphobic" and contributes to the cultural discomfort of sexual ambiguity (201)²¹. PGD is sometimes defended as an alternative to normalization treatments, circumventing what have been criticized as mutilative procedures, and it is thus upheld as a preferable practice. In addition to avoiding normalization treatments that are generally criticized by theorists such as Kessler and Dreger, some DSDs present with serious comorbidities, such as congenital adrenal hyperplasia, some of which require serious medical treatment (Accord). In such cases, the use of PGD it may be permissible and perhaps even encouraged. However, the question remains whether it is permissible to utilize PGD to avoid DSD do not involve serious or life-threatening co-morbidities (e.g., only result in ambiguous genitalia). According to Sparrow,

PGD has several advantages over "corrective" surgery if parents are concerned to raise a child with normal sexual anatomy. [...] Questions about the possibility of surgical and/or psychological harms to the individual being "treated," ... do not arise in the context of genetic selection. (Sparrow 31).

Sparrow's view has been criticized for privileging parental anxieties over the potential child, and critics argue instead that the focus should instead be on "combating violent, curative, disabling procedures, medical malpractice" (Orr 215) and "with [providing parents] information showing the reality of intersex people leading fulfilled lives, as well as the existence of clinical and social biases against diversity in sex, gender, and sexual

²¹ See Celeste Orr's "Exorcising Intersex and Crippling Compulsory Dyadism" for a detailed discussion regarding (potentially) eugenic practices as they relate to DSDs, and some of the ethical implications of PGD.

orientation” (Nisker 39). Theorists interested in focusing on this have proposed alternative models of categorization that include individuals with DSDs in an effort to normalize what is perceived as (physiological) sexual deviancy.

Chapter 3: Contemporary models of sex categorization

DSDs appear to present a challenge to the traditional binary view of sex categorization as they highlight ways in which bodies can be mosaics of features associated with sex development. They are perhaps the clearest examples of cases in which sex traits are not internally consistent within individuals. Using DSDs as evidence against the binary view, theorists such as Anne Fausto-Sterling have argued that sex should not be conceptualized as binary but rather ternary, or even that myriad legitimate sex categories exist (“The Five Sexes”). In this chapter, I will describe and critique three models of sex categorization: the traditional binary view, or the ‘common sense’ view of sex; the five-sex (or three-sex) model proposed by Fausto-Sterling which aims to include intersex variations as distinct sex categories; and the emerging spectrum view which describes sex as existing on a spectrum of possibly myriad legitimate categories.

3.1 Traditional binary model of sex

The traditional model of sex categorization is that there exist two sexes—male and female—that do not overlap. Alice Sullivan defines sex as “... [in humans] a binary biological category. Individuals are classified by reproductive function as male or female. Sex is determined in utero, and is immutable” (Sullivan 519). Additionally, the traditional view also holds that one’s gender identity is coextensive with their biological sex.

Morgenroth et al. describe the binary as follows:

The gender/sex binary is not only *descriptive* [...] but also prescriptive and *proscriptive* [...] In other words, binary thinking about gender/sex enforces a social system in which individuals with two X chromosomes are expected to develop female bodies, identify as women, and act in line with feminine stereotypes, while individuals with an X and a Y chromosome develop male bodies, identify as men, and act in line with masculine stereotypes. Individuals who violate these expectations ... are often harshly punished. (Morgenroth et al. 731)

The traditional binary is the intuitive or common-sense view of sex. 3G sex—genetic-gonadal-genital—is internally consistent 99% of the time, meaning in 99% of humans XX chromosomes are accompanied by ovaries and a vulva and vaginal canal, while XY chromosomes are accompanied by testicles and a penis; 1% of the time, there is variation in 3G sex that results in a DSD (“Genetic-gonadal-genitals sex”). Joel argues that the high correlation of 3G sex leads many to extrapolate that there are high levels of internal consistency across other domains, as well (Joel “Genetic-gonadal-genitals sex”).

There is, however, neuroscientific evidence that human brains are not sexually dimorphic, and endocrinological evidence that hormonal distribution in humans is not sexually dimorphic. The view that there exist two categories into which humans can be divided and that these biological categories are equivalent to the social categories of gender has been a staple of physiological and psychological research for decades. Neuropsychiatrist Louann Brizendine’s *The Female Brain* claimed that:

[S]cientists have documented an astonishing array of structural, chemical, genetic, hormonal, and functional brain differences between women and men. We’ve learned that men and women have different brain sensitivities to stress and conflict ... Women may remember the smallest details of their first date, and their biggest fights, while their husbands barely remember that these things happened. Brain structure and chemistry have everything to do with why this is so.
(Brizendine 4)

A growing body of research shows that there is significant overlap in the brain structures of women and men. Under different environmental conditions, sex differences in brain structures are not uniform. Hyde and colleagues used MRI to analyze over 1400 human brains from four data sets. In each dataset, they assessed internal consistency of a number of features with overlap between females and males, defining the forms that were more common in females compared with males (female-end form), the forms that were more common in males compared with females (male-end form), and the forms that were similarly

common in both females and males (intermediate form) (Hyde et al. 3). Testing each brain for internal consistency contrasted with mosaicism ('internal consistency' defined as all features being female-end form or all male-end form in a particular brain; 'mosaicism' defined as having at least one male-form feature amongst all female-end form features, or vice-versa), they found internal consistency in only 0.7%-10.4% of brains (Hyde et al. 4). Though some features are more common in females and others in males, it is unlikely that human brains are internally consistent and sexually dimorphic; rather, brains are comprised of a mosaic of features.

Additionally, the widespread assumption that there are 'male hormones' (e.g., testosterone) and 'female hormones' (e.g., progesterone; estrogens, such as estradiol) is challenged by the presence of high levels of both androgens and estrogens in both males and females. According to Lienen and colleagues, the average levels of estrogens estradiol and progesterone do not differ between males and females (Lienen et al. 15). Additionally, levels of estradiol and progesterone in non-pregnant females are more similar to the average levels in males than to pregnant females (Tulchinsky et al.). This presents a challenge to the view that sex determinations can be made on the basis of hormones.

Further, with regard to secondary sex characteristics²² and other physiological characteristics such as height, both the assumptions that there are high levels of internal consistency of the female-end form of such traits in 3G females (and male-end form in 3G males) and the assumption that 3G females and 3G males are highly dimorphic are incorrect. For example, 33-50% of 3G males have the female-end form of breasts with the male-form of facial and body hair, and 5-10% of 3G females have the male-form of facial and body hair with the female-end form of breasts (Joel "Genetic-gonadal-genitals sex" 12), indicating a

²² From the American Psychological Association: "Secondary sex characteristics are features not directly concerned with reproduction, such as voice quality, facial hair, and breast size" ("Sex Characteristic").

similar kind of mosaicism with regard to secondary sex characteristics and other physiological traits that we saw in terms of neurology. Although 3G sex appears to be highly consistent and dimorphic the explanatory power of 3G sex is diminished by these discoveries.

The traditional binary model contributes to the treatment practices of DSDs discussed in Chapter 2 and identifies bodies that fall outside the perceived normal spectrum as in need of fixing to fit within the accepted parameters of our cultural understanding of sex and gender, particularly as our understanding relates heteronormative practices as demonstrated by the conception of acceptable genitalia (see Kessler). Thus, challenges to the binary view are motivated by several factors. First, the social consequences of upholding the view that gender and sex are coextensive are negative for those who violate the expectations of the social system outlined above—trans individuals are more likely to have experienced violence and inappropriate behaviours in public, online and at work than cisgender individuals (Stats Canada “Experiences of Violent Victimization”). Second, it fails to incorporate a number of ways sex and gender traits can combine. It is clear that some individuals with XX chromosomes do not identify as women or act in line with feminine stereotypes, and it is also clear that some individuals with XX chromosomes do not develop what are considered to be female bodies.

3.2 The Five Sexes

Anne Fausto-Sterling responds to the binary view with a model of her own. In her 1996 article titled “The Five Sexes: Why Male and Female Are Not Enough” she criticizes the standard model of sex by explaining how intersex individuals are neither male nor female, so they do not fit in the traditional sex binary. She begins by describing the phenomena of intersex as it was then understood:

For some time medical investigators have recognized the concept of the intersexual body. But the standard medical literature uses the term intersex as a catch-all for three major subgroups with some mixture of male and female characteristics: the so-called true hermaphrodites, whom I call herms, who possess one testis and one ovary (the sperm- and egg-producing vessels, or gonads); the male pseudohermaphrodites (the "merms"), who have testes and some aspects of the female genitalia but no ovaries; and the female pseudohermaphrodites (the "ferms"), who have ovaries and some aspects of the male genitalia but lack testes. (Fausto-Sterling "The Five Sexes" 21).

This model is somewhat oversimplified based on our current understanding of DSDs—it is not the case that individuals fall neatly into the five categories proposed by Fausto-Sterling. DSDs are highly complex and in many cases, the etiology is not well understood.

In the five-sex model, it seems that in terms of variations of 3G sex would be: FFM (ferm); FMM (merm); MMF (merm); or MFF (ferm)²³. What a *herm* would be is unclear. Perhaps this model could be altered into a ternary model in which the term *herm* includes all DSDs, so we are left with *males*, *females*, and *herms*, which aligns with the understanding of "intersex" in which it constitutes a third sex category. This raises the question: do DSDs constitute a distinct sex category or distinct sex categories?

Fausto-Sterling suggests that the prevalence of "intersex" conditions is as high as 1.7% of live births (*Sexing the Body* 153). Bearing in mind that there is debate over the statistical frequency of DSDs (Sax²⁴), it appears the traits Fausto-Sterling refers to above (i.e., 3G sex) correlate 99% of the time. The 1% in which they vary would presumably be further divided into *merms*, *ferms*, and *herms*. The research conducted by Joel and Hyde discussed in section 3.1 seems to indicate that most people are mosaics in terms of what we

²³ Here "F" refers to the female-type features (vulva, ovaries, XX chromosomes) and "M" refers to the male-type features (penis, testicles, XY chromosomes). Most people being internally consistent will have the whole female-form of 3G sex (FFF) or all male-form (MMM).

²⁴ Fausto-Sterling defines as intersex any "individual who deviates from the Platonic ideal of physical dimorphism at the chromosomal, genital, gonadal and hormonal levels" (Blackless et al. 161). Sax suggests that "... the term "intersex" should be restricted to those conditions in which chromosomal sex is inconsistent with phenotypic sex, or in which the phenotype is not classifiable as either male or female. Applying this more precise definition, the true prevalence of intersex is seen to be about 0.018%, almost 100 times lower than Fausto-Sterling's estimate of 1.7%" (Sax 174).

consider sex traits, with the exception of 3G sex. While the 1% of individuals who are not internally consistent with regard to genitals, gonads, and genes do not in any meaningful sense make up a separate category (<1%, as it is further divided into the three proposed categories) in terms of explanatory power or statistical analysis, if it happened to be the case that the distribution of mosaicism fell into three categories—mostly male-end form, mostly female-end form, and equally male- and female-end form, then *herms*, *ferms*, and *merms* might be reconceptualized to expand beyond 3G sex. However, if DSDs are this infrequent, particularly the DSDs to which Fausto-Sterling refers, such a statistically insignificant category is not particularly significant. That is not to say that the experiences or medical outcomes of the individuals diagnosed with DSDs are insignificant or negligible, but to suggest that the claim that such a small number of cases warrant the introduction of a separate category with such limited application is impractical. Sullivan argues that compared to other categories used in social sciences and statistical analysis that are quite fuzzy, such as social class, educational level, or ethnic group, sex is a far “cleaner” variable; statistically, such a small margin of error should not be seen as problematic (Sullivan 520).

Additionally, Fausto-Sterling claims that “Western culture is deeply committed to the idea that there are only two sexes” (“The Five Sexes” 68) and that this view is disputed elsewhere around the globe. However, as discussed in Chapter 1, while it is the case that many cultures conceptualize social gender in non-binary ways, there is a lack of evidence that they view *sex* as non-binary. As noted, Fa’afafine of Samoa are distinct from Samoan women due to the recognition that they are (biologically) distinct from females—they are males with a feminine gender and occupy a legitimate gender role that is distinct from that of females with a feminine gender (Vasey and Bartlett). However, Fausto-Sterling is correct to

point out some of the ways in which sex and gender are interwoven and that the traditional binary model fails to consider the mosaic distribution of sex traits.

3.3 The Spectrum View

Emergent in popular discourse is the view that sex exists on a spectrum of many legitimate categories. This view appears to be inspired by the arguments put forward by Fausto-Sterling and fosters the notion that the binary view is insufficient. The September 2017 issue of *Scientific American* titled “*It’s Not a Women’s Issue: Everybody has a stake in the new science of sex and gender*” features a graphic that pictures sex as non-binary (Montañez “Visualizing Sex”). Scientific American staffer Amanda Montañez wondered “what data could tell us about the frequency of transgender and non-binary identities, what proportion of the population is intersex, and how that value might break down into rates of specific DSDs” (“Visualizing Sex”). Her research found that the data on trans and non-binary identities is lacking and is often conflated with data regarding sexual orientation, surveys often conflate sex and gender, and that estimates regarding the frequency and presentation of DSDs vary widely (Montañez “Beyond XX and XY”). After consultation with Dr. Amy Winsiewski, a DSD specialist at the University of Oklahoma, Montanez completed the graphic depiction of DSDs (“Beyond XX and XY”). The graphic serves as visual evidence of the complexity of sex development and visualizes sex as a spectrum from *biological male* to *biological female*, though it fails to highlight the rate at which each point on the spectrum occurs. It notes ten points on the spectrum from biological female (1) to biological male (2), and points 2-9 as specific DSDs: Turner syndrome; XX testicular disorder of sex development; Congenital adrenal hyperplasia; Mixed gonadal dysgenesis; Androgen Insensitivity Syndrome; Klinefelter Syndrome; 5-alpha reductase deficiency;

Persistent Mullerian duct syndrome; Typical biological male (Montañez “Beyond XX and XY”).

One conclusion that can be drawn from the evidence that sex appears to exist on a spectrum from *typical biological female* to *typical biological male* is that there exists a spectrum of legitimate sex categories including, but not limited to, *male* and *female*. This view appears to be more prominent in popular discourse than academic literature; the social movement towards greater support for the non-binary view of gender may lend support to the notion of non-binary sex. A number of op-eds published in recent years reflect this position, some published by biologists and neuroscientists. For example, Liza Brusman, a molecular biology PhD student at the University of Colorado, Boulder, penned an op-ed in which she argued that “... just like gender isn’t binary, our biology isn’t binary either: it, too, exists on a spectrum” (Brusman). In 2018, Fausto-Sterling also published an op-ed titled “Why Sex is Not Binary” in which she states that “[i]t has long been known that there is no single biological measure that unassailably places each and every human into one of two categories — male or female” (“Why Sex is Not Binary”) and reiterates that mosaicism is found at every level of sex determination.

The spectrum view in its basic form—that there exist many or possibly infinite legitimate sex categorizations—has two problems. The first is similar to but more protracted than the problem facing the ternary model above. There simply are not enough people in the “other” categories for them to be statistically meaningful, particularly if we are only looking at variations in 3G sex. The additional categories have limited explanatory power outside of the prognosis of an individual or a very small group of individuals. In terms of efforts to build social identities that are meaningful to individuals and to those around them these categories may be important, but this doesn’t mean that there is a one-to-one mapping from

these identities to underlying natural biological kinds. It seems more likely, as I will suggest in the next chapter, that there are two biological kinds that have fuzzy edges, as do biological kinds more generally.

Second, as the binary view is the common-sense view, moving to a multi-sex model requires a high degree of epistemic labour. This challenge does not itself make it incorrect, but if a version of the binary view can support the same progressive changes in social attitudes, it does make supporting a multi-sex model superfluous in terms of motivating social change. There is a significant amount of backlash toward the multi-sex view in public discourse. Morgenroth and colleagues' 2021 psychological study "Defending the Sex/Gender Binary: The Role of Gender Identification and Need for Closure" argues that views in favour of altering our traditional conception of the sex/gender binary are met with resistance and investigates psychological mechanisms underlying that resistance:

In addition to providing a sense of identity, the gender/sex binary provides the benefit of structuring the complex social world into two clear categories that provide information about its members, thus making the social world easier to navigate. As such, it might be particularly appealing to individuals with high levels of need for closure. (Morgenroth 733).

Conflation of sex and gender terms makes it difficult to parse what exactly the concern or support is regarding. For example, the statement "there are only two genders—male and female" does not make clear whether the speaker believes there are two sex categories—male and female—or two social gender categories—masculine and feminine, or men and women—which as discussed in Chapter 1, are conceptually distinct. In any case, there is strong social resistance to non-binary views of gender and sex, which this thesis argues has at least partly to do with flaws of the non-binary views of sex that are proposed, and as well, the very real possibility that the common-sense view is at least partly informed by the empirical support for a binary conceptualization of biological sex in all mammalian species,

including our own. Biologically, sexual reproduction requires two different kinds of gametes and two different kinds of mammalian bodies for producing these gametes.

The view that sex categorization must either be binary as described in section 3.1 or that include several sex categories is, I believe, a false dichotomy. The model I propose and support in Chapter 4 addresses the problems raised against the proposed binary and non-binary models while supporting research conducted by Hyde and colleagues with regard to sexual dimorphism and the concerns of theorists concerned about the ethical medical treatment of DSDs.

Chapter 4: Homeostatic Property Clusters: An alternative model of bimodal sex categorization

I have argued that the models addressed in Chapter 3—the binary, five-sex, and spectrum models—are all three problematic models of sex categorization. In this chapter, I defend an alternative model that I believe addresses the problems facing these models, supports the research described in Chapters 1, 2, and 3 with regard to sexual development and sexual dimorphism, supports the concerns of theorists concerned about the ethical medical treatment of DSDs, and allows for individuals and groups to self-identify in ways that are consistent with biological groupings.

It appears as though our conventional understanding of sex is inaccurate. Recall that mosaicism is more common than internal consistency in traits associated with sex, including breast form, height, hormones, and brain structures, although mosaicism presents to a far lesser degree with regard to genitals, genes, and gonads, or “3G sex” (Joel “Genetic-gonadal-genitals sex”). The models discussed in Chapter 3 propose either that sex exists on a wide continuum or that DSDs comprise a sex category distinct from male or female. I argue instead that DSDs do not represent individuals that are ‘between-sex’, nor do they constitute a new biological category (or new biological categories). The view that either sex is binary in the traditional sense or there are more than two legitimate sex categories is a false dichotomy. Instead, DSDs and other forms of mosaicism reflect the myriad ways traits related to sex develop and co-occur.

Sex categories themselves might better be conceptualized as clusters of properties. Family resemblance, made popular by Wittgenstein’s *Philosophical Investigations*, is the view that things which may be thought to be connected by one common feature or property may instead be connected by a series of similarities, where no one feature is common to all of the things.

Consider, for example, all the activities that we call “games”. I mean board-games, card-games, ball-games, athletic games, and so on. What is common to them all? – Don’t say: “They *must* have something in common, or they would not be called ‘games’ “—but *look and see* whether there is anything common to all. – For when you look at them, you won’t see something that is common to *all*, but similarities, affinities, and a whole series of them at that. [...] I can think of no better expression to characterize these similarities than “family resemblances ... And I shall say: ‘games’ form a family. (Wittgenstein 36).

There are clear parallels to the case Wittgenstein outlines for the ‘family’ of *games* and the ‘families’ of *male* and *female*. However, the notion of family resemblance can be criticized for its vagueness; how many, and what kinds of similarities, must things share to constitute a family? There is also the question of how well family resemblance applies to natural kinds as opposed to artificial kinds.

Alison Stone proposes that we might better turn to Richard Boyd’s idea of Homeostatic Property Clusters (HPC) (43), developed as an account of species membership where having enough of a particular set of properties makes something belong to a particular species kind. Boyd applies HPC to the biological concept “species” (Boyd), a notoriously contested concept in biological theory. While physics and chemistry present us with what seem to be neatly defined natural kinds of things, biological kinds like species seem not to be as well defined. In response to the worry that biological kinds like species are not in fact natural kinds, HPC characterizes natural kinds as clusters of properties that co-occur and are supported by homeostatic mechanisms that cause and maintain the property clusters. According to Boyd, biological kinds are good candidates for a natural kind cluster as species members share many, but not necessarily all, properties that are caused by various underlying mechanisms. Species members may share a common ancestor, an ecological niche, gene exchange, or common developmental mechanisms, allowing for numerous variations between members while acknowledging that traits and properties of members of

the same biological species are clustered due to underlying homeostatic mechanisms

(Brzović 2b)²⁵. HPC kinds are described by Stone as follows:

1. Certain properties form clusters.
2. This is not an accident—the presence of some properties tends to encourage others because the underlying mechanisms or processes tend to encourage the presence of all these properties.
3. The clustering of these properties has important causal effects.
4. Things in which the clustering of most of these properties occurs form a kind.
5. A thing may display some, but not all, of these properties (and some, but not all, of the underlying mechanisms).
6. Consequently, it may in some cases be impossible to resolve conclusively whether a thing belongs to a particular kind (Stone 43).

This account can be easily applied to sex: having XX chromosomes, ovaries, a vagina, a vulva, breasts, etc. often co-occur for causal reasons: human embryos begin as sexually undifferentiated and genetic sex is determined by whether the embryo inherits an X- or Y-chromosome. In the absence of a Y-chromosome, the bipotential gonad develops into an ovary which allows the development of Mullerian structures (Witchel 2). The ovary is not exposed to testosterone (T) and anti-Mullerian hormone (AMH) and the development of the female external genitalia is encouraged (Witchel 3). Together, these properties have an

²⁵ Note, however, that *sex* and *species* as kinds are dissimilar in important ways. Section 4.3 further discusses Richardson’s conception of sex as a *dyadic* class (opposed to species as an *individual* class). “Strictly, of course, sexes are not accurately analogized to species. Sexes are not lineages. Males do not produce males, females do not produce females. Males and females mate, and their male and female offspring carry a random combination of paternal and maternal genetic material. Because of sexual reproduction, the sexes do not meet any of the criteria for a species, including interbreeding, shared common ancestry (monophyly), morphology, and spatial and temporal boundaries. Human males and females are biological subclasses of a sexual species” (Richardson 10).

important causal effect—they allow a body to gestate a foetus and give birth. However, various factors can prevent *all* of these properties from occurring together, such as hormonal variances (e.g., AIS). Some properties are more important than others in terms of the causal effect. For example, having a larger than average clitoris or smaller than average breasts does not in itself prevent normal reproduction, while certain chromosomal or hormonal abnormalities may impact fertility. Nevertheless, if enough of these properties are present, then the body to which they belong can be categorized as “female”²⁶.

Stone suggests that to be female or male—to belong to the *male* or *female* kind—is to have enough of a cluster of properties that cluster together for causal reasons (45). There are three potential problems with this account.

4.1 Femaleness as the ability to give birth

It may seem that under the HPC account, the definition of *femaleness* implies that what it is to be a member of the female kind is to be able to give birth. Stone addresses this challenge herself. Stone never claims that the ability to give birth is necessary for kind membership as a female, but rather having a body that contains mostly “female properties.” As such, prepubescent, infertile, post-menopausal, and possibly some trans women²⁷ can be accurately described as female. “[E]ven if in principle one has all the properties necessary for reproduction, this is not sufficient to ensure that one will be able to conceive and give

²⁶ It may seem at first that defining “female” as “having female properties” is circular—however, Stone correctly notes that “female” is shorthand for the list of relevant properties (34); the term we use to refer to this list is largely irrelevant. It is worth noting that the term “female” (as well as “male”) carries significant social connotations with regard to conceptions of femininity (and masculinity). However, they are also the terms that are “out there” and in use by speakers; the proposal is not that to be female is to have female properties or to be male is to have male properties, but rather that there exists two clusters of naturally occurring properties, and we call these clusters “female” and “male”.

²⁷ Stone suggests that a “post-operative male-to-female transexual” (whom today we would typically refer to as a transwoman rather than a transexual, and describe her experience as a gender transition rather than a ‘sex-change’) may be accurately described as female if she “has enough properties to be female but will be unable to conceive as long as she lacked ovaries” (45). While this seems correct in principle, given the relevant properties for kind membership it is difficult (but not impossible) to imagine a scenario in which this would be the case.

birth. Further conditions must also be met: one must be of suitable age and no causes of infertility must be present” (Stone 46).

4.2 Properties relevant to kind membership

The possibility of “true hermaphroditism” seems to pose a challenge to the HPC model. Stone notes:

Some intersexed people have a condition known as “true hermaphroditism”. They have one ovary and one testis (or, sometimes, a fused ovo-testis). Often they produce both egg and sperm cells, androgen and oestrogen, and develop internal and external genitals which have a mix of male and female attributes. Given my definitions, these people are both male and female. Strictly speaking, then, I should say that someone is female if she has enough of the properties in the female cluster and, in addition, has either none of the properties in the male cluster or, at least **not enough of the to make her a hermaphrodite** [*emphasis added*]. (*Feminist Philosophy* 45).

The existence of “true hermaphroditism” seems to suggest that there are at least some people who belong to neither or both kinds. Actually, by Stone’s account, it seems that anyone with “enough” of the properties from both clusters would be a *hermaphrodite*. Stone does not develop a full account of which properties are included in either the male or female clusters, but the properties Stone considers relevant are those involved in sexual reproduction—gonads, hormones, genitals, etc. (44).

DSDs present in many diverse and complex ways. “True hermaphroditism” is currently known as Ovotesticular DSD and is defined by the presence of both testicular and ovarian gonadal tissue within a single individual (Nistal et al. 345). Ovotesticular DSD is the rarest DSD that occurs in humans, representing about 5% of all DSD cases. By 1991, about 500 total cases had appeared in the literature (Nistal et al. 345). The external genitalia of individuals with Ovotesticular DSD are usually ambiguous but can range from normal male-form to normal female-form; the gonads can be any combination of ovary, testes or

combined ovary and testes (ovotestes) and an ovotestis is present in approximately 2/3 of affected individuals (Özdemir et al.).

Ovotesticular DSD presents a case against the HPC model. Under the understanding of *male* and *female* above, Stone suggests that these individuals would be properly understood as both *male* and *female* if they produced "... both an egg and sperm cells, androgen and oestrogen*, and develop internal and external genitals with a mixture of male and female attributes" (45). However, given the consensus that no one attribute should be uniquely privileged in sex determination discussed in Chapter 3, the presence of male and female gametes is not uniquely indicative of belonging to either the male or female kind respectively under the cluster model. If it were the case that an individual had exactly half of the traits from each cluster they could be said to belong to both kinds, though this does not appear to be the case. Due to the extreme rarity of Ovotesticular DSD, outcome data is lacking. However, gender assignment continues to be recommended in the neonatal period "based on the appearance of the external genitalia [masculinized or feminized, though usually the genitals are ambiguous], the formation of the internal reproductive glands, the potential for fertility and the available medical literature" (NORD - National Organization for Rare Disorders). In no cases do both the ovary and testicle function; the ability to function as both a male and female to the point of self-reproduction has never been reported in humans (Cici et al.), and patients present with either female or male phenotypes (i.e., appear otherwise feminine or masculine, with feminized or masculinized genitalia). For example, a patient in Z. Li et al.'s 2021 case study "46, XX Ovotesticular disorder of sex development (true hermaphroditism) with seminoma" identified as masculine, had heterosexual relationships, and reported normal erections (Z. Li et al. 1). Under the HPC model, this patient would be male.

A potential challenge to Boyd's HPC view is that it appears to be overly permissive; if any clustering of properties might represent a natural kind, this goes against the common view is that natural kinds pick out groupings that are explanatorily privileged in some way. Recall that a natural kind corresponds to a grouping that reflects the structure of the natural world rather than the interests and actions of human beings. Naturalists believe that: *members of a natural kind should have some natural properties in common, should permit inductive inferences, and should be categorically distinct.* Alternatively, John Dupré argues that natural kinds should not be considered as privileged sets of categories, and instead there are many resemblance relations in the world that we pick out depending on our interests and that these can all qualify as natural kinds (28). Dupré calls this view "Promiscuous Realism" and defends the notion that many diverse interests can determine which groupings count as natural kinds.

[D]ifferent entities can share some similarities with members of one group and some with members of another group, and which group we pick out as relevant will depend on our interests. This view is realist because it involves the criterion that something counts as a natural kind if its members share at least some similarities, even if minimal. Those similarities need to be some objective features of the world and not facts about us. For example, the fact that we group some things together would not count as a common property that can serve as a basis for classification. This view therefore excludes as nonnatural classifications of entities which do not share any common properties. Different aims and interests will tend to produce different classifications, and those classifications can be taken as natural kinds if the members share at least some common properties that cause those entities to be categorized together in the first place. (Brzović 2c)

Cluster approaches suffer the challenge of determining which and how many naturally occurring properties candidates must share in order to be members of a particular cluster.

Promiscuous Realism avoids this challenge by determining that there are many legitimate clusters that may exist, and a candidate may belong to several legitimate clusters.

Promiscuous Realism holds that even a minimum of shared properties is enough to consider something a natural kind if the classification serves some purpose. Thus, it may be the case

that there are several legitimate ways of categorizing bodies into clusters that share properties, depending on whether the classifications serve a purpose.

However, it is not the case that all classification schemes ought to be regarded as equal. Instead, promiscuous realists argue that we can refine our classifications based on the purposes that classifications serve. For example, the cluster of people with blue eyes constitutes a grouping of individuals with a shared, natural property, but the property has limited explanatory power; grouping them in such a way is minimally informative. However, the grouping of people who share female-end form properties identified at the beginning of this chapter serves an important purpose, namely determining risk factors for certain health conditions closely related to properties associated with the ‘female’ cluster.

Dupré argues that our common-sense classifications and scientific classifications often cross (28). For example, lilies are commonly classified as a certain kind of flower, but the *genus* *Lilium* comprises over one hundred species, including bulbs such as garlic and onions; both common sense and biological science provide us with ways of taxonomizing lilies (Bird and Tobin 1.1.3). According to Dupré, both categorizations are equally legitimate, depending on our interest: “There is accordingly no unique way of carving nature at its joints; different systems of classification are equally acceptable, scientifically and metaphysically” (Bird and Tobin 1.1.3).

However, some practices, particularly scientific practices, have purposes that are epistemic and the categories that arise from these practices should be taken more seriously than socially determined or convenient ‘groupings’ of things as informative categories of things. Though the common-sense category of “lily” may be useful in certain contexts, for example in flower arrangements, the scientific *genus* *Lilium* carries explanatory and predictive power that the common-sense category of “lily” does not. Fausto-Sterling’s

proposed model—that there exist five legitimate sex categories—seems to be supported by Promiscuous Realism. However, as I have argued, the five-sex model is limited in terms of explanatory power and statistical analysis. The explanatory power and pragmatic function of the HPC model exceed that of the five-sex or multi-sex views.

Recall the conclusions drawn by Joel and colleagues with regard to mosaicism across sex traits, concluding that most people are gender/sex mosaics with regard to their brain structures and that there is significant overlap in most sex traits including breast form, height, and facial and body hair (“Genetic-gonadal-genitals sex”). 3G sex is internally consistent 99% of the time, meaning in 99% of cases individuals possess either XX chromosomes, a vulva, and ovaries *or* XY chromosomes, a penis, and testicles (Joel “Genetic-gonadal-genitals sex”) and it thus serves as an adequate homeostatic base from which to ground the sex-trait clusters. Note that it is not the case that an individual must possess *all three* of the 3G traits to be accurately sexed as male or female but must possess *mostly* traits from one cluster (mostly male- or female-end form). Although the extent to which we can understand the relevant traits in each cluster depends on the empirical evidence we have for the ways in which traits develop in dimorphic ways in humans, there is strong evidence to suggest that humans develop sexually in a bimodal pattern. This pattern is not completely dimorphic, and mosaicism appears to be common. In many cases of mosaicism, such combinations are identified as DSDs. However, it is not the case that every case of cross-cluster combinations is identified as a DSD, and most cases are not cause for medical concern (e.g., female-form breast tissue in males, or larger than average clitoral tissue).

With regard to social concerns surrounding the implications of “binary” thinking about sex, including stereotypical assumptions about “normal” gendered behaviour and

gender identity, Sarah Richardson’s 2010 paper, “Sexes, species, and genomes: why males and females are not like humans and chimpanzees” may offer a useful substitute in terminology. Richardson argues that sex as a class is best conceived as a “dyadic”, or relational, kind:

“Males” and “females” are also biological subclasses of sexual species. As such, they are frequently explicitly or implicitly analogized to populations and species. Yet sex is not simply a property of individuals, nor is it simply a subclass. Because sexual reproduction is essential to the propagation of the species, the sexes are profoundly interdependent. Specifically, the population dynamics and fitness of one sex cannot be modeled without that of the other. I argue, therefore, that sex is a dyadic concept, meaning that sex is relational. (Richardson 13)

Richardson maintains that it is not the notion of two biological sexes that is problematic for critical gender theorists, but that binary thinking “invite[s] dualistic, dichotomous thinking, so that it becomes difficult to think of two without subsuming one into the other, ranking them, implying polarity or complementarity, or posing them as opposites. Binaries tend to imply exhaustive categories and to drive reasoning toward the detection of difference as fixed polarity” (Richardson 16). The conceptualization of sex as a dyadic class is consistent with the HPC model as described in this chapter—rather than conceiving the male and female cluster-kinds as *binary*, they may be better conceived as *dyadic*: two biological subclasses of a sexually reproducing species, whose species-specific behaviour is highly integrated and cohesive²⁸.

Biological sex, then, is best conceptualized in a dyadic cluster model:

1. *Certain properties form clusters:*

Naturally occurring properties co-occur for causal reasons and tend to fall into two clusters: (what we define as) female-end form and male-end form.

²⁸ Richardson conceives sex as a dyadic kind in the context of genetics research and argues that sex conceived as a “dyadic” kind rather than an “individual” kind highlights key differences between the kind of class *sex* represents and the kind of class *species* represents.

- 2. The presence of some properties tends to encourage others because the underlying mechanisms or processes tend to encourage the presence of all these properties:*

Female-end form properties co-occur due to causal mechanisms that result from an embryo inheriting an X chromosome from the father; male-end form properties co-occur due to causal mechanisms that result from an embryo inheriting a Y chromosome. However, we do not completely understand all of the causal mechanisms that cause this co-occurrence or the bifurcation.

- 3. The clustering of these properties has important causal effects:*

The clustering of 3G sex traits encourages additional primary and secondary sex characteristics, which result in or support female- or male- reproductive capabilities.

- 4. Things in which the clustering of most of these properties occurs form a kind*

The clustering of one set of such properties is “female” and the properties are described as “female-end form” properties; the clustering of the other set of such properties is “male” and the properties are described as “male-end form” properties.

- 5. A thing may display some, but not all, of these properties (and some, but not all, of the underlying mechanisms):*

We know that three of the properties (XX and XY chromosomes, gonads, and genitals) co-occur consistently 99% of the time. Secondary sex characteristics occur in generally dimorphic ways, but not to the same extent as 3G properties. An individual may display *mostly* female-end or intermediate-end form traits but may have some male-end form traits *of any kind*.

- 6. Consequently, it may in some cases be impossible to resolve conclusively whether a thing belongs to a particular kind:*

It may be difficult or impossible to conclude if an individual is (“truly”) female or male, because it may be difficult or impossible to determine exactly how many of each -end form traits they possess.

4.3 Limitations and social concerns

Alison Stone suggests that sex categories might be conceptualized as clusters and that these clusters can be developed through Richard Boyd’s Homeostatic Property Cluster model. As I have argued, the HPC model is, in my view, the best way of conceptualizing sex categories given the empirical evidence available.

Stone’s model appears to also embrace a category for individuals who may be neither male nor female when she says “... someone is female if she has enough of the properties in the female cluster and, in addition, has either none of the properties in the male cluster or, at least, not enough of them to make her a hermaphrodite” (45). As we have seen, mosaicism is more common with regard to sex traits than internal consistency, and depending on what properties we consider to be relevant to sex kind membership it may be the case that most people possess traits from both clusters. Given the high degree of improbability that an individual would possess exactly half of the properties from either cluster, the HPC model as I’ve outlined it conceptualizes sex as two clusters of properties that tend to co-occur. Under the HPC model as I’ve described it, all individuals are accurately categorized as male or female. This is the primary distinction between the view supported by Stone and the view this thesis defends.

As discussed in Chapters 1, 2, and 3, there are worries about the limitations of the binary view for individuals with DSDs, including social distress due to generalized “interphobia” or discomfort with ambiguity, and medical mismanagement by likely well-intentioned physicians and surgeons who aim to improve quality of (social) life for

individuals with DSDs through surgical and other forms of normalization. The binary view, as it is traditionally conceptualized, leaves no space for deviation from what is considered normal for either male- or female-sexed bodies, and thus it supports normalization treatments. As we have seen from Kessler, Fausto-Sterling, and Dreger, the management of DSDs has historically been focused on normalization, partly due to the perceived social risk an individual who does not fall within the constraints of the sex binary might face. It may appear that the HPC model, in supporting a dyadic view of sex, would also lend support to the views opposed by these theorists. However, the HPC model as I defend it does not support this view of normalcy.

Rather, the HPC view as I defend it models sex cluster-kinds as kinds with fuzzy borders, as supported by the growing body of research that individuals are rarely internally consistent with regard to traits associated with sex and that mosaicism with regard to sex traits is the norm. The HCP model allows us to conceptualize bodies that would perhaps otherwise be considered “between sex” as within of the spectrum of normalcy and not necessarily in need of treatment²⁹. For example, an enlarged clitoris does not lead to the same morbidity and mortality as, say, a malfunctioning heart valve. The heart valve needs to be operated on in infants and small children, while an enlarged clitoris does not³⁰—as a form of natural variation, we should expect to see large clitorises among biological female organisms, as biological kinds have fuzzy borders. In some cases, it may be prudent to single out some of these variations as important social kinds, particularly with regard to personal identity, but that does not make them distinct biological kinds.

²⁹ Here I am referring to “treating” the sexual ambiguity, not the treatment of medical emergencies or co-occurring conditions that impact the health of an individual.

³⁰ Historically, a large clitoris may be carved down to meet aesthetic standards, not for any reason that would impact the individual’s health (Kessler). However, some DSD present with conditions that do lead to serious health challenges, such as congenital adrenal hyperplasia (CAH) (Accord). In these cases, treatment of these comorbidities may be necessary.

Further, the HPC model as I describe it can serve as a useful rhetorical tool against potentially transphobic narratives that rely on traditional ways of thinking about the sex/gender binary. Take, for example, the rhetoric of right-wing political commentator Ben Shapiro, when discussing the legitimacy of trans identities:

[i]f you are going to dictate to me that I am supposed to pretend, that *I* am supposed to pretend, that men are women and women are men, no, my answer is no. I am not going to modify basic biology because it threatens your subjective sense of what you [a transgender person] are. (“Ben Shapiro DESTROYS Transgenderism” 1:10-1:35)

Shapiro intentionally conflates sex and gender and adheres to the traditional view of binary sex/gender as discussed in section 3.1. In this case, Shapiro’s intended message is that women are *female* and men are *male*, and that one’s “subjective sense of what [they] are” (i.e., one’s gender identity) is undermined by “basic biology” (i.e., one’s biological sex). The HPC view may support Shapiro in being *half* right: his mistake may not be in his claim that one cannot choose the sex category to which they belong, but instead in claiming that one cannot accurately identify oneself as both male and a woman or both female and a man. On the HPC view, one could identify as a man, for example, even though he has a biologically female body given the cluster of properties that are part of that body. Shapiro’s basic argument is as follows:

- (1) Sex is a biological category.
 - (2) You cannot self-identify as a member of a biological category.
 - (3) Self-identification as *male* when one is *female* is illegitimate.
 - (4) Sex and gender are synonymous.
- (C) Therefore, self-identification as a *man* when you are in fact *female* is illegitimate.

Shapiro’s mistake can now be easily spotted through the lens of HPC in conjunction with the SGD. Criticisms often tend to focus on premise (3) as it is easily interpreted as transphobic—it seems as though premise (3) denies the legitimacy of trans identities by

denying the possibility of identifying as a member of a gender category that does not match one's sex.

This thesis supports the view that *sex* and *gender* are distinct concepts, and that *male* and *female* denote mutually exclusive biological categories (i.e., one is either biologically male or biologically female). Although premises (1), (2), and (3) are correct, the final premise is mistaken. Isolating the flaw with Shapiro's position identifies the argument as fallacious—trans identities do not represent males (or females) identifying as females (or males) in a biological sense, but rather males (or females) identifying as women (or men) in a social sense. The understanding that the biological categories may be mutually exclusive categories does not entail the same for our social categories.

To be sure, the conversation surrounding the legitimacy of trans identities is complex and politically delicate. The outcomes of debates surrounding gender identity as it relates to biological sex have significant implications for the lives and wellbeing of those who do not identify as cisgender. Acknowledging that conversations of this nature must be undertaken thoughtfully and carefully, I suggest that while the HPC view does not offer an immediate or direct solution to this ongoing and important debate, the HPC view can plausibly be supposed to offer further and important context to the greater conversation, the intricate details of which are suited for another project.

Conclusion

This thesis has aimed in part to demonstrate that sex is, indeed, serious business and that the complexity of sex categories is not simple in relation to the complexity of social gender. The ways in which biological sex is conceptualized have direct implications for a range of individuals, including but not limited to individuals with DSDs and transgender people.

In particular, this thesis has identified flaws of the traditional binary model as well as the shortcomings of prominent non-binary views of sex. Criticism of the traditional binary model of sex categorization is not novel, but what this thesis has argued is that the frameworks proposed in response to this model are themselves flawed in ways that miss the underlying strength of the traditional model as a biological approach to sex in sexually reproducing mammalian species. Fausto-Sterling aims to provide a framework that encompasses the myriad ways a body can be composed, but she does so in a way that seems to allow social and individual choices about identity to determine the underlying reality of the biological world the human species is part of.

By engaging with the conceptual distinction between *sex* and *gender* this thesis unpacks how these concepts are central to the debate around how best to carve up sex categories. Ultimately, I regard the sex/gender distinction as an imperative of the cluster model of sex categorization that I defend. While entwined, the term *gender* refers to a set of norms while *sex* refers to a set of physiological attributes. The use of the sex/gender distinction allows us to maintain the use of sex as a factor in statistical analyses while allowing flexibility in terms of social and personal identification by allowing us to conceptualize *sex* as distinct from an individual's self-identification as a man, woman, or neither.

In describing our current understanding of sexual development in humans and our understanding of Disorders of Sexual Development (DSDs), I support arguments in favour of limiting surgical intervention at an early age and limiting the need for “normalization” procedures. The significant research conducted to reflect the ways in which sex traits develop and are bifurcated provides strong evidence to support that sex traits (or, what we regard as sex traits; e.g., chromosomes, gonads, genitals, hormones, structural differences in the brain) do not develop in consistently dimorphic ways. Considering this, I am critical of the traditional binary model, the five-sex model, the spectrum model, as well as the possibility of biological sex as personal identification.

There may be legitimate and practical reasons for dividing up the world into social kinds that do not map onto biological kinds. Sex and gender are a fundamental way in which we divide up our social world; providing a non-binary identity category for individuals who do not identify with either the masculine or feminine gender role is an important factor in respecting the myriad ways in which individuals interpret and experience their identities as masculine, feminine, or some combination thereof. Diagnosing an individual as distinctly outside of the accepted binary system has important social consequences, however, reflected in the social resistance to non-binary views more generally. There is an important distinction between identifying oneself as outside of the generally accepted binary social gender roles and being identified as biologically outside the normal biological spectrum.

The HPC model conceptualizes sex as two categories to which bodies belong based on the number of physiological attributes from either cluster they possess. While acknowledging the kernel of truth in the common-sense notion of sex, the HPC model better encompasses the natural variation across sex traits than the traditional binary view. The HPC framework also has several advantages over the alternatives to the traditional binary model

that are described in Chapter 3. It is supported by a growing body of research in neuroscience and endocrinology: humans are generally sexually dimorphic, although our picture of exactly how dimorphic we are remains incomplete. While research on this dimorphism is important, the motivations of such research and the interpretations of the results must be carefully considered. Overly deterministic biological interpretations of the dimorphism can lead to undesirable consequences, such as the view that particular behaviours are natural for each sex and therefore certain social structures that subordinate women socially and economically should be supported. However, as discussed in section 1.3, ignoring legitimate general dimorphism between the sexes can also have serious consequences.

The cluster model does not oppose the ethical standards and considerations put forward by DSD advocacy groups and theorists opposed to normalization treatments for infants. Thanks to the profound work on the part of these theorists and advocates, the medical community is reforming its approach to DSD treatment. It is now recommended that DSDs should be treated with a cautionary approach to genital surgery with strong consideration of the consequences of surgery later in life, that surgery before puberty should only be considered in extreme cases, and that only surgeons with specific training in the care of DSDs perform genital surgeries (Délot and Vilain 390). Medical risks and outcomes must be considered in conjunction with psychosocial risks outcomes, which are influenced by social perceptions of normalcy and belonging (to a particular sex category). The HPC model allows flexibility in the treatment of DSDs and approaches to particular conditions: if no one trait is considered centrally important or necessary for sex-kind membership, the stigma of what it means to be diagnosed with a DSD is significantly challenged, and a DSD becomes similar in kind to abnormal height, body or facial hair growth, or gynecomastia.

Finally, the model I have supported in Chapter 4 is not diametrically opposed to the common-sense view, but rather asks for a reform of the strict criteria we assume to be applied to either category. This makes the cluster model a potentially effective rhetorical tool against transphobic and/or sexist narratives that use the traditional binary model as support for particular policies or moral arguments. Importantly, there is significant social and political support for these narratives which cannot be ignored. The cluster model, in addition to being more empirically accurate, can be used as an effective rhetorical tool against these narratives because it demonstrates that the potentially transphobic or sexist conclusions do not follow from a binary, or dyadic, model, appropriately understood.

There remains significant research to be done in the realm of biological sex development in humans and the highly complex nature of gender. This thesis provides a framework for conceptualizing biological sex that I hope will serve as a more useful starting point for such endeavours.

Works Cited

- Accord Alliance. "What Is Congenital Adrenal Hyperplasia (CAH), and Is It a DSD? | Accord Alliance." *Accord Alliance | Better Care. Better Outcomes. Better Lives.*, 1 Aug. 2013, www.accordalliance.org/faqs/what-is-congenital-adrenal-hyperplasia-cah-and-is-it-a-dsd/#:~:text=Recall%20that%20DSD%20are%20defined,
- Alegria, Analucia A., et al. "Sex Differences in Antisocial Personality Disorder: Results from the National Epidemiological Survey on Alcohol and Related Conditions." *Personality Disorders: Theory, Research, and Treatment*, vol. 4, no. 3, 2013, pp. 214–22, doi:10.1037/a0031681.
- American Psychological Association. *Definitions Related to Sexual Orientation and Gender Diversity in APA Documents*. www.apa.org/pi/lgbt/resources/sexuality-definitions.pdf. Accessed 20 Aug. 2021.
- American Society of Plastic Surgeons. "Gender Confirmation Surgeries." *American Society of Plastic Surgeons*, www.plasticsurgery.org/reconstructive-procedures/gender-confirmation-surgeries. Accessed 9 Aug. 2021.
- The Associated Press. "David Reimer, 38, Subject of the John/Joan Case." *The New York Times*, 12 May 2004, www.nytimes.com/2004/05/12/us/david-reimer-38-subject-of-the-john-joan-case.html. Accessed 9 Aug. 2021.
- Bach, Theodore. "Gender Is a Natural Kind with a Historical Essence." *Ethics*, vol. 122, no. 2, 2012, pp. 231–272. JSTOR, www.jstor.org/stable/10.1086/663232. Accessed 6 July 2021.
- Bangalore Krishna, Kanthi, et al. "Pragmatic Approach to Intersex, Including Genital Ambiguity, in the Newborn." *Seminars in Perinatology*, vol. 41, no. 4, 2017, pp. 244–51. doi:10.1053/j.semperi.2017.03.013.

- BBC. "BBC - Science & Nature - Horizon - The Boy Who Was Turned into a Girl." *BBC*, 7 Dec. 2000, www.bbc.co.uk/science/horizon/2000/boyturnedgirl_transcript.shtml. Accessed 20 Aug. 2021.
- BBC News. "Meghan Murphy: Canadian Feminist's Trans Talk Sparks Uproar." *BBC News*, 30 Oct. 2019, www.bbc.com/news/world-us-canada-50214341. Accessed 9 Aug. 2021.
- Beauvoir, Simone. *The Second Sex*. 1949. New York: Vintage Books, 1989. Print.
- "Ben Shapiro DESTROYS Transgenderism And Pro-Abortion Arguments." *YouTube*, uploaded by The Daily Wire, 9 Feb. 2017, www.youtube.com/watch?v=gkONHNXGfaM.
- Bennecke, Elena, et al. "Early Genital Surgery in Disorders/Differences of Sex Development: Patients' Perspectives." *Archives of Sexual Behavior*, vol. 50, no. 3, 2021, pp. 913–23, doi:10.1007/s10508-021-01953-6.
- Bird, Alexander, and Emma Tobin. "Natural Kinds." *Stanford Encyclopedia of Philosophy*, 15 Feb. 2017, plato.stanford.edu/entries/natural-kinds.
- Bissinger, Buzz. "Caitlyn Jenner: The Full Story". *Vanity Fair*, 25 June 2015, vanityfair.com/hollywood/2015/06/caitlyn-jenner-bruce-cover-annie-leibovitz. Accessed July 15. 2021.
- Blackless, Melanie, et al. "How Sexually Dimorphic Are We? Review and Synthesis." *American Journal of Human Biology*, vol. 12, no. 2, 2000, pp. 151–66, onlinelibrary.wiley.com/doi/abs/10.1002/%28SICI%291520-6300%28200003/04%2912%3A2%3C151%3A%3AAID-AJHB1%3E3.0.CO%3B2-F.

- Blok, Christel J. M. de, et al. "Breast Cancer Risk in Transgender People Receiving Hormone Treatment: Nationwide Cohort Study in the Netherlands." *BMJ*, 2019, p. 11652, doi:10.1136/bmj.11652.
- BMJ. "Gender-Affirming Hormone in Children and Adolescents." *BMJ EBM Spotlight*, 21 May 2019, blogs.bmj.com/bmjebmspotlight/2019/02/25/gender-affirming-hormone-in-children-and-adolescents-evidence-review.
- Boyd, Richard. "How to Be a Moral Realist." *Essays on Moral Realism*, edited by Geoffrey Sayre-McCord, Ithica, Cornell University Press, 1988, pp. 181–228.
- Brizendine, Louann. *The Female Brain*. Broadway Books, 2006.
- Brusman, Liza. "Sex Isn't Binary, and We Should Stop Acting like It Is." *Massive Science*, 14 June 2019, massivesci.com/articles/sex-gender-intersex-transgender-identity-discrimination-title-ix.
- Brzović, Zdenka. "Natural Kinds | Internet Encyclopedia of Philosophy." *Internet Encyclopedia of Philosophy*, www.iep.utm.edu/nat-kind. Accessed 9 Aug. 2021.
- Butler, Catherine, and Anna Hutchinson. "Debate: The Pressing Need for Research and Services for Gender Desisters/Detransitioners." *Child and Adolescent Mental Health*, vol. 25, no. 1, 2020, pp. 45–47., doi:10.1111/camh.12361.
- Butler, Judith. "Judith Butler: The Backlash against 'Gender Ideology' Must Stop." *Newstatesman.*, 21 Jan. 2019, www.newstatesman.com/2019/01/judith-butler-backlash-against-gender-ideology-must-stop. Accessed 11 Aug. 2021.
- Butler, Judith. "Performative Acts and Gender Constitution: An Essay in Phenomenology and Feminist Theory." *Theatre Journal*, vol. 40, no. 4, 1988, p. 519. doi:10.2307/3207893.
- Butler, Judith. *Gender Trouble*. 1990. Routledge, 2021. Print.

- Buvinic, Mayra, and Ruth Levine. "Closing the Gender Data Gap." *Significance*, vol. 13, no. 2, 2016, pp. 34–37, doi:10.1111/j.1740-9713.2016.00899.x.
- Canada Research Coordinating Committee. "Best Practices in Equity, Diversity and Inclusion in Research." *Government of Canada*, 22 June 2021, www.sshrc-crsh.gc.ca/funding-financement/nfrf-fnfr/edi-eng.aspx.
- Canadian Institutes of Health Research. "What Is Gender? What Is Sex? - CIHR." *Search and Menus Canadian Institutes of Health Research*, 28 Apr. 2020, cihr-irsc.gc.ca/e/48642.html.
- Canadian Paediatric Society. "Gender Identity." *Canadian Paediatric Society*, www.caringforkids.cps.ca/handouts/behavior-and-development/gender-identity. Accessed 12 Aug. 2021.
- Cavanagh, Sheila L., and Heather Sykes. "Transsexual Bodies at the Olympics: The International Olympic Committee's Policy on Transsexual Athletes at the 2004 Athens Summer Games." *Body & Society*, vol. 12, no. 3, 2006, pp. 75–102, doi:10.1177/1357034x06067157.
- "Census 2021: Final Guidance for the Question 'What Is Your Sex?'" *Office for National Statistics*, www.ons.gov.uk/census/censustransformationprogramme/questiondevelopment/genderidentity/census2021finalguidanceforthequestionwhatisyoursex. Accessed 6 July 2021.
- Centers for Disease Control and Prevention. "Men and Heart Disease." *Centers for Disease Control and Prevention*, 3 Feb. 2021, www.cdc.gov/heartdisease/men.htm.
- Colapinto, John. *As Nature Made Him: The Boy Who Was Raised as a Girl*. 2nd ed., New York, Harper Perennial, 2006.

Criminal Code. RSC 1985, c. C-46, s. 2681997, c. 16, s. 5

Délot, Emmanuèle C., and Eric Vilain. “Chapter 16 - Disorders of Sex Development.” *Yen and Jaffe’s Reproductive Endocrinology : Physiology, Pathophysiology, and Clinical Management*, 8th ed., Elsevier, 2018, pp. 365–393.e5.

“Detransition Real Life Experience.” *YouTube*, uploaded by elle palmer, 29 July 2020, www.youtube.com/watch?v=fbjXDo6XDIg.

Diamond, Milton. “Sex Reassignment at Birth: A Long Term Review and Clinical Implications.” *Archives of Pediatrics & Adolescent Medicine*, vol. 151, no. 3, 1997, doi:10.1001/archpedi.1997.02170400084015.

Diamond, Milton, and Hazel Glenn Beh. “David Reimer’s Legacy: Limiting Parental Discretion.” *Cardozo Journal of Law & Gender*, vol. 12, no. 5, 2009, pp. 5–30, papers.ssrn.com/sol3/papers.cfm?abstract_id=1446966.

Dreger, Alice. “The Olympic Struggle Over Sex.” *The Atlantic*, 2 July 2012, www.theatlantic.com/health/archive/2012/07/the-olympic-struggle-over-sex/259321. Accessed 9 Aug. 2021.

Dreger, Alice Domurat. *Intersex in the Age of Ethics (Ethics in Clinical Medicine Series)*. 1st ed., Univ Pub Group, 1999.

Dupré, John. *The Disorder of Things: Metaphysical Foundations of the Disunity of Science*. Harvard University Press, 1993.

Ellis, R. E. “Reference Man: Anatomical, Physiological and Metabolic Characteristics. Report of the Task Group on Reference Man ICRP Publication 23.” *Physics Bulletin*, vol. 27, no. 2, 1976, p. 79, doi:10.1088/0031-9112/27/2/041.

Fausto-Sterling, Anne. “The Five Sexes.” *The Sciences*, vol. 33, no. 2, 1993, pp. 20–24, doi:10.1002/j.2326-1951.1993.tb03081.x.

- Fausto-Sterling, Anne. "Opinion | Why Sex Is Not Binary." *The New York Times*, 27 Oct. 2018, www.nytimes.com/2018/10/25/opinion/sex-biology-binary.html. Accessed 9 Aug. 2021.
- Ford, Anne Rochon, and Dayna Nadine Scott. "A Critique of Risk Disclosure as the Solution for Minimizing Toxic Exposures in Pregnancy." *NEW SOLUTIONS: A Journal of Environmental and Occupational Health Policy*, vol. 27, no. 1, 2017, pp. 51–67, doi:10.1177/1048291117697108.
- García-Acero, Mary, et al. "Disorders of Sexual Development: Current Status and Progress in the Diagnostic Approach." *Current Urology*, vol. 13, no. 4, 2020, pp. 169–78, doi:10.1159/000499274.
- Genetic and Rare Diseases Information Center (GARD). "46, XY Disorders of Sexual Development." *Genetic and Rare Diseases Information Center (GARD)*, rarediseases.info.nih.gov/diseases/8538/46-xy-disorders-of-sexual-development#:~:text=A%2046%2C%20XY%20disorder%20of,not%20clearly%20male%20or%20female. Accessed 22 Aug. 2021.
- "Governor Ron DeSantis Signs Fairness in Women's Sports Act." Governor Ron DeSantis 46th Governor of Florida, 1 June 2021. Press Release. Database Name or Title of Non-Publisher Website, <https://www.flgov.com/2021/06/01/governor-ron-desantis-signs-fairness-in-womens-sports-act/>. Accessed 5 July 2021.
- Gregory, Sean. "Caster Semenya Is Barred From Her Best Race. But She Won't Give Up On Tokyo." *Time*, 28 Apr. 2021, time.com/5958665/caster-semenya-tokyo-olympics.
- Guadamuz, Thomas E., et al. "HIV Prevalence, Risk Behavior, Hormone Use and Surgical History Among Transgender Persons in Thailand." *AIDS and Behavior*, vol. 15, no. 3, 2010, pp. 650–58, doi:10.1007/s10461-010-9850-5.

“Guidelines for Psychological Practice with Transgender and Gender Nonconforming People.” *American Psychologist*, vol. 70, no. 9, 2015, pp. 832–64, doi:10.1037/a0039906.

Gurney, Karen. “Sex and the Surgeon’s Knife: The Family Court’s Dilemma ... Informed Consent and the Specter of Iatrogenic Harm to Children with Intersex Characteristics.” *American Journal of Law & Medicine*, vol. 33, no. 4, 2007, pp. 625–61, doi:10.1177/009885880703300403.

Harari, Yuval Noah. *Sapiens: A Graphic History: The Birth of Humankind (Vol. 1)*.

Hayton, Debbie. “Why This Trans Athlete Is No Laurel Hubbard.” *UnHerd*, 5 Aug. 2021, unherd.com/the-post/why-this-trans-athlete-is-no-laurel-hubbard.

Hesse, Minoca. “We Celebrated Michael Phelps’s Genetic Differences. Why Punish Caster Semenya for Hers?” *The Washington Post*, 2 May 2019, www.washingtonpost.com/lifestyle/style/we-celebrated-michael-phelpss-genetic-differences-why-punish-caster-semenya-for-hers/2019/05/02/93d08c8c-6c2b-11e9-be3a-33217240a539_story.html.

Hoebeke, Piet B., et al. “Erectile Implants in Female-to-Male Transsexuals: Our Experience in 129 Patients.” *European Urology*, vol. 57, no. 2, 2010, pp. 334–41, doi:10.1016/j.eururo.2009.03.013.

Hughes, Ieuan A., et al. “Androgen Insensitivity Syndrome.” *The Lancet*, vol. 380, no. 9851, 2012, pp. 1419–28, doi:10.1016/s0140-6736(12)60071-3.

Hughes, Ieuan A., et al. “Consensus Statement on Management of Intersex Disorders.” *Archives of Disease in Childhood*, vol. 91, no. 7, 2005, pp. 554–63, doi:10.1136/adc.2006.098319.

- Hyde, Janet Shibley, et al. "The Future of Sex and Gender in Psychology: Five Challenges to the Gender Binary." *American Psychologist*, vol. 74, no. 2, 2019, pp. 171–93, doi:10.1037/amp0000307.
- Intersex Society of North America. "Congenital Adrenal Hyperplasia (CAH) | Intersex Society of North America." *Intersex Society of North America*, isna.org/faq/conditions/cah. Accessed 9 Aug. 2021.
- Intersex Society of North America. "Frequently Asked Questions | Intersex Society of North America." *Intersex Society of North America*, www.isna.org/faq/printable. Accessed 9 Aug. 2021.
- Intersex Society of North America. "Dear ISNA Friends and Supporters | Intersex Society of North America." *Intersex Society of North America*, 2008, isna.org/farewell_message. Accessed 9 Aug. 2021.
- Ivy, Veronica, and Aryn Conrad. "Including Trans Women Athletes in Competitive Sport." *Philosophical Topics*, vol. 46, no. 2, 2018, pp. 103–40, doi:10.5840/philtopics201846215.
- Joel, Daphna, and Anne Fausto-Sterling. "Beyond Sex Differences: New Approaches for Thinking about Variation in Brain Structure and Function." *Philosophical Transactions of the Royal Society B: Biological Sciences*, vol. 371, no. 1688, 2016, p. 20150451. doi:10.1098/rstb.2015.0451.
- Joel, Daphna. "Genetic-gonadal-genitals sex (3G-Sex) and the Misconception of Brain and Gender, or, Why 3G-Males and 3G-Females Have Intersex Brain and Intersex Gender." *Biology of Sex Differences*, vol. 3, no. 1, 2012, p. 27, doi:10.1186/2042-6410-3-27.

- Joel, Daphna. "Sex beyond the Genitalia: The Human Brain Mosaic." *Proceedings of the National Academy of Sciences*, vol. 112, no. 50, 2015, doi:10.1073/pnas.1509654112.
- Kessler, Suzanne. *Lessons from the Intersexed*. 1st ed., Rutgers University Press, 1998.
- Khalidi, Muhammad Ali. "Are Sexes Natural Kinds." *Current Controversies in Philosophy of Science*, Forthcoming.
- Kingma, Boris, and Wouter van Marken Lichtenbelt. "Energy Consumption in Buildings and Female Thermal Demand." *Nature Climate Change*, vol. 5, no. 12, 2015, pp. 1054–56, doi:10.1038/nclimate2741.
- Klosok, Aleks and George Ramsay. "Laurel Hubbard Becomes First out Transgender Woman to Compete at the Olympics." *CNN*, 2 Aug. 2021, edition.cnn.com/2021/08/02/sport/laurel-hubbard-olympics-weightlifting-spt-intl/index.html.
- Lehtonen, Jussi, and Geoff A. Parker. "Gamete Competition, Gamete Limitation, and the Evolution of the Two Sexes." *MHR: Basic Science of Reproductive Medicine*, vol. 20, no. 12, 2014, pp. 1161–68, doi:10.1093/molehr/gau068.
- Li, Tian-Fu, et al. "46,XX Testicular Disorder of Sexual Development with SRY-Negative Caused by Some Unidentified Mechanisms: A Case Report and Review of the Literature." *BMC Urology*, vol. 14, no. 1, 2014, doi:10.1186/1471-2490-14-104.
- Li, Zixiang, et al. "46, XX Ovotesticular Disorder of Sex Development (True Hermaphroditism) with Seminoma." *Medicine*, vol. 99, no. 40, 2020, p. e22530, doi:10.1097/md.00000000000022530.
- Liening, Scott H., et al. "Salivary Testosterone, Cortisol, and Progesterone: Two-Week Stability, Interhormone Correlations, and Effects of Time of Day, Menstrual Cycle,

- and Oral Contraceptive Use on Steroid Hormone Levels.” *Physiology & Behavior*, vol. 99, no. 1, 2010, pp. 8–16, doi:10.1016/j.physbeh.2009.10.001.
- Mikkola, Mari. “Feminist Perspectives on Sex and Gender (Stanford Encyclopedia of Philosophy).” *Stanford Encyclopedia of Philosophy*, 25 Oct. 2017, plato.stanford.edu/entries/feminism-gender. Accessed 15 July. 2021.
- Minto, Catherine L., et al. “The Effect of Clitoral Surgery on Sexual Outcome in Individuals Who Have Intersex Conditions with Ambiguous Genitalia: A Cross-Sectional Study.” *The Lancet*, vol. 361, no. 9365, 2003, pp. 1252–57, doi:10.1016/s0140-6736(03)12980-7.
- Montañez, Amanda. “Visualizing Sex as a Spectrum.” *Scientific American Blog Network*, 29 Aug. 2017, blogs.scientificamerican.com/sa-visual/visualizing-sex-as-a-spectrum. Accessed 9 Aug. 2021.
- Montañez, Amanda. “Beyond XX and XY: The Extraordinary Complexity of Sex Determination.” *Scientific American*, 1 Sept. 2017, www.scientificamerican.com/article/beyond-xx-and-xy-the-extraordinary-complexity-of-sex-determination. Accessed 9 Aug. 2021.
- Morgenroth, Thekla, et al. “Defending the Sex/Gender Binary: The Role of Gender Identification and Need for Closure.” *Social Psychological and Personality Science*, vol. 12, no. 5, 2020, pp. 731–40, doi:10.1177/1948550620937188.
- Morris, Steven. “Germaine Greer Gives University Lecture despite Campaign to Silence Her.” *The Guardian*, 29 Nov. 2017, www.theguardian.com/books/2015/nov/18/transgender-activists-protest-germaine-greer-lecture-cardiff-university. Accessed 9 Aug. 2021.

- Nanda, Serena. "The Hijras of India." *Journal of Homosexuality*, vol. 11, no. 3–4, 1986, pp. 35–54, doi:10.1300/j082v11n03_03.
- Natural Sciences and Engineering Research Council of Canada. *Guide for Applicants: Considering equity, diversity and inclusion in your application*. www.nserc-crsng.gc.ca/_doc/EDI/Guide_for_Applicants_EN.pdf. Accessed 6 July 2021.
- Nistal, Manuel, et al. "Perspectives in Pediatric Pathology, Chapter 7. Ovotesticular DSD (True Hermaphroditism)." *Pediatric and Developmental Pathology*, vol. 18, no. 5, 2015, pp. 345–52, doi:10.2350/14-04-1466-pb.1.
- Nisker, Jeff. "Informed Choice and PGD to Prevent 'Intersex Conditions.'" *The American Journal of Bioethics*, vol. 13, no. 10, 2013, pp. 47–49, doi:10.1080/15265161.2013.828125.
- Nolan, Ian T., et al. "Demographic and Temporal Trends in Transgender Identities and Gender Confirming Surgery." *Translational Andrology and Urology*, vol. 8, no. 3, 2019, pp. 184–90, doi:10.21037/tau.2019.04.09.
- NORD - National Organization for Rare Disorders. "Ovotesticular Disorder of Sex Development." *NORD (National Organization for Rare Disorders)*, 27 Sept. 2016, rarediseases.org/rare-diseases/ovotesticular-disorder-of-sex-development.
- Öçal, Gönül. "Current Concepts in Disorders of Sexual Development." *Journal of Clinical Research in Pediatric Endocrinology*, vol. 3, no. 3, 2011, pp. 105–14. doi:10.4274/jcrpe.v3i3.22.
- Orr, Celeste. *Exorcising Intersex and Crippling Compulsory Dyadism*. 2018. University of Ottawa. PhD dissertation. Recherche uO Research. Homeruor.uottawa.ca/bitstream/10393/37597/3/Orr_Celeste_E_2018_thesis.pdf

- OutRight Action International. "Acronyms Explained." *OutRight Action International*, 18 Feb. 2020, www.outrightinternational.org/content/acronyms-explained. Accessed 9 Aug. 2021.
- Özdemir, Meltem, et al. "Ovotesticular Disorder of Sex Development: An Unusual Presentation." *Journal of Clinical Imaging Science*, vol. 9, 2019, p. 34, doi:10.25259/jcis_45_2019.
- Pearce, Ruth, et al. "TERF Wars: An Introduction." *The Sociological Review*, vol. 68, no. 4, 2020, pp. 677–98, doi:10.1177/0038026120934713.
- Pickles, Kate. "Ministers Pledge to End Trans-Discrimination in NHS Screening Programmes." *Mail Online*, 27 Feb. 2019, www.dailymail.co.uk/health/article-6750777/Ministers-pledge-end-trans-discrimination-NHS-screening-programmes.html. Accessed 9 Aug. 2021.
- Reilly, Justine M., and C. R. J. Woodhouse. "Small Penis and the Male Sexual Role." *Journal of Urology*, vol. 142, no. 2 Part 2, 1989, pp. 569–71, doi:10.1016/s0022-5347(17)38818-3.
- Richardson, Sarah S. "Sexes, Species, and Genomes: Why Males and Females Are Not like Humans and Chimpanzees." *Biology & Philosophy*, vol. 25, no. 5, 2010, pp. 823–41, doi:10.1007/s10539-010-9207-5.
- Roberts, Timothy A., et al. "Effect of Gender Affirming Hormones on Athletic Performance in Transwomen and Transmen: Implications for Sporting Organisations and Legislators." *British Journal of Sports Medicine*, vol. 55, no. 11, 2020, pp. 577–83, doi:10.1136/bjsports-2020-102329.
- Röhle, Robert, et al. "Participation of Adults with Disorders/Differences of Sex Development (DSD) in the Clinical Study Dsd-LIFE: Design, Methodology,

- Recruitment, Data Quality and Study Population.” *BMC Endocrine Disorders*, vol. 17, no. 1, 2017, doi:10.1186/s12902-017-0198-y.
- Saul, Jennifer. “Politically Significant Terms and Philosophy of Language.” *Out from the Shadows: Analytical Feminist Contributions to Traditional Philosophy*, edited by Sharon Crasnow and Anita Superson, 1st ed., Oxford University Press, 2012, pp. 195–216.
- Sax, Leonard. “How Common Is Intersex? A Response to Anne Fausto-Sterling.” *The Journal of Sex Research*, vol. 39, no. 3, 2002, pp. 174–78, doi:10.1080/00224490209552139.
- “Sex Characteristic.” *APA Dictionary of Psychology*, American Psychological Association, dictionary.apa.org/sex-characteristic. Accessed 13 Aug. 2021.
- Shapiro, Ben. “Ben Shapiro: The Left’s Gender Theories Are Anti-Scientific Nonsense but They’re Gaining Ground.” *Pittsburgh Post-Gazette*, 10 June 2021, www.post-gazette.com/opinion/Op-Ed/2020/12/05/Ben-Shapiro-The-left-s-gender-theories-are-anti-scientific-nonsense-but-they-re-gaining-ground/stories/202012050012. Accessed 9 Aug. 2021.
- Singh, Prerna. “How Biological Determinism Perpetuates Sexism Using ‘Science.’” *Feminism In India*, 19 June 2018, www.feminisminindia.com/2018/06/18/biological-determinism-science-sexism. Accessed 9 Aug. 2021.
- Sparrow, Robert. “Gender Eugenics? The Ethics of PGD for Intersex Conditions.” *The American Journal of Bioethics*, vol. 13, no. 10, 2013, pp. 29–38, doi:10.1080/15265161.2013.828115.
- Statistics Canada. “Experiences of Violent Victimization and Unwanted Sexual Behaviours among Gay, Lesbian, Bisexual and Other Sexual Minority People, and the

- Transgender Population, in Canada, 2018.” *Statistics Canada*, 9 Sept. 2020, www150.statcan.gc.ca/n1/pub/85-002-x/2020001/article/00009-eng.htm. Accessed 9 Aug. 2021.
- Statistics Canada. “Technical Report on Changes for the 2021 Census Sex at Birth and Gender: Technical Report on Changes for the 2021 Census.” *Statistics Canada*, 20 June 2020, www12.statcan.gc.ca/census-recensement/2021/ref/98-20-0002/982000022020002-eng.cfm. Accessed 9 Aug. 2021.
- Stone, Alison. *An Introduction to Feminist Philosophy*. 1st ed., Polity, 2007.
- Sullivan, Alice. “Sex and the Census: Why Surveys Should Not Conflate Sex and Gender Identity.” *International Journal of Social Research Methodology*, vol. 23, no. 5, 2020, pp. 517–24. doi:10.1080/13645579.2020.1768346.
- “Transphobic Hate Crime Reports Have Quadrupled over the Past Five Years in the UK.” *BBC News*, 11 Oct. 2020, www.bbc.com/news/av/uk-54486122.
- Thompson, Michaela. *Medicalization of Deviant Conditions: The Problem with Well-Intentioned—but Misguided—Medicine*. 5 Aug. 2016. University of Lethbridge, Undergraduate honours thesis.
- Valentine, David. *Imagining Transgender: An Ethnography of a Category*. Illustrated, Duke University Press, 2007.
- Vasey, Paul L., and Nancy H. Bartlett. “What Can the Samoan ‘Fa’afafine’ Teach Us about the Western Concept of Gender Identity Disorder in Childhood?” *Perspectives in Biology and Medicine*, vol. 50, no. 4, 2007, pp. 481–90, doi:10.1353/pbm.2007.0056.
- Winter, Sam, et al. “Transgendered Women of the Philippines.” *International Journal of Transgenderism*, vol. 10, no. 2, 2007, pp. 79–90, doi:10.1080/15532730802182185

Witchel, SF. “Disorders of Sex Development.” *Yearbook of Paediatric Endocrinology*, 2018. doi:10.1530/ey.15.6.19.

Wittgenstein, Ludwig. *Philosophical Investigations*. 4th ed., Wiley-Blackwell, 2009.

Wright, Colin. “JK Rowling Is Right—Sex Is Real and It Is Not a ‘Spectrum.’” *Quillette*, 25 Nov. 2020, quillette.com/2020/06/07/jk-rowling-is-right-sex-is-real-and-it-is-not-a-spectrum.