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To cite this article: Anne Fausto-Sterling (2019): Gender/Sex, Sexual Orientation, and Identity Are in the Body: How Did They Get There?, The Journal of Sex Research

To link to this article: <https://doi.org/10.1080/00224499.2019.1581883>



Published online: 15 Mar 2019.



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ANNUAL REVIEW OF SEX RESEARCH SPECIAL ISSUE

Gender/Sex, Sexual Orientation, and Identity Are in the Body: How Did They Get There?

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In this review, I explore theoretical and empirical approaches to the development of gender/sex and sexual orientation (SO). Leaving behind the nature versus nurture opposition, I look at both identities as deeply embodied. My approach intertwines sex, gender, orientation, bodies, and cultures without a demand to choose one over the other. First, I introduce basic definitions, focusing on how intertwined the concepts of sex and gender really are. I affirm recent trends to consider a new term—gender/sex—as the best way to think about these deeply interwoven bodily traits. I introduce several literatures, each of which considers the processes by which traits become embodied. These points of view offer a basis for future work on identity development. Specifically, and selectively, I provide insights from the fields of phenomenology, dyadic interaction and the formation of presymbolic representations in infancy, and dynamic systems in infant development. I consider how thinking about embodied cognition helps to address intersubjectivity and the emergence of subjective identity. Next, I review what we currently know about the development of complex sexual systems in infancy and toddlerhood. Finally, I discuss the few existing theories of SO development that consider the events of infancy and childhood.

In this review, I outline the elements of a theory that considers sex, gender, gender/sex, and sexual orientation (SO) as interdependent, embodied dynamic systems. Aspects of each can be examined separately, but usually for any individual they are components of a unified whole. Although such systems change shape and activity throughout the life cycle, I focus on what we do and do not know about them in early development, especially during the first year of infancy. The goal is to provide a scaffold for new research.

My approach contrasts with much past work. For example, the authors of a recent, extensive review of research into the causes of (homo)sexual orientation concluded that “there is considerably more evidence supporting non-social causes of SO than social causes” (Bailey et al., 2016, p. 46). They came to this conclusion after considering a wide-ranging literature reporting on research designed around the premise that SO must either originate primarily from essential biological (genetic, hormonal, and intrauterine environment) processes

or from what they and others describe as “social causes” (sometimes referred to as social constructionism). Such a framework structures the questions asked and answered by investigators on both sides of a debate about biology versus upbringing (individual and cultural socialization) and precludes ways of looking at the question that do not share the same theoretical structure.

Using the social versus not social framework, Bailey et al. (2016) presented a thorough and balanced review both of scientific findings and of social and ethical applications of such findings. I do not take up this second, social policy thread in this review; it is an important one, to be sure, but I chose, rather, to focus on theories of embodiment and development, which have been largely absent from discussions of gender/sex and orientation. Further, there is no need to contribute more using the same theoretical context to a discussion of biological and social contributions of homosexuality, as many recent publications emphasize biological versus social frameworks (Bocklandt & Vilain, 2007; Bogaert et al., 2018; Hines, 2015; Vilain, 2008). Instead, I take an orthogonal turn. I leave behind the social-versus-nonsocial, nature-versus-nurture oppositions, outlining an approach that intertwines sex,

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gender, orientation, bodies, and cultures without a demand to choose one over the other.

It seems uncontroversial to posit that our desires, behaviors, and choices emanate from our bodies and that our bodies are, of course, expressions of biological processes; but perhaps it is more controversial to insist as well that nurture/culture directs, shapes, and limits these processes. I build the case systematically, starting with basic definitions and proceeding to a general discussion of theories and principles of embodied development. Finally, I apply the ideas developed to a discussion of orientation and gender/sex.

In Defense of Infancy

I am often asked why I focus so relentlessly on infancy. Why not preadolescence or adolescence? Are there no later influences on gender/sex and SO? Developmental plasticity certainly continues past age three, and the events of childhood and adolescence contribute importantly to the development of gender/sex and orientation. But these events build on the events that happen during the first 18-plus months of development. Although studies note the emergence of a gendered sense of self beginning generally between the ages of two and three, researchers who study orientation and gender/sex have only sketchy knowledge of the acquisition of gender knowledge during infancy (Fausto-Sterling, García Coll, & Lamarre, 2012a, 2012b; Martin & Ruble, 2010; Ruble, Lurye, & Zosuls, 2010; Ruble, Martin, & Berenbaum, 2006). Gender attribution of self and others and gender-related behavior patterns begin to show up between two to three years of age, but where does gender recognition of self and other come from? With regard to gender/sex and orientation, infant development is understudied, underestimated, and undertheorized (Fausto-Sterling, 2007, 2012b). If developmental dynamics is the right way to look at things, then the important events of preadolescence build on existing bodily history; the shape of the vessel at any one moment structures the shape it can take in the next moment.

In her memoir about being transsexual, Jan Morris wrote that on a particular day, when she was between the ages of three and four, she suddenly knew that she had been born in the wrong body. This was, she wrote, her first solid memory: “It is true that my mother had wished me to be a daughter, but I was never treated as one.” Indeed, the full passage suggests a rather more complex story. Morris continued: “It is true that gushing visitors sometimes assembled me into their fox furs and lavender sachets to murmur that, with curly hair like mine, I should have been born a girl ... If I had announced my self-discovery ..., my family might not have been shocked” (Morris, 1974, p. 4). This statement, and many like it from gender-variant adults about their gender-nonconforming child- and toddlerhoods all have one thing in common: They omit infancy. Instead, they start their narrative of development at toddlerhood. In this telling of the gender/sex and orientation story, one is born. Nothing happens before language and self-

consciousness develops. Then gender/sex and orientation appear, if not full-blown, still, somehow magically clear and constant. This leaves me wondering what does happen and what might happen in the period from, say, birth to three years. It is this part of the story, which for the most part precedes verbal narrative, on which I focus in this review.

Basic Terms

For this article, I focus on sex, gender, gender/sex, SO, and embodiment. “Identity” (meant here as an internal sense of self) is a word that might attach to any of these concepts. Indeed, one of the main topics to discuss is how identity gets attached in a deep way, as part of the belief system about self. How does it come to be “in our bones” rather than merely a stylish hat we can put on or remove at will?

Sex and Gender

Defining *sex* and *gender* is more difficult than it might seem at first blush. It appears to be simple for the legal purpose of filling in a birth certificate (we know that the baby is either a boy or a girl because we look at the external genitalia using prenatal imaging or direct inspection at birth). Nevertheless, historians have pointed out the problems raised by bodies that fall outside of these two categories (Dreger, 1998; Stryker, 2006). Whether biologists and medical experts have focused on sex-determining molecules, chromosomes, hormones, or internal or external genitalia, it has not been possible to agree upon a categorical definition. Indeed, this entanglement of the idea of sex with socially agreed-upon sex-related categories lies at the heart of the International Olympic Committee’s unsuccessful efforts to determine whether particular women are eligible to compete as females (Blackless et al., 1999; Fausto-Sterling, 1989, 2000; Fine, 2016; Jordan-Young, 2010; Jordan-Young, Sonksen, & Karkazis, 2014; Karkazis & Jordan-Young, 2018; Karkazis, Jordan-Young, Davis, & Camporesi, 2012; Kessler, 1998; Richardson, 2013).

Money and Ehrhardt (1972) explained their findings on intersex individuals by defining levels of sex, each of which could develop independently of the other. In Figure 1, I offer a modification of their proposal, which, despite efforts to present an account of “pure” sex, lets gender slip into the story.¹ In my view Money attempted to save sex as a natural category by developing the linked concepts of gender role (the public presentation of the degree that one is male, female, or other) and gender identity (the private experience of gender role). Money and Ehrhardt understood gender identity/role to be an individual characteristic, and the concepts served to stabilize

¹Stryker (2006, p. 9) wrote, “The subjective identities of transsexuals ... and the gender inversion of butches and queens all work to confound simplistic notions of material determinism... . Sex ... is not the foundation of gender in the same way that an apple is the foundation of red fruit in the mirror; ‘sex’ is a mash-up, a story we mix about *how* the body means... . ‘Sex’ is purpose-built to serve *as* a foundation.”

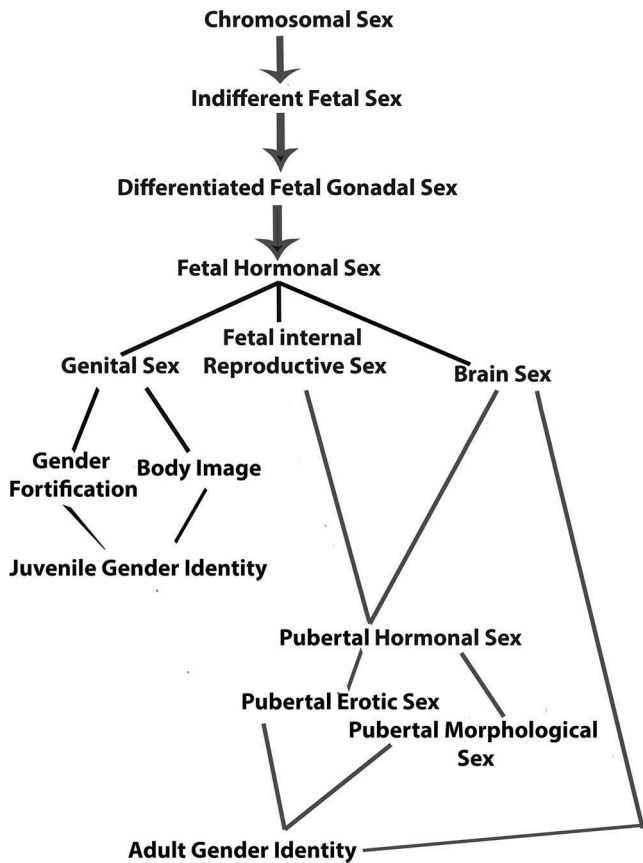


Figure 1. Expanded version of Money and Ehrhardt's (1972) presentation of "levels of sex."

sex in the face of its multilevel variability. In the 1970s, feminist theorist and anthropologist Rubin (1975) proposed to isolate sex as a natural category that summed up anatomy, phenotype, and physiology as binary and fixed, but she denied sex a significant role in producing social inequality between men and women. This task fell to gender, defined as the cultural meanings of man/male and woman/female and of highly varying cultural enactments of masculinity and femininity. Rubin's move became deeply embedded in feminist politics. Sociologists' elaborations of gender as a social structure are far removed from Money and Ehrhardt's concept of gender identity/role as an individual, personal characteristic (Kessler & McKenna, 1978; Lorber, 1994; Stoller, 1968).

During the 1990s, scholars reevaluated Money's representation of intersexed bodies as well as their treatment in medical practice. Prior to this time, and relying heavily on Money's ideas, medical experts combined surgery with child-rearing advice to shoehorn into boxes labeled male or female those bodies which did not fit either. To achieve this they had to use cultural (i.e., social gender) concepts about sexual difference to guide the physical adjustment of bodies (e.g., shortening a phallus or removing testicles) (Fausto-Sterling, 2000). Analysis of these practices led scholars such as Kessler (1998) and Butler (1993) to argue that sex itself is a socially constructed category. As Halperin (2014) so succinctly stated, "[A]ccording to Rubin, human societies begin with sexed bodies and produce

gender. According to Butler, human societies begin with gender and impose it on human bodies as sex" (p. 452).

Those biologists, medical scientists, and behavioral scientists who were aware of feminist moves to denaturalize sex pushed back with an explosion of research detailing sex differences even at the level of individual cells. Much of this push-back was evaluated in a book-length report commissioned by the Institute of Medicine. The authors of this volume defined "sex as the classification of living things, generally as male or female according to their reproductive organs and functions assigned by the chromosomal complement, and *gender* as a person's self-representation as male or female or how that person is responded to by social institutions on the basis of the individual's gender presentation. Gender is shaped by the environment and experience" (Institute of Medicine, 2001, p. 13). By implication, sex was seen as a given, natural baseline, shaped by neither environment nor experience.

The argument about whether sex is a legitimate, binary, and exclusively biological category continues apace. Joel, for example, argued forcefully that we cannot conceptualize brains as male or female simply because they are found in bodies with particular genitalia (Joel, 2012; Joel et al., 2015; Joel & Fausto-Sterling, 2016; Joel, Persico, Hånggi, Pool, & Berman, 2016; Kaiser, 2012). Others just as forcefully disagreed (Chekroud, Ward, Rosenberg, & Holmes, 2016; Del Giudice et al., 2016; Rosenblatt, 2016). Although a fading formulation that predominated in mid-20th century discourse about trans* people (Halberstam, 2018), the idea of a male brain in a female body also continues to animate some of the public discourse about trans* individuals (Califia, 1997; Halberstam, 2018).² I take the designation *trans** from Halberstam. They wrote: "I have selected the term 'trans*' ... precisely to open the term up to unfolding categories of being organized around but not confined to forms of gender variance. . . . The asterisk holds off the certainty of diagnosis; it keeps at bay any sense of knowing in advance what the meaning of this or that gender variant form may be, and perhaps most importantly, it makes trans* people the authors of their own categorizations" (Halberstam, 2018, p. 4). In a similar way, Tate, Youssef, and Bettergarcia (2014) use the term *trans** as a shorthand for "transgender spectrum."

A recent paper by Latham (2017) beautifully illustrates the difficulties in holding sex and gender constant. In it, they analyzed their own experience in a gender surgery clinic. From initial sign-up to evaluation as a candidate for chest surgery (breast removal and reconstruction to a more "masculine" appearance), Latham shows how, within a medical setting, definitions of sex accrue and morph. Upon entry, Latham fills out a form that asks "Sex?" They declare FtM, observing that on the form sex is self-determined. Then a doctor evaluates Latham's blood testosterone levels and notes natal sex, determining that both of these indicate that Latham is currently female. Later, a medical worker indicates that sex must

² Jazz Jennings, at age seven, expressed this idea clearly in a YouTube clip: <https://www.youtube.com/watch?v=3XZWF0gP6RY>.

include the feeling that women want to have breasts, and because Latham does not want these they must not be female. Latham throws a wrench in the works, however, because, even though they want breast surgery, they do not want to take masculinizing hormones. Both a psychiatrist and a surgeon balk at what appears to them to be a “levels of sex” contradiction (see Figure 1). Latham also encounters resistance because they do not hate their current genitals (a vagina and accoutrements). According to the psychiatrist, whose consult is required at this clinic, “One cannot be both. Sex must be becoming singular; [you] must feel [yourself] to be male *and* hate being female” (p. 187). At this point in the process, Latham writes, “I am failing at presenting *enough* male sex-objects ... I’m on the verge of my sex being made female (and thus being denied access to the surgery ... women cannot obtain this surgery)” (Latham, 2017, p. 188). However, gender rescues Latham, as they are deemed to be of the male sex by possessing the arguably cultural attributes of masculinity, especially dress, hairstyle, mannerisms, and gait. I note for future reference that mannerisms and gait are at least partly embodied motor characteristics, less superficial than long or short hair, and are thus part of what constitutes embodied gender/sex, as discussed subsequently in this article.

Gender/Sex

As early as 1993, Unger and Crawford homed in on the problem addressed in this section. As they noted, sex and gender are neither dichotomous nor independent of each other. Gendered structures change biological function and structure. At the same time, biological structure and function affect gender, gender identity, and gender role at both individual and cultural levels. The circularity of defining sex and gender, made even more obvious by the increasing number of individuals who identify as nonbinary, has produced two interventions: the first by van Anders and Dunn (2009) and the second by Hyde, Bigler, Joel, Tate, and van Anders (2018). Van Anders (2015) is concerned with ways to study SO. But orientation toward whom? Is it toward individuals with different chromosomes (hetero?) or the same chromosomes (homo?)? Or does sexual attraction have more to do with gendered attributes that often, but not always, link to those chromosomes?

To escape these difficulties, van Anders and Dunn (2009) combined gender and sex into a unifying concept called *gender/sex*. In the past, Fausto-Sterling (2012b) and Pitts-Taylor (2016) used the term *sex/gender* to indicate the hopelessness of considering these terms apart from each other. But here and going forward, I urge uniformity of terms, especially because van Anders has so clearly laid out the problems of using them as separate terms. She defines *sex* as people labeled male, female, sexqueer, trans*, and intersex, for whom “sex” refers to “sex-related bodily features that are ... biological ... evolved, physical and/or innate (e.g., vulvas, penises, breasts, body shape)” (van Anders, 2015, p. 1181). *Sex* may also be a word used to describe one’s internal sense of self. Words that indicate

gender include *feminine, masculine, genderqueer, trans*, tomboy, butch, femme*, and so on. Here too, these words may describe one’s internal sense of self. Last, van Anders introduced *gender/sex* as “whole people/identities and/or aspects of women, men and people that relate to identity and/or cannot really be sourced specifically to sex or gender” (van Anders, 2015, p. 1181). In my view, few aspects of adult behavior, emotions, SO, or identity can be sourced purely to sex or purely to gender.

Hyde et al. (2018) considered challenges to the sex/gender binary in the context of future research in the field of psychology. They drew on empirical findings from the fields of neuroscience, neuroendocrinology, transgender and queer studies, and developmental psychology that undermine a sex/gender binary and recommended that the field of psychology adopt new research methods that acknowledge and investigate the multidimensionality of gender/sex. The idea of gender/sex as a softly assembled dynamic system that comes into being starting in infancy and is maintained through one-on-one interactions with other individuals and via cultural enforcement of gender/sex is not emphasized by either van Anders (2015) or Hyde et al. (2018) (for contrast, see Harris, 2005; Thelen & Smith, 2006). In the current review, I hope to remedy this absence of development by thinking about *becoming* a gender/sex.

Sexual Orientation

The meaning of SO seems self-evident. But as is the case with gender/sex, the reality is complex. Bailey and colleagues (2016) defined SO as “relative sexual attraction to men, to women or both” (p. 45). They used two categories, heterosexual and nonheterosexual, and they noted significant differences in the nature of SO in men and women. As they detailed in their article, there are many intersections between gender/sex and SO. These connections form a theoretical puzzle to which I will return. Van Anders (2015) offered a more expansive definition of SO as “interests, approaches, attractions and fantasies” (p. 2). In her sexual configurations theory, orientation is not limited to gender/sex but may include characteristics such as partner number and presumably also age and body type. In subsequent work, Schudson, Manley, Diamond, and van Anders (2018) reported on an empirical study that emphasized the role of the gender element in characterizing SO.

In this review I focus on gender/sex and orientation because (a) this relationship is often implied in empirical research but rarely subject to critical clarification and (b) our knowledge base for early childhood precursors to partner number and to attractions of age and body type is virtually nonexistent. Salomaa and Matsick (2019) reviewed the latest methods for defining and measuring SO in the context of an ever-expanding field of nuanced self-definition. They advocated for a functional approach: tailoring measurement instruments to the goal (clinical, population survey, risk assessment) of any particular study. The implication of their work is that (a) SO is multidimensional

and (b) it is not a historically or socially fixed trait that can be measured in a single “correct” fashion.

In the empirically based fields of psychology and biology (as opposed to older varieties of psychoanalysis; Freud, 2010), heterosexuality is generally taken for granted; most research on SO focuses on the causes and/or phenomenology of nonheterosexuals, thus rendering “the heterosexual” as a norm to which other orientations are compared. Money’s (1988) concept of lovemaps is a mid-20th-century exception to this formulation. Money’s lovemap is a personalized representation in the mind/brain (he often used this formulation to indicate that these are inseparable) that “depicts the idealized lover and the idealized program of sexueroetic activity with that lover as projected in imagery and ideation, or actually engaged in with that lover” (p. 127). Money clearly meant to account for all types of sexual configurations, including those considered normal and acceptable, as defined by “those with ideological authority” (p. 127), and he considered lovemaps to be as individual as fingerprints.

Despite this earlier attention to both hetero and nonhetero orientations, the empirical literature of the past 40-plus years has devoted many paragraphs to problems of measuring nonheterosexuality while paying scant attention to difficulties inherent in the measurement of heterosexuality. Just as problematic as the absence of nuance for the heterosexuality term is the lack of consistency in assessing homosexuality. Most studies that try to identify genetic components of homosexual orientation use a Kinsey scale of 0 to 6, and usually define heterosexual as 0 to 1 and homosexual as 5 to 6, leaving out 2 through 4 because their inclusion makes it too difficult to obtain significant results (Sanders et al., 2017). But, as shown so dramatically by Rebecca Jordan-Young (2010), the variability in Kinsey numbers used in different studies is so great that “one scientist’s heterosexuals are another scientist’s homosexuals” (Jordan-Young, 2010, p. 168).

The social science and public health literature often subdivides orientation into identity, attraction, and behavior, viewing these three aspects as a Venn diagram (Laumann, Gagnon, Michael, & Michaels, 1994). These social science literatures frequently operationalize SO via self-report using identity labels such as LGBT or “straight,” or self-reports of actual behaviors or attractions. Such measurements often differ from one study to the next. Wolff, Wells, Ventura-DiPersia, Renon, and Grov (2017) have reviewed many of these difficulties and emphasized the importance going forward of using multidimensional methods for measuring and analyzing SO. Geary et al. (2018) noted that the measured size of populations of sexual minorities (and thus, by unnamed implication, the majority as well) varies significantly depending on which dimension is applied. In addition, they confirmed Laumann et al.’s (1994) pioneering work that showed substantial individual variation in degree of overlap between identity, behavior, and attraction. As is the case for gender/sex, and as is addressed in the central portion of this article, this literature, which constructs and measures SO in adults, is mostly silent about developmental origins.

Embodiment

Embodiment has many meanings, but here I detail what I mean by embodied gender, or gender in the body. It is easy to say what I do *not* mean. I do not mean symbols worn *on* the body, for example, dresses, tattoos, pink barrettes, or muscle shirts; nor do I intend easily alterable symbols *of* the body, such as hair length, beards, or shaved legs, armpits, or groins. Even so, some of these (e.g., hairstyle and clothing choices) which are consciously chosen and worn on the body’s exterior may unintentionally produce the kind of embodiment I do intend. Nearly 40 years ago, Iris Young (1980) suggested that women’s habit of sitting with crossed legs while occupying a confined space developed out of the modesty demanded of women wearing potentially revealing dresses. That this becomes a habit, in other words, an unconscious, automatic aspect of many women’s neuromuscular systems, she argued, can be seen by the fact that women often sit with crossed legs even when wearing pants (Young, 1980).

There are many examples of embodied gender/sex. Consider current public controversies about men occupying too much public space through a behavior dubbed “manspreading.” If recently postulated causes prove accurate, manspreading provides a perfect example of an embodied behavior rooted in gender/sex (Petter, 2017). Consider this example: If a young girl who often plays outdoors wearing a dress regularly chooses not to climb trees (because the dress makes tree climbing cumbersome and she is, anyway, not supposed to soil her clothes), then she is less likely to develop top-level tree-climbing skills, and so on. As another example, we can even, through practice and careful cognitive application, retrain our voices, including raising the register, altering the tonality, and changing the cadence of a typical man’s voice to become that of a typical woman’s. With enough practice, these changes become habitual; that is, the neuromuscular systems that produce these new voices work automatically, without immediately preceding cognitive input (Louis, 2017). In sum, as children and even as adults, we can choose consciously from among the many cultural features of gender to embed new bodily habits into our sensorimotor (neuromuscular) system. Even without conscious choice, however, many cultural features of gender shape how our bodies function.

The embodiment I mean has a developmental history that begins even before birth. Newborn cry melodies, for example, reflect the patterns of rhythm and sound of the native language spoken (and heard) while they were still in utero (Mampe, Friederici, Christophe, & Wermke, 2009). The embodiment of which I speak is automatic, unintentional, and found in all aspects of our nervous system: autonomic (visceral—such as butterflies in the stomach upon seeing across the room a beloved or even a stranger for whom one feels a strong attraction), sensory and sensorimotor, neural networks, and central and peripheral nervous systems. Memory is embodied. Many embodied responses have a gendered valence. Many have cognitive consequences. SO is at heart embodied, an emotional and physical response (or lack thereof) to another human being, a desire for physical and emotional interaction

with a specific other. Even popular ideas such as the existence of gaydar (i.e., recognizing gay people based on bodily mannerisms) are about embodied gender/sex (Hartinger, 2009). (For a discussion of the idea of habit as used by phenomenologists, see Crossley, 2013.)

Embodied Development: General Principles and Theory

Creating a unified concept of gender/sex solves certain theoretical problems, but having such a category does not tell us how gender/sex becomes *of* the body. Several traditions within psychology, philosophy, and sociology, however, offer toolkits useful for thinking forward about how we might study gender/sex and orientation. In this section, I review contemporary discussions of gender and phenomenology, dynamic systems theory, especially as applied to motor development by Thelen and her colleagues, and the concepts of embodied cognition.

Phenomenology and Habit

Phenomenology is a substantial philosophical tradition that considers the embodied nature of experience. Rather than presupposing an objective, preexisting world, Merleau-Ponty, for example, argued for the historical and embodied nature of perception (Toadvine, 2018). Phenomenologists emphasize the following: We use our bodily senses to perceive and understand the world. But our bodies are not sensorily constant. Rather, how our senses perceive the world is shaped by experience, a history sedimented in the body. In my reading, the worldview presented by phenomenologists is fundamentally incommensurate with dichotomous explanatory frameworks such as sex versus gender, body versus culture, and nature versus nurture

Philosopher Sara Heinämaa (2012) sees great possibility in applying the toolkit offered by contemporary phenomenologists to an understanding of sex and gender. She contrasts traditional gender theories that try to explain differences between men and women by the interactions between social (gender) and biological (sex) with phenomenology, which examines how personal and interpersonal experiences produce and maintain a sense of sexual difference (Heinämaa, 2012). From a developmental point of view, I suggest this would mean ceasing to study infant and child development as the unfolding properties and capabilities of the child as an independent subject. Instead I urge the study of gender/sex development as a continuously evolving (both intra- and intergenerationally) set of habits resulting from ongoing interactions between the child and other humans and objects in their world. Gender/sex (from infancy to adulthood) would be understood to sediment gradually in the body, seeming to arise “naturally,” but in fact being a biosocial sediment built up over a lifetime.

Heinämaa (2012) critiqued the biosocial model of bodies from two important angles. First, she argued, it is useless to layer gender as a system of meaning on top of a body

understood as a complex machine, because such an approach fails to understand that as senses form in the body they become “a *source* of meaning” (p. 232). Rather, human bodies are themselves expressive in relation to other human bodies. The meanings of sense, motivation, and self are established and maintained as two or more individuals relate to each other. For example, gender versus sex divides womanhood and manhood into two types of reality: femininity/femaleness and masculinity/maleness. This divide, however, does not acknowledge that these two layers can only be understood in relation to each other.

Generally, we do not identify another person as male or female because we can see and categorize their genitals. Our daily practice is far more nuanced, as we observe others moving their bodies and behaving toward things and people in their surrounds. When I am out and about, as I notice other people I mentally categorize them as male or female. I do this by visually assessing their clothing, their visible body structures, and how they move. I might decide to test out my gaydar system. Since I cannot always get a clear reading, I may look more closely. Or I might wait until I can speak with them, noting their voice pitch and sensing how close they stand to me as they engage in conversation. In a study of proximal and distal attachment interactions in mother–son/daughter and father–son/daughter dyads, Lewis and Weinraub (1978) noted, “In our culture ... there is even less tolerance of proximal expression for men.” Overly proximal expression “is viewed as incompatible with masculine independence” and connotes “sexual interest if expressed toward a female or homosexual tendencies if expressed toward another male” (p. 170).

These “tells” (and my audio and spatial perception) may help me reach a conclusion. Often, as I go through this mental exercise, I have to expand my categories and admit uncertainties. Are they a feminine-presenting man? A masculine-presenting woman? If either of these, does that mean they are gay or lesbian? What about their own sense of self and choice or habit of presentation? Sometimes when I interact with someone, even a stranger, they will become more “feminine” or more “masculine” as we talk, as our personal interaction leads them to modify how they physically present their own sense of self. These changes lead me to perceive them anew. And so, finally, I find that I have to abandon my two categories in favor of a more multiple, improvisational, relational, temporally unstable, and active understanding of gender/sex.³ As Heinämaa (2012) suggested, living beings all move spontaneously, responsively, and with explicit motivation. “Sexual difference,” she concluded, “is not a difference between two substances but is a difference between two modes ... of relating ... the question of sexual identity is not ‘what’ but ‘how’” (p. 236).

As she discusses gender, Heinämaa (2012), drawing from Merleau-Ponty, becomes disturbingly binary. In the previous example, which was stimulated by her article,

³ See Kessler and McKenna (1978).

I interlaced a more expanded understanding of a spectrum of masculine to feminine body expression. Indeed, one of the ongoing criticisms of phenomenology, especially as applied to human difference, is that its practitioners tend to speak in terms of human universals rather than individual variability. The idea that we interpret the world and ourselves through our sensory interactions belongs in the toolkit we assemble to build theories of gender/sex and orientation—but as spelled out by traditional phenomenology, it is insufficient for our purposes.

Subjectivity

Oksala (2006) took a more critical stance toward phenomenological attempts to explain gender difference. She argued that even though it is important to study the idea that experience resides in the body and is registered in relationship to exterior objects and people, the body is too limited a structure on which to build a philosophical accounting of gender. Such an analysis must necessarily include descriptions of varying types of living bodies, but the resulting descriptions can only be understood within the framework of the worldviews (ontologies) “in which those bodies and experiences gain value and meaning” (p. 234).

To accomplish this task of studying bodies with an awareness of how they achieve value and meaning, Oksala (2006) examined intersubjectivity. This requires us to understand that (and how) as subjects, from before conception and unto death, people are members of a community, inhabitants of a cultural sphere or “homeworld” (p. 235) within which they receive continuous (some might say unrelenting) instruction via person-to-person interactions (intersubjectivity) on what counts as “normal”—in dress, daily activities, body language, speaking styles, and more. Studying gender phenomenologically helps us see that living bodies acquire gendered valence through intersubjective experience. The homeworld in which bodies develop is a system of normality that is conservative and conventional. “Being socialized to a culture ... means learning from others what counts as normal in the case of gender, too” (Oksala, 2006, p. 235). Importantly, Oksala emphasized that cultures—and thus what counts as normal—change, something which I believe is happening worldwide at this moment, as we witness, discuss, measure, and devise social policy around the emergence of the nonbinary.

Oksala’s account emphasizes how cultures establish or reproduce people who express culturally predominant or statistically normal expressions of gender/sex and orientation. Indeed, intersubjectivity appears as an overwhelming force that reproduces social norms in individual bodies. How, then does nonnormative subjectivity⁴ ever happen? How do we end up with gender-nonconforming children and adults? How

do we end up with nonheterosexual orientations? How does “the other” ever break through? Subjectivity is a specter that haunts any discussion of identity and embodiment. It is a concept that seems to preclude analysis, to stop thought.

When a child or an adult insists that in their inner self, their core, they know themselves to be male, female, nonbinary, or genderqueer, what are they actually saying? Are they indicating that they feel alienated from parts of their body (penis or prominent Adam’s apple, etc., if self-identified as female; breasts or menstruation, etc., if self-identified as male)? If such body alienation is what they mean, then is it plausible to think that they are primarily experiencing some dissonance with their body image? The work of Manzouri and Savic (2018) is interesting in this regard. They used multimodal magnetic resonance image (MRI) scanning to assess the cortical thickness and subcortical volumes of the brains of adult trans* men and women, cisgender controls, and hetero- and homosexual men and women. Without critically delving into the experimental details and limits of a study such as this, I want to point to a potentially interesting conclusion. They located differences between cis and trans* individuals’ cerebral networks that mediate self-body perception. This contrasted with links for male homosexuality to brain regions that show some size differences in male and female brains.

Or (and?) if there is (not) an issue with bodily self-perception mediated by specific neural networks, when a child or an adult insists that in their inner self, their core, they know themselves to be male, female, nonbinary, or genderqueer, do they mean that they want to dress, speak, or walk in a certain way? Does a three-year-old with male genitalia who says that they are “really” a girl mean that they prefer girl toys and companions? Parsing such meanings for both cis and trans* children (remember that children are the focus of this review) is a needed first step in trying to understand and thus explain subjectivity. We similarly need to clarify what cis children think about being gender nonconforming or conforming. If a child born with male genitalia says they are definitely a boy, does that mean that their body image includes having a penis? Or (and?) does it mean they prefer male playmates, the color blue, and trucks? We could get answers to these questions by asking the children.

Egan and Perry (2001) used four measures related to gender identity and seven related to sex typing to study children in the fourth through eighth grades. They found a modest correlation between gender identity and sex typing (e.g., boys or girls liking male- or female-typed activities), which suggested to them that other factors, unmeasured in their study, contributed to a child’s sense of gender typicality (Egan & Perry, 2001). Tate et al. (2014) argued (and I agree with this) that the processes leading to identity self-categorization are likely symmetrical in statistically normative and statistically minority individuals. They believe that research should focus on the symmetry of experiences of gender/sex self-identification and, by my own extension of

⁴ By “nonnormative” I mean numerically in the minority. I am *not* using this word to connote a medical condition; nor does it connote something that, morally speaking, should or should not be.

their argument, orientation for majority and minority individuals (Tate et al., 2014).

Developmental psychologists use empirical methods to define the early stages of gender/sex knowledge and self-identity. As Johnson (2000) argued, such staging often leads researchers to evoke “biological underpinnings” if they identify a time at which self-identity seems, suddenly, to appear (Martin & Ruble, 2010). In other words, a primarily cognitive and behavioral description does not capture the mechanisms by which individual subjectivity develops. Instead, Johnson makes a phenomenological argument “that gender is constructed by the child—not privately, ‘in the mind,’ as cognitivists would suggest—but in the space between subjects, in lived moments of communication” (p. 148).

Johnson, then, throws us right back into the problem of how autonomous subjectivity might be produced by a situation that is decidedly intersubjective or nonautonomous. This conundrum (*pace* Jan Morris) is currently the topic of intense thought and discussion by scholars of embodied cognition. What follows is a flavor of this discussion. Clearly, the problem of subjectivity, especially applied to the appearance of the normative and nonnormative self-identification of gender/sex and orientation, deserves its own review. Here I want to acknowledge it as an unsolved problem and point to scholars who are currently exploring the problem.

Thompson (2005) elaborated on what he calls “an enactive approach.” As he and other enactivists see it, our minds are located in our complete physiologically functioning bodies, which are, in turn, embedded in the world. We cannot, then, reduce our sense of self to structures inside our head. Rather, an individual’s mental life emerges from three inextricable modes of bodily activity: “self-regulation, sensorimotor coupling and intersubjective interaction” (Thompson, 2005, p. 408). Cognitive phenomenologists such as Thompson distinguish between an unconscious “body schema” and a conscious “body image.” The latter is what one consciously considers or analyzes when, for example, looking in the mirror. The former, which I imagine encompasses an interior sense of gender/sex or orientation, is not intentional or conscious. Rather, Thompson defined it as “an integrated set of dynamic sensorimotor principles that organize perception” (p. 411). Phenomenologist Merleau-Ponty referred to body schema as “prereflective.”

Maybe thinking about prereflective body schema can provide a handle for studying the development of a sense of self as having a gender/sex or an orientation. Consider the sense of touch. We feel touch—both the objects we touch and the touch received. How we process touch depends on our body’s particularities. Where in a spectrum of variability does the physiology of an individual’s nerve cell impulse transmission lie? What density and sensitivity of pressure, temperature, and mechanoreceptors does a particular individual’s skin contain? Have these receptors developed in response to previous touch? When our autonomous (in the moment of touch) physiology registers touch from another

human, what we sense also depends on the force, mode, and affective context in which another touches us. Prereflectively, a person stores sensations of touch; our skin also responds to touch by losing or gaining specialized areas and types of innervation. Finally, when individuals evoke a consciousness of touch they use language to provide a narrative.

The centrality or bodily independence of the narrative self is a topic of intense discussion. Brandon (2016) argued that the narrative self (a child who says, “I like to dress up in my mother’s clothes” or who declares that they *are* a girl) is the emergent property of a specific body, but she also insisted that an individual’s narrative self-image shapes their physical body. Higgins (2018) specified the idea that a sense of selfhood derives equally from bodily and social processes. He used the term *biosocial selves* to connote “a mode of being in which the constitutive biological bodily and social processes (i.e., ‘biosocial processes’) of selfhood are non-decoupleable” (p. 446). According to Higgins, individual humans occupy unique experiential worlds. He noted that infants are born with at least primitive bodily abilities for social interaction and that, via their initial social interactions, infants develop increasingly complex cognitive abilities. Recent experiments in which researchers placed head cams on infants to record the world from the baby’s perspective reflect a growing recognition that researchers need to understand what the infant sees in the midst of a social interaction (Smith, Jayaraman, Clerkin, & Yu, 2018).

The Embodied Dynamics of Parent–Infant Interactions

If one is to understand the origins of gender/sex and SO, it seems essential to begin at the beginning and examine events as they unfold. Yet phenomenologists focus almost entirely on adults (Simms, 1993, 1994). Under the developmental psychology tent, however, several traditions seem, in that Venn diagram sort of way (see Figure 2), to overlap with the concepts of producing meaning through sensory perception, intersubjectivity, the body as sediment, and gender/sex as a developmental, interactive achievement. These are considered next.

Psychoanalysts Beebe and Lachmann (2002) and Beebe et al. (2010), building on the work of Stern (1985), have extensively studied the relationships between the behaviors of mother–infant dyads and the subsequent quality and degree of infant and toddler maternal attachment. Experimentally, their approach has two important components: first, studying the second-by-second minutiae (alone and in mutual response) of the individual human components of the dyadic unit; second, making use of a longitudinal study design (e.g., see Beebe et al., 2000; Beebe & Lachmann, 1994).

Their theoretical question is: How do infants organize and represent to themselves their experience of their primary caregiver? Beebe and colleagues focus on the first year of infancy, during which time, they suggest, the infant develops presymbolic internal representations of self

Figure 2

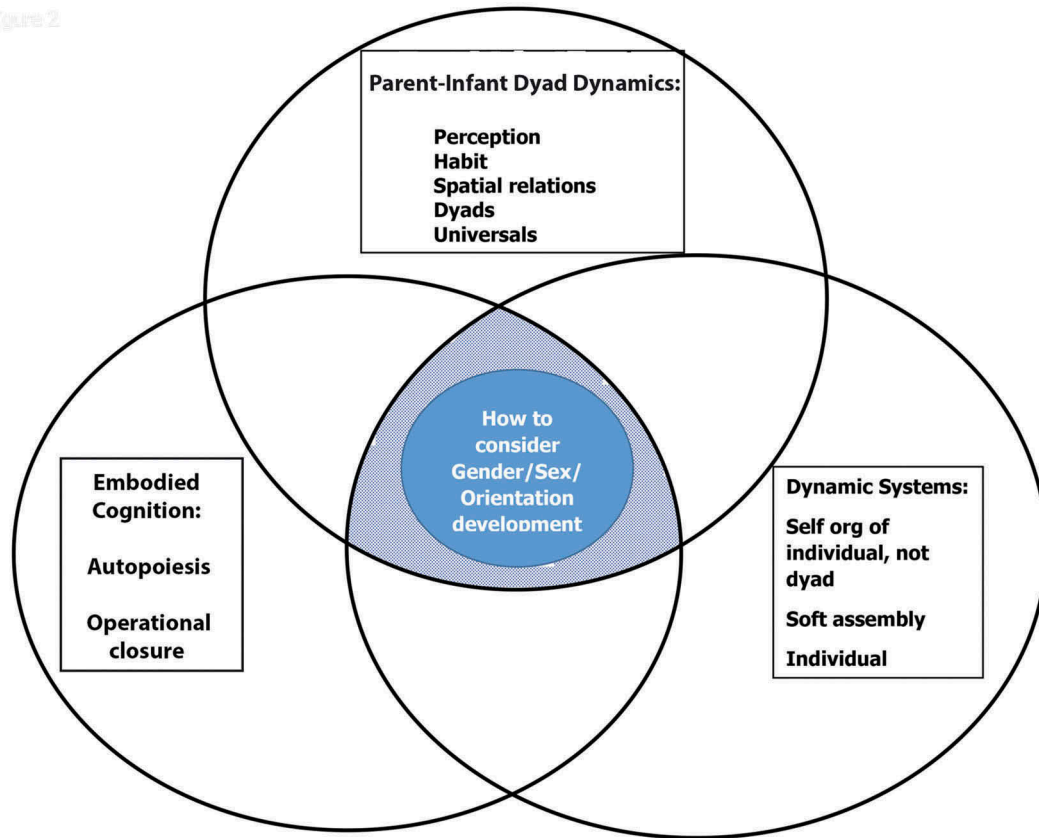


Figure 2. Each large circle indicates an approach to studying infant development.

and object. It is possible that this is the same idea as Merleau-Ponty's notion of prereflective thought. Presymbolic representations are present before the emergence of symbolic thought, timed by Piaget to appear at about 16 to 18 months of development. Beebe and colleagues defined symbolic thought as the ability "to imitate an object that is not physically present and to refer to an object in a way that is not defined by its physical features" (Beebe, Lachmann, & Jaffe, 1997, p. 134). Empirical evidence shows that children acquire symbolic representations of gender/sex at least as early as the middle of the second year, and we argue that such representations begin to sediment during infancy (Eichstedt, Serbin, Poulin-Dubois, & Sen, 2002; Poulin-Dubois, Serbin, & Derbyshire, 1998; Poulin-Dubois, Serbin, Eichstedt, Sen, & Beissel, 2002; Poulin-Dubois, Serbin, Kenyon, & Derbyshire, 1994). An important caveat for this narrative is that virtually all of the subjects used in studies on gender and infant development cited in this article are from North America or Europe and are primarily white and middle class. Clearly, what we know to date about gender and development is fairly culturally specific. The work of Halim and colleagues is an exception to this generalization (Halim, Ruble, Tamis-LeMonda, & Shrout, 2013).

Beebe et al. (1997) postulated that the symbolic ability of infants to represent self and surrounding objects emerges from presymbolic representations of the dynamic interplay

within the adult–infant dyad. Beebe et al. presumed that such representations reside materially in the infant's nervous system, both peripheral and central. As development proceeds, early representations form the scaffolding for subsequent experiences that lead to a representational restructuring, and so on. It is no surprise to any parent that infant "development is in a constant state of active reorganization" (p. 133).

The interactive structures Beebe and colleagues described are "of the body" in a way that should excite the imagination of phenomenologists (and others) interested in gender/sex and orientation. Further, these interactions are neither causal nor symmetrical. Rather, they are based on the expected probability that a particular response or behavior from one dyadic partner will elicit a particular response or behavior from the other partner (Beebe & Lachmann, 2002). Based on their empirical investigations, they identified five especially important aspects of dyadic interactions that concern affect, arousal, space, and time, including the following:

- *State transforming*—an expectation that one partner can change a state of arousal of the other; for example, a mother bouncing a baby on her lap to get the baby to stop crying.
- *Facial mirroring*—the expectation from one partner that the other will mirror an affective signal made by the first partner; for example, a father leaning over an

infant and smiling broadly in the hope that the infant will return the smile.

- *Disruption and repair*—an expectation of how easily and quickly a dyad can repair a facial-visual mismatch; for example, a caregiver and infant locking eyes as the caregiver talks to and touches the infant; the infant breaks eye contact and the caregiver leans back in to try to reestablish eye contact.
- *Interpersonal timing*—especially expectations of the extent of vocal rhythm matching and interruption.

Beebe and Lachmann highlighted ongoing regulations, disruption and repair, and heightened affective moments as especially salient for the internal organization of dyadic experience. This internal organization shapes the growing capacity for self-regulation (itself dependent on dyadic experience) and then choreographs dyadic interplay during the first postnatal year (Beebe & Lachmann, 1994).

I hypothesize that variations in any or all of these components based on the gender/sex composition of the dyad form the initial scaffolding for embodied gender/sex. This conceptualization, represented in Figure 3 as a five-pointed star, contains many permutations. First, each of the five points of the star contributes to overall gender/sex embodiment. It is unclear if and how they are linked. That is, if the embodiment of spatial interactions develops in a particularly gender/sexed way, does that drag along the other four points? How many aspects of presymbolic embodiment need to point in the same gender/sex direction for another to perceive the infant as male/masculine or female/feminine? Similarly, how many aspects of presymbolic

embodiment need to become embedded in an infant’s nervous system for the internal system to produce a subjective sense of self as boy or girl?

It should be possible to study these questions empirically. In addition to the interlinkage between the five points of the gendered embodiment star, it would be important to examine the development of symbolic embodiment in the standard binary combinations (mother–son, mother–daughter, father–son, father–daughter) but also to design a number of nonbinary study points. How, for example, might embodiment develop if one broke down “mother” into butch-presenting, fem-presenting, and trans*? I remind the reader that here I discuss the first year of infancy in particular. During this period the infant is relatively undifferentiated with regard to gendered preferences or behaviors. The greater gender/sex-related variability resides in the gendered attitudes and attributes of the caregivers as they interact with a child with male- or female-designated genitalia, and as they respond to the individually variable but not particularly gendered sensory responses of an individual infant. My hypothesis is that these initial interactions produce spectra of gendered behaviors and internalized subjective feelings and inclinations as symbolic understandings of the world that emerge as a subjective sense of self in years two and three of development.

Dynamic Systems Theory

Dynamic systems theory occupies center ring under the developmental psychology tent. Beebe, Lachmann, and

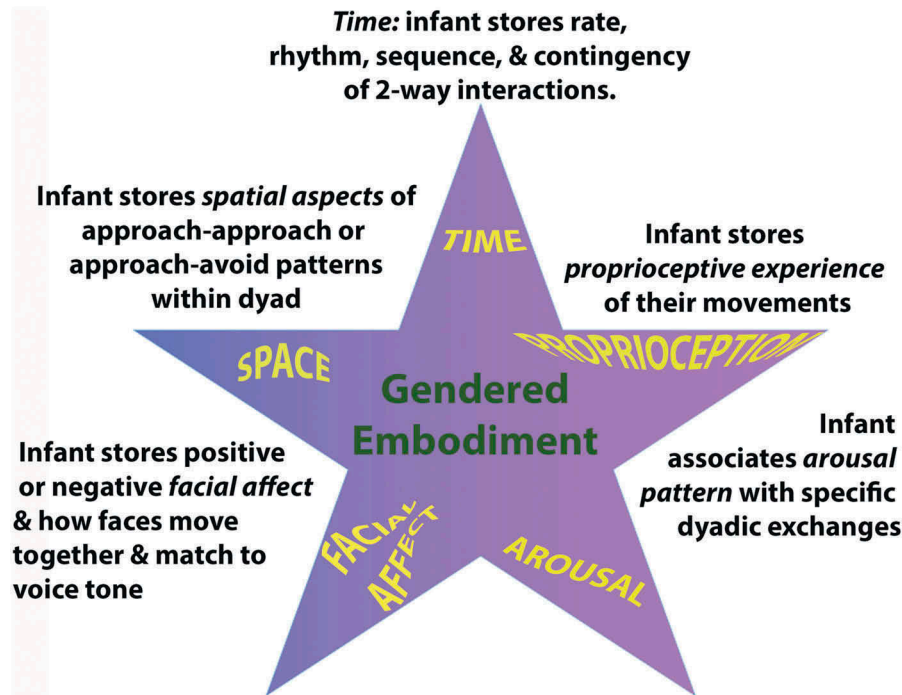


Figure 3. Presymbolic representations of important aspects of dynamic interactions between caregiver–infant dyads and their possible roles in gendered embodiment in the first months after birth.

colleagues pay it homage (Beebe et al., 2000; Beebe & Lachmann, 2002) but concentrate on the fine details of face-to-face dyadic interactions. When Thelen (1995) and her colleagues entered the scene, they were not thinking about attachment as much as about the inadequacies of traditional developmental psychology, especially with regard to motor development. For the most part, dynamic systems theorists have not attended to gender/sex (but see Diamond, 2007; Fausto-Sterling, 2012a; Fausto-Sterling et al., 2012a, 2012b; Martin, Fabes, Hanish, & Hollenstein, 2005). The theoretical principles dynamic systems theorists use to account for the utterly predictable emergence of basic motor and cognitive competencies belong in the gender/sex scientist's study design and analysis toolkit (Thelen & Smith, 2006).

Gender/sex and orientation are complex and usually stable systems assembled from bodily, cultural, and intersubjective subsystems. They reach deep into our nervous systems and physiology. They also exist superficially through symbols such as clothing, adornments, and hairstyles. These surface symbols express how we identify internally and signal our identity to others. A dynamic systems theorist would look backward in time from the "end" result (that is, how a person is at any particular instant in the life cycle) and ask how the present system came into being. Our theorist would describe the present as a softly assembled system. As Thelen and Smith (2006, p. 274) wrote, soft assembly "banishes forever the vocabulary of programs, structures, modules, and schemas" and substitutes the notions of complexity, stability, and change. In adults, gender/sex is quite stable, but one of the virtues of the concept of soft assembly is that it permits change. If one or more of the subsystems that stabilize a contemporary gender/sex system change with time, a currently stable state can destabilize and reform in a new and different assembly. Diamond (2007) nicely illustrated these points as she studied ongoing changes in SO and identity in a population she has been studying for well over a decade.

Imagine a dynamic systems vision of gender/sex and orientation as a video of evolving and dissolving patterns. Less stable patterns would give way in sequence to new patterns. Others might be so stable that over time they would seem to be an essential trait. It is well-known, for example, that when toddlers first evince a self-conscious gender/sex, they can be rigid and adamant about its importance. But this rigidity is temporary and in a few years dissolves into a more flexible embodiment of gender/sex (Miller, Lurye, Zosuls, & Ruble, 2009; Ruble et al., 2010, 2007; Trautner et al., 2005). Regardless of when one looks at the life cycle, and perhaps *because* of its complexity, gender/sex must be understood as a probability-based, self-organizing system (Kelso, 1995; Thelen, 1988). (In basic biology a self-organizing system is one that assembles spontaneously based on the stochastic-chemical force-properties of its component molecules, cells, or tissues [e.g., Schoner & Kelso, 1988; Kondo, 2014]).

At birth the only obvious indication of possible future gender/sex that stems directly from the infant are the external

genitalia. Beyond that, parents attach signifiers, such as hair ribbons, pink or blue clothing, or sports-themed onesies to indicate gender/sex to all concerned. Yet by age three most toddlers have internalized a gender/sex, and that internalization (forming identity) can be measured experimentally (Fagot & Leinbach, 1989, 1993; Fagot, Leinbach, & Hagan, 1986; Fagot, Leinbach, & O'Boyle, 1992; Leinbach & Fagot, 1986), and seen behaviorally in terms of play preferences and clothing choices (Miller et al., 2009; Zosuls et al., 2009). Note that two to three years is also the earliest age at which gender-variant children begin to evidence disagreements with birth-assigned gender/sex (Zucker & Vanderlaan, 2016). In some of the classic adult autobiographies of transsexuals, the author also remembers this same age as a critical moment of recognition (e.g., see Morris, 1974). This suggests that whatever the processes are that produce a gender/sex identity, they generally happen in a similar timeframe for cis boys and cis girls as well as the varieties of gender-variant children. I posit that similar categories of interactions are at play during the formation of gender/sex identity, but that what differs from one dyad to the next is the particular combination of infant sensory systems and primary caregiver handling and caring practices.

What processes mediate this transfer of gender/sex from primarily exterior to strongly interior? I would answer this question by including gender/sex in Thelen's (2000) turn to embodied cognition. Thelen placed herself in the intellectual tradition of phenomenology and "a growing group of psychologists, philosophers, linguists, and cognitive scientists who seek to understand how human cognition is truly embodied" (pp. 4–5). We can frame the problem more specifically by asking how a child becomes skilled at being a gender/sex. A three-month-old infant, as Thelen pointed out (compared even to a five-year-old, for example), is not very skilled physiologically, motorically, perceptually, or cognitively. A five-year-old boy may be able to throw a ball and wants to play with one, but at three months of age, that same boy cannot grasp a ball and has little interest in it. For this infant, the grasping skills and the desire to play ball, which can be seen in some cultural contexts as a gender/sex skill (Miller et al., 2009), develop together within an enveloping context of sports signifiers. The child is offered a ball at three, six, nine, and 12 months and beyond, receives specific instruction in how to throw a ball and copious praise and gender/sex labeled reinforcement ("What a big boy! What a great throw!") for any interest shown from birth onward. The specific gender/sex skill of ball play (including ability and desire) is an emergent property of a coupled system in which the nervous system and neuromuscular function is embedded within a body, which is embedded within a larger culture and physical world. Thelen (2000) distinguished this understanding from a more traditional input-output model. "Behavior," she wrote, "is an emergent pattern of multiple cooperating components, all of which count and none of which are privileged" (p. 7).

This idea provides a plausible starting point for a normative account of gender/sex formation. As noted in

my earlier discussion, however, we still need a narrative for nonnormative (minority frequency) development. The problem, as I phrase it, is determining how, in the course of developing relatively universal features of human existence, individual differences break through. By “relatively universal,” I mean features such as walking or reaching, or having a gender/sex or orientation identity. It should go without saying that there are people with various forms of disability who do not learn to walk or reach. In that sense, having a gender/sex or orientation identity may be a more universal feature than executing a particular motor skill. Again, I turn to Thelen and colleagues for a starting point. In a series of articles they detailed results of a longitudinal study of how infants learn to reach and grasp a toy. They observed four infants weekly, from three to 30 weeks, and biweekly thereafter, until 52 weeks (Spencer, Vereijken, Diedrich, & Thelen, 2000). Spencer et al. (2000) described a suite of components (e.g., head and torso control; the ability to touch and grasp nearby objects) needed to achieve stable reaching. Each child exhibited a variety of behaviors that preceded a transition to reaching. But they differed in terms of the timing and order of appearance of specific behaviors. In an earlier analysis, Thelen et al. (1993) reported that the same four infants first attempted to reach at ages 12 to 22 weeks and that while reaching each used different motor strategies to secure the toy that they reached for. Two of the children had large and strong spontaneous movements, and each damped these down to achieve their goal. In contrast, the other two, who were quieter, ramped it up, producing faster and more energetic efforts to lift their arms. Thus each child accomplished a goal of reaching for a toy by accommodating their individual motor inclinations.

Thelen et al. generalized their approach to other skills. I suggest that, as with reaching, we can look at the time period when a child becomes able to self-label as a boy or a girl as a developmental phase shift. Before that time, each child is finding individual solutions to tasks (e.g., choosing a toy, dressing in a manner that is self-pleasing, attracting positive attention and feedback from an adult caregiver) that eventually become attached to gendered labels (Thelen et al., 1993). The child’s individual attempts intersect with the behaviors of the primary caregivers and also with peers and siblings so that gender/sex and orientation emerge as systems that are simultaneously subjective and intersubjective.

Embodied Cognition

Varela (1996, 1997) and Thompson and Varela (2001) outlined how autonomous consciousness emerges via a process they call radical embodiment. They opposed this idea to standard neuroscience, which studies consciousness by looking for “the neural correlates of consciousness.” They disagreed with what they see as one-way causation, from neural events to conscious experience. Rather than being brain bound, they argued, consciousness emerges across and from the interactions of the brain-body-world

divisions. They emphasized the coupling of the affective sensorimotor states in social cognition. That is, psychological subjects interpret one another by evaluating facial expression, posture, and vocalizations, and so on.

Thompson and Varela (2001) did not write about gender/sex identity or SO. Their approach, however, offers a third way to envision the development of embodied gender/sex, gender/sex identity, and orientation. One of the infant’s initial tasks is to absorb bodily information as a subunit of the dyad (so thoroughly studied by Beebe and colleagues, as previously discussed). With such information, infants gradually separate from the dyad to become autonomous individuals. To base a developmental theory of identity and SO within the framework of embodied cognition, it is posited that individual identities involve a domain of interactions. Thus, a child cannot arrive at a stable sense of their own gender/sex without engaging in dyadic interactions and specific sorts of play activities.

Identity in the autonomous individual necessarily entails larger-world interactions that produce contextualized meanings about gender/sex. Such contextualized meanings may be what others refer to as gender schema (Liben & Signorella, 1980; Martin & Halverson, 1981). (This use of schema differs from Merleau-Ponty’s use of the word. In bringing together different literatures, it is essential to attend carefully to different meanings of the same word.) For example, “girls are people who play with dolls” emerges as a generally known fact or a component of a gender schema. This emergence may result from directed play (caregiver offers infant a doll), caregivers verbalizing a belief system, and/or direct observation (infant watches other children or a video), but need not be a direct injunction. The global significance of and information about gender/sex provides an intentional link back to the autonomous individual and stimulates what Varela (1997) called operational closure. In terms of gender/sex, operational closure is defined as the multimonth process by which children acquire linguistic labels, the ability first to passively label gender/sex of self and others, then actively and over time to acquire the concepts of gender constancy and gender stability (Bem, 1989; Fagot & Leinbach, 1985, 1989, 1993).

Studies of the emergence of gender/sex linguistic labeling, and the acquisition of self-concepts of gender constancy and stability have, historically, been framed in terms of binary gender. But what about individuals with minority gender/sex identifications? The childhood acquisition of nonbinary identities is unstudied. We lack basic information about timing and self-definition. For example, do all or some nonbinary people experience or express their identities in the same timeframe (ages two to five years) as gender/sex majority children? How do such children define or express their gender identity? Do they have a self-concept as a girl who engages in boylike behaviors (or vice versa)? Or do they decline to label as either a girl or a boy, or self-label as both? Before thinking through how Varela and Thompson’s ideas about embodied identity might work for gender/sex minority children, it is important to know more

about the timing and singularities of their gender/sex identity development.

Operational closure is required for individuals to establish themselves as autonomous beings, and closure stabilizes gender/sex identity. I see gender/sex identity as an autopoietic system, that is, a network that reproduces itself “and that also regulates the boundary conditions necessary for its ongoing existence as a network” (Bourgine & Stewart, 2004, p. 327). Identity is at once a property of the individual body/mind and a collective property involving interactions with others and with objects in the world. As conscious states, identity and orientation are embedded in an individual’s bodily and environmental context throughout the life cycle. As Thompson and Varela (2001) wrote with regard to consciousness, these are emergent processes, not emergent properties.

Embodied cognition, parent–infant dyad interaction, and dynamic systems each offer ways to think differently about embodied gender/sex and orientation. The more traditional phenomenologists tend not to think developmentally and are often too binary in their approach. Dynamical systems theories have not focused on internalization processes, preferring to emphasize the concepts of self-organization and emergence. And radical embodiment and embodied cognition focus on the interlinking of neural processes inside the brain with the rest of the body, intersubjective interactions, and the world that contains us all. The theme, however, that unifies each approach is the embeddedness of the body—in the womb, as a dyad, and in intersubjective interactions more broadly, in relating to the physical world (even gravity). This theme, together with the experimental approaches it enables, forms the basis for a newly productive study of gender/sex, identity, and orientation.

Embodied Development

What Do We Already Know?

What’s an infant to do? Although at first, it seems, not much, newborns actually come into the world with some surprising talents. Some examples: Fetuses hear speech while still in utero, and at birth neonates synchronize movement with adult speech and have a cry melody shaped by their native language (Condon & Sander, 1974; Mampe et al., 2009). In utero, the fetus develops a regulatory coordination between autonomic (cardiac) function and motor (somatic) activity; this continues after birth. These, in turn, link to improving state regulation, that is, to the ability to maintain a particular behavioral state, such as sleeping, lying quietly, paying attention, and so on (Dipietro, 2015).

In one demonstration of infant regulatory abilities, DeCasper and Fifer (1980) had infants suck on a nonnutritive nipple that was attached by way of a pressure transducer to a recording system that played either a recording of their mother’s voice (reading from Dr. Seuss) or that of a stranger. They placed

headphones over the infant’s ears and played a tone (or not). If the infant initiated a burst of sucking during a tone period, the mother’s voice began to play. If the infant sucked during a no-tone period, the stranger’s voice played. During a 20-minute session, the infant significantly increased the sucking–tone combination that rewarded it with the mother’s voice. Other examples of neonatal regulatory control indicate that an infant vocalizes more when it hears another infant (Simner, 1971), that infants can adjust their sucking rhythms to turn on a musical recording, and that they can localize sound in space (Beebe et al., 1997).

At birth, the infant perceives the world amodally, a skill which enables it to make rapid associations between different modes of sensory input. Stern (1985) reviewed much of the evidence for infant amodality, but one older and one recent example serve to illustrate the concept. Meltzoff and Borton (1979) blindfolded three-week-old infants and had them suck on either a smooth or a knobby pacifier. After the infants gained some experience with oral touching, the researchers placed the nipples in front of the now not-blindfolded infants. Infants looked longer at the nipple type they had sucked on, demonstrating that a purely tactile experience produced visual recognition (Meltzoff & Borton, 1979). More recently, Walker et al. (2018) showed two animations of a bouncing ball to neonates. In one, an audio pitch was raised when the ball bounced up and was lowered when it fell down. In the other, the audio pitch was raised when the ball fell down and vice versa. The test infants looked significantly more at the video in which the physical height of the ball corresponded to a higher audio pitch. This extraordinary skill of amodality enables an infant from the get-go to form and act on representations of more global qualities of experience.

The neural mechanisms of amodal perception are unknown. But the fact that neonates start out with an ability for global perception without the need to develop a schematic outline to assemble different sensory inputs is important. An infant can experience certain properties of people and things, for example, shape, motion, number, intensity level, and rhythm, directly and globally (Stern, 1985). It is a plausible hypothesis that, given their perceptual capacities, neonates and young infants begin to imbibe gender/sex in their world from the moment they can perceive—even in utero. An infant may globally associate voice timbres with adult body types or take in adult gender/sex differences in touch well before more culturally specific behavioral schema become a repetitive part of their world.

Existing evidence suggests that, at first, infants associate adults’ voices and faces amodally. From four to six months they layer in adult gender, such that they look longer at faces that have gender-coincident voices (Walker-Andrews, Bahrick, Raglioni, & Diaz, 1991). In a differently structured set of experiments, Patterson and Werker (2002) found that infants could not use gender as a cue to match voices with faces until eight months of age. Walker-Andrews (1997), writing about how infants come to detect affect, argued that neonatal detection is global and based on amodal readings

of face and voice. With time, she believed, infants develop narrower, multimodal affective readings, focusing more on voice at first and later on reading emotions directly from facial expression. Individual differences in amodal perception (which have not been investigated) could lead to differing global perceptions of gender/sex that might in turn contribute to embodied identity formation.

It takes two to tango. On the one hand, infants enter the world with some remarkable skill sets, especially amodal perception, reflexes such as sucking, rudimentary motor movement, a basic autonomic nervous system, and a remarkable neural responsiveness to sensory input. On the other, they are fairly helpless. They require extensive input if they are to accomplish physiological and mental tasks needed to become autonomous individuals. The fact that individual neonates have some capacity to regulate their own physiological states does not render them autonomous (Als & Brazelton, 1981). Solidifying and expanding state regulation abilities depends on caregiver interaction. Babies who stay with their mothers, for example, can settle into a day–night difference within a few days. In comparison, neonates awaiting adoption without a consistent individual caregiver do not establish stable sleep–wake or day–night patterns (reviewed in Beebe & Lachmann, 2002).

Researchers use several measures to assess the physiological and behavioral development of premature and newborn infants. These include (a) vagal tone⁵ (usually indicated by heart rate); (b) infant state organization, in other words, how skilled the infant is at regulating sleep and wake cycles and managing crying and wakefulness; and (c) neurodevelopmental measures such as tracking ability, orientation, and habituation. Feldman and Eidelman (2003) compared premature infants given standard, no-touch, incubator care with infants given skin-to-skin kangaroo care in which the bare-skinned baby is placed directly between the mother’s bare breasts. They found that skin-to-skin contact improved the rates of autonomic maturation and state organization and improved neurobehavioral status compared to infants with incubator care alone.

Feldman (2006) further documented that state organization, especially sleep–wake cyclicality, vagal tone, and arousal modulation, predicted mother–infant synchrony at three months, while mother–infant synchrony is itself predictive of an infant’s later cognitive development, self-regulatory abilities, and cultural engagement (see also Feldman & Eidelman, 2009; Trevarthen & Aitken, 2001). Feldman (2015) summarized the results of her 10-year longitudinal study of parent–child reciprocity using a tripartite dynamic model supported by correlations established at multiple time points from birth to 10 years. Starting at birth, she looked at infant autonomic and neurobehavioral regulation. These abilities differ from one infant to another. The multiple factors (including maternal behaviors and

physiology during gestation) contributing to birth differences remain to be identified and untangled regarding whether they act independently or are processed together, if they have reciprocal influences.

In her tripartite model, Feldman (2015) suggested that these regulatory starting points (part 1) feed directly into mutual influences (part 2) in which the child’s attributes influence the main caregiver and vice versa. During infancy and childhood, the child’s emotional regulation consolidates over time due to the infant’s own starting state and aided by the caregiver’s input. Reciprocally, parent–child reciprocity stabilizes and remains consistent over time. It is important to note that this is a normative model. Many things could derail the consistency and stability—parental emotional distress, a death in the family, the birth of triplets that diverts parental attention, and so on. Finally (part 3), Feldman presented evidence for a third mechanism in which an early birth condition or phenotype evinces a direct, unmediated effect over a long period of time.

Feldman tested her model by looking for correlations of early measures with her 10-year waypoint in which she examined behavior adaptation (internalizing and externalizing behaviors), empathy (in dialogue and to another’s distress), accident proneness (a measure of lowered self-regulatory abilities), and autonomic regulation (vagal tone). Three of these 10-year measures were predicted uniquely by a set of both direct and mediated paths, while the fourth, vagal tone, was directly predicted by vagal tone at birth. For example, vagal tone and neurobehavioral regulation at birth directly predicted accident proneness at 10 years, as did parentally mediated emotional regulation from birth to five years. Empathy was unique among the four measures in that there were no unmediated effects at age 10. That is, empathy developed only through the mutual interactions of the child’s emotional regulation and the parents’ responses.

Where Do Sexual Feelings Come From and How Do They Get Oriented?

Discussions of the origins of SO usually focus on “orientation.” Possibly we are (culturally speaking) too squeamish to consider the sexual term of the SO phrase because it demands that we think about how children develop sexual feelings in the first place. The idea that infants and children are sexual beings, and discussions of what sexuality might look like even in a preverbal child, are definitely on the “no fly” list. Discussing and measuring childhood sexuality is, to say the least, a difficult matter (Graaf & Rademakers, 2011). On one hand, pretending that children are asexual leaves us unable to study sexual development or its precursors. On the other hand, imputing sexual agency to children, potentially, can open the door to child abuse. These difficulties are not new (e.g., see Masson, 1984). Furthermore, there may be gender/sex differences in the development of and responses to infant and childhood sexual feelings and expression. Such differences mean that one should not consider the topic without attending to the specific effects of

⁵ The vagus nerve is critical for the control of the parasympathetic nervous system that governs the functions of the viscera, including the lungs and gut.

gender/sex. If we are to learn more about the childhood origins of adult sexuality, then it behooves us to develop a code of ethics with which to guide such study. One approach to developing such a code would be to assess the difference between normative and nonnormative sexual behaviors in children. Studies that attempt to obtain this information are few and far between, but the works of Friedrich, Grambsch, Broughton, Kuiper, and Beilke (1991), Friedrich et al. (1992), and Friedrich, Fisher, Broughton, Houston, and Shafran (1998) suggest one possible approach.

Thinking about SO and identity as embodied, to consider that they develop, means that we need a theory of sexual development. In this section I review what little is known, pointing out the sometimes flimsy empirical basis of such putative knowledge. I do so not because I believe that all the sources cited are definitive but because often they are the only existing sources. As such, they provide starting points in the search for data to either confirm or refute older claims, and the building of an acceptable research framework with which to learn about sexual development in infancy and childhood.

It seems odd to use the words *sexual* and *erotic* when speaking of neonates because our daily usage is so tied to discussions of love, dating, mating, and adolescent and adult pleasures. For this reason, I start by defining terms. The online *Oxford English Dictionary (OED)* defines *erotic* as “relating to or tending to arouse sexual desire or excitement” and *sexual* as “relating to the instincts, physiological processes, and activities connected with physical attraction or intimate physical contact between individuals.” If one looks up the phrase *sexual intimacy*, words such as *intercourse*, *coitus*, or *lovemaking* begin to appear. But if, rather than focusing on the concomitants of intercourse and mating, we stick with defining *sexual* as relating to physiology, physical attraction, or intimate physical contact between individuals, it becomes easier to imagine applying the word to infants. Notably, the *OED* definitions mention neither pleasure nor orgasm.

It is worth stating at the outset that psychologists know little about how sexual feelings—both emotional and physical expressions of desire and attraction—become embodied or how embodied sensations become linked to adult behaviors. In this review, I have tried to assemble the very spotty information that exists and curate it into a framework that poses several related questions. When and how do sexual sensations within the body develop? When and how do these sensations become intertwined with objects of love and desire? What do we know about the timing of a transformation of infantile sexuality to adult orientation and expression? How does developing orientation relate to embodied gender and expression? Frayser (1994) covered some of the same ground but added in a cross-cultural aspect.

When and How Do Sexual Sensations Within the Body Develop?. Infants enter the world with variable abilities for state regulation, while routine parental care, such as touch and calming activities (e.g., rocking in a darkened room), supports continued development of the infant’s

physiology. I argue that, in infancy, neural sensitivities that as adults we link to coitus or adult lovemaking develop as components of the neural system that are part of the routine set of interactions between infants and caregivers. Trevarthen and Aitken (2001) presented a table of the 12 cranial nerves listing the skills, feelings, and sensory features of communication they enable in the infant. The olfactory nerve, for example, facilitates an internal sense of smell and taste and mediates the intersubjective experiences of smelling and (or while) kissing another. The trigeminal nerve facilitates facial feelings, enabling an infant to experience another’s touch, while the vagus nerve innervates the heart and gut and mediates the ability to feel one’s own emotions. These nerves are all functioning at birth—mediating suckling; helping to regulate heartbeat, temperature, and digestion; and facilitating an infant’s alertness to affectionate input from adults. In some sense, then, there is nothing special about sexuality. Even though, progressively during childhood and on into adulthood, it becomes a physiological “thing” (that we imagine as unique) linked to heightened emotion and the special attachments of love and lovemaking, it starts as part of the basic physiological repertoire an infant employs as it evokes and responds to adult caretaking activities. Sexuality emerges from the same neurological and physiological events that establish mutual caregiver–infant intersubjectivity.

It is possible that discussions of infant sexuality disappeared with increased skepticism about neo-Freudian accounts of sexual stage development. Here, I return to the most recent of these accounts, which date from the third quarter of the 20th century. I do not think these are the “correct” story but rather that they are a plausible story which researchers today need to refute, modify, or confirm. According to Borneman (1994) and in agreement with much of the psychoanalytic literature, oral sensitivity, including the infant’s lips, gums, and tongue, associated with suckling, is possibly the earliest libidinal zone to differentiate. Psychologists writing in the 1960s and 1970s often tried to refigure Freud’s stages of infant sexuality by placing observed behaviors in a broader ethological context. Thus, the oral stage came to be seen “as part of a broader developmental phase of pair-bonding and attachment which includes all aspects of body contact, cuddling, clinging and touching and also rhythmic and rocking movements” (Higham, 1980, p. 17). Higham also broadened the Freudian point of view by considering behaviors such as clinging to a favorite soft blanket or stuffed animal, accompanied by thumb-sucking and rhythmic rocking, as a means to release stress and to self-calm as a biosocial repertoire that is one of the earliest stages of developing sexuality. In her account, the anogenital region follows on rather closely in time as a libidinal zone, as increasing innervation density develops in response to the multiple daily cleanings, washings, oilings, and powderings provided by caregivers.

At some point during development, the neural sensitivities of human libidinal zones connect to specific somatosensory regions of the cerebral cortex. Penfield and Boldrey’s (1937) map of these connections, figured as a homunculus on

a sectioned view of the motor and somatosensory cerebral cortex, is so arresting that most people do not look carefully at the genital zone, which, as it turns out, clearly represents a penis and testicles. Female genitalia, however, are nowhere to be found. Recently, Di Noto, Newman, Wall, and Einstein (2013) supplied some of this missing information by publishing a “hermunculus,” the representation of the female body on the somatosensory brain cortex. The two maps have many location analogies. For example, the genital region in both men and women map in similar locations, but the nipple and breast take on greater prominence in the hermunculus.

Di Noto et al. (2013) noted how much of the female body is missing from these neural maps which show the connection between distant body parts and particular regions of the cerebral cortex, and they made an important plea: that such maps, for both men and women, be devised in a more developmentally conscious fashion. They wondered how the map might change during pregnancy and menopause but also during aging, after breast or prostate surgery, or as a result of radical practices such as female genital mutilation or, for that matter, circumcision. We know little about somatosensory map development during infancy and early childhood (Marshall & Meltzoff, 2015). Given that such maps exhibit a degree of plasticity in adults (Ramachandran & Rogers-Ramachandran, 2000), we imagine that the development of body–brain linkages involved with the physiology of sexual expression starts to develop during infancy. Noninvasive technologies to create such maps and study their development from infancy to adulthood now exist (Kuhl, 2010). It is likely that researchers will begin to create infant hom/hermunculi, at least for culturally uncontroversial parts of the body (Saby, Meltzoff, & Marshall, 2015).

The neurological repertoire that develops into adult sexual repertoires is present in infancy. Kinsey, Pomeroy, and Martin (1948) reported parental observations of orgasm in both boys and girls as young as four months. They identified orgasm as rhythmic body movements; thrusting; tension of muscles in the abdomen, hips, and back; and convulsions of the anogenital region followed by release and quietude. Only absent is ejaculation (Kinsey et al., 1948). Higham (1980) and Martinson (1973, 1980) reviewed mostly clinical reports of erections and genitopelvic thrusting followed by quieting in infants under the age of six months (Higham, 1980; Martinson, 1973, 1980). As they develop the motor control needed to purposively explore and touch different parts of their bodies, infants begin to touch their own genitals, usually between six and 12 months (Higham, 1980).

Sexual expression, though, is more than a progression of reflexes leading to orgasm (e.g., as famously described by Masters & Johnson, 1966). It also involves feelings of pleasure. In an older literature, researchers discussed sex as a system of “tensional outlets” (Martinson, 1980, p. 32), although I think that today we would just as likely speculate in terms of dopamine release. Bieber (1965) defined the sexual system, even in infants, to include internal and external genitalia as well as parts of the brain’s limbic

lobe involved with arousal and behavior. Invoking the limbic lobe, more currently referred to as the limbic system, suggests a place for emotion, pleasure, and attachment in the infant sexual system, but the idea of infant pleasure remains unexplored in the literature that specifically addresses infant sexuality.

In discussing the global quality of infant perception, Stern (1985) suggested that infants incorporate affective experience (happiness, sadness, fear, interest) in terms of intensity or urgency (which he calls activation) and hedonic tone, which he defined as “the degree to which the feeling quality is pleasurable or unpleasurable” (Stern, 1985, p. 55). The first experiences of affect are via hedonic tone, of which the earliest detected seem to be interest and joy (Johnson, Emde, Pannabecker, Stenberg, & Davis, 1982). Emde, Klingman, Reich, and Wade (1978) categorized infant emotions into three axes: hedonic (happy/like compared to unhappy/dislike), activation (startled, excited, or concentrating versus relaxed, asleep), and external-internal (curious or interested versus happy, sleepy or bored). In empirical studies (asking adults to interpret photographs of infants) they concluded that hedonic tone is observable from birth onward and that activation and internal-external axes combine with hedonic tone to produce recognizable facial expressions of infant emotion by three months.

When and How Do Infantile Sensations Become Intertwined With Objects of Love and Desire?. We know virtually nothing about how infants, toddlers, and children synthesize sensory, affective, and ultimately cognitive awareness to produce preadolescent, adolescent, and adult SO. We do possess bits and pieces of information about timing. Borneman (1994) divided an infant’s sexual development into two aspects, both of which develop from birth onward. The first involves the increasing division of the body surface, which at first acts as a global, haptic sponge, into zones of touch sensitivity. He called the zones that form the basis for sexual touch *erogenous zones* and referred to their emergence as *libido development*. The second concerns the expansion from an infant’s first “beloved,” the primary caregiver, to an increasingly large circle of love partners but also objects. He called the extension from a primary love object to many others *object relationship development*. This latter may turn into what we call SO (Borneman, 1994). In a similar but more recent mode, Marshall and Meltzoff (2015) proposed that one component of the developing body schema involves brain maps of the infant body (infant her/homunculi?) that contribute to “the basic registration of self-other correspondences and thus may facilitate the earliest relationships and feelings of connectedness with others” (p. 500).

The infant transitions from an initial state of greater or lesser abilities for physiological control to greater maturity in interaction with a primary caregiver. The immediate affordances of greater state/arousal control allow the incorporation of cultural information about expected behaviors. Primary caregivers provide the earliest cultural information about gender and

orientation. This information is located in the physical surroundings they provide and more importantly through their patterns of sensory communication. Hsu and Fogel (2003), for example, used a microanalytic approach to analyze parent–infant interactions as patterns of communication. They identified the mother (their experimental subjects were mother–infant dyads) as the active agent of asymmetrical, unilateral, and disruptive communication patterns during the first six months of development. In an extensive (and frankly sometimes bewildering) series of studies, Fogel and colleagues examined interactions and transitions from one pattern to another of infants and their mothers in the first two months (Lavelli & Fogel, 2005), from two to six months (Hsu & Fogel, 2003), and at nine months (Fogel & Dekoeyer-Laros, 2007). Following on earlier work (Trevarthen & Aitken, 2001), Fogel and colleagues considered that a new developmental level, called *secondary intersubjectivity*, emerges out of the nine-month transition. They defined this as the actions of “coordinating and sharing with another person one’s attention, feelings and intentions toward a third pole of an object, event or action” (Fogel & DeKoeper-Laros, 2007, p. 64). This contrasts with primary intersubjectivity (the main mode of interactions from months two to nine) in which an infant simply knows that it feels different to interact with another person than it does to be alone. Lavelli and Fogel (2005) documented the earliest transitions, during the first two months, from simple gazing and maternal direction of the interaction to active engagement from both the infant and caregiver. Beebe and Lachmann (2002) took up a similar theme when they wrote, “Across development, interactive regulation reorganizes inner as well as relational processes; reciprocally, changes in self-regulation in either partner alter the interactive process” (p. 35).

Stern (1985) divided the emergence of a sense of self in infancy into several periods. During the first two months after birth, he saw the infant as actively developing an emergent sense of self. At two to three months of age, Stern described the emergence of a core sense of self. Specifically, the infant offers evidence that it can distinguish self from other. As a core sense of self emerges, the infant develops the skill of being a self who interacts with another (for example, in a game of peekaboo). He considered the next quantum leap in the development of self to happen between the seventh and ninth months, as infants gradually realize that they can share their inner experiences with someone else. Following on these abilities, the infant and caregiver begin a process of tuning into each other’s affective state and last, as language emerges during the second year of life, a sense of verbal self emerges.

This is what is known, at least in broad outline. The big questions remain. How, and on what kind of developmental timetable, do infants, then children, and then adolescents link physiological senses of pleasure and stimulation with their own senses of self and agency? How and when do they think of physiological pleasure as an affective experience? How do love objects develop? To understand SO as a phenomenon that

develops throughout the life cycle, these questions must be addressed.

Orientation and Gender/Sex

What Do We Know About the Transformation of Infantile Sexuality to Adult Orientation and Expression?

Knowledge about the transformation during childhood and adolescence of infantile sexuality into more adult forms of sexual expression, orientation, and attachment is sketchy at best. Just under 10% of the men surveyed in Kinsey et al.’s (1948) sample reported some form of sex play as young as age five, with the percentage increasing steadily through age 14. Over half of the experiences reported at the youngest ages were heterosexual and the remainder homosexual. At age five, about 3% of the experiences included coitus, with the percentage increasing gradually until age 10 and more steeply thereafter (see Table 24, Figure 25, in Kinsey et al., 1948). The picture for women is similar, although overall frequencies are lower. About 4% of their sample reported erotic arousal at age five; the percentage jumps to 16% by age 10 and continues to increase with age thereafter (Kinsey, Pomeroy, Martin, & Gebhard, 1953, Table 146, p. 544). Martinson (1980) confirmed that children ages three to eight years old engage in kissing and touching, including masturbation. By age six, children are trying to figure out where babies come from and to understand anatomical differences between boys and girls (Martinson, 1980).

Bell, Weinberg, and Hammersmith (1981) offered verbatim anecdotes from adults recalling childhood sexual activities with other children from as young as age three. In comparing such experiences, as recalled by adult heterosexual and adult homosexual men, they concluded that both groups engaged in similar activities both with other boys and with girls. However, the homosexual men recalled feeling sexually aroused with other boys even at very young ages, and the converse was true for heterosexual men. These researchers viewed the homosexual and heterosexual identities that take shape during adolescence as emerging from earlier preferences. Although the specific numbers differed when comparing homosexual and heterosexual women, the overall conclusions were similar. Both categories of women recalled heterosexual play encounters at early ages; more future homosexual women recalled early encounters with other girls. The authors concluded that homosexual preference arose fairly early regardless of prior heterosexual encounters.

This time line of nervous development, attachment, childhood sex play, and adult orientations indicates that the development of sexuality and orientation starts early and continues over time. Such a teleological telling of the story tilts the explanatory playing field toward naturalistic explanations of orientation. Johnson (2000) discussed the

problem with regard to how children acquire their beliefs about gender. Younger children use social cues to identify gender: long hair signifies a girl; a child playing with trucks and cars must be a boy. This amuses the adults who understand that the child is still too immature to grasp the true difference, that of the genitalia. But what if the world children see and interpret is not actually structured according to adult teleology? What if, to figure out how things happen, we listened to the children? Johnson contrasted an open interview process to find out how children conceptualize gender with the more traditional, simplified tasks and interviews of parents and teachers that have produced the accepted timetable for acquiring gender knowledge. She suggested that members of the under-five set fluctuate between fluidity and rigidity as they navigate in and out of an adult world that structures difference. Further, she argued, a child's fluidity results from his or her awareness of the actual ambiguity of gender in everyday life.

Finally, Johnson (2000) discussed what she called the "moral/emotional" dimensions of gender belief. Johnson found that asking small children about gender transgressions provoked a kind of moral anxiety. When she asked a child why ladies do not drive cars, the child replied that they would crash. And if a man cooked dinner, it would burn. Johnson cites Mary Douglas as writing that "all margins are dangerous" (Johnson, 2000, p. 146) and hears a child's anxiety at examining gender at the margins. Retrieving the child's voice, Johnson concluded, directs our focus to the unstable and ambiguous nature of gender constitution. It also "reinforces the need for further explorations of the processes through which both gender and selfhood are negotiated dialogically between adults and children" (Johnson, 2000, p. 148).

It is difficult to imagine designing ethical, review-board-approved, direct, open-ended interviews with children about SO even though knowledge obtained from listening to the children would probably provide us with perspectives that we have no other way of developing. Still, perhaps Johnson's methods of investigating gender/sex provide a way in. Gendered play, embodied gender expression, and desires to be like a girl or be like a boy have long been linked to SO. This, then, is the last big topic to address: What are the links between childhood gender expression and adult orientation? What might such links mean, developmentally? Because reported correlations do not account for all instances of heterosexual or homosexual orientation, what does gender leave out? The next section discusses the ways in which adults have been asked about this. What, I wonder, might be learned from talking with the children and observing them, prospectively, as they interact with adults and peers?

How Does Developing Orientation Relate to Embodied Gender and Expression?

Bailey et al. (2016) offered a thorough review of current thinking within mainstream psychology about adult SO.

They documented the strengths and weaknesses of measurement instruments and the prevalence of nonheterosexuality in Euro-American cultures. They emphasized two matters important to the question of gender. First, there are documented sex differences in the expression of hetero and nonhetero identities and behavior sets. Among nonheterosexual adults, many more women than men label themselves as bisexual. Furthermore, men seem to be more category specific in their sexual responses to either male or female stimuli. Bailey et al. were also struck by the apparently higher frequency of sexual fluidity: context-dependent attractions in which the relationship drives self-labeling as homo- or heterosexual (see also Diamond, 2008).

The second matter, which has held the attention of sex researchers for more than 35 years, is the correlation between what investigators call childhood gender-nonconforming (CGN) behaviors and adult homosexuality. In one of the first large-scale post-Kinsey surveys, Bell et al. (1981) found "a powerful link between gender non-conformity and homosexuality" in both women and men (p. 188). In their study, about half of the homosexual men reported typically masculine childhoods and about one-quarter of the adult heterosexual men were gender nonconforming as children. Similarly, about one-fifth of the lesbians and about one-third of the straight women remembered being highly feminine in childhood. Bailey et al. (2016) amply reviewed the large literature reporting on connections between childhood gender nonconformity and adult homosexuality.

Before considering three models that relate childhood gender nonconformity to adult nonheterosexuality, some caveats about the basic idea should be noted. Bailey et al. (2016) listed the following measures of childhood gender nonconformity: for boys—playing with dolls, wanting long hair, a dislike of competitive sports, preferring to play with girls, elevated separation anxiety, and wanting to be a girl; for girls—dressing like a boy, liking to play with boys, having an interest in competitive sports, showing little interest in "girls'" toys (dolls and makeup), and wanting to be a boy. These two lists demonstrate the argument's contention that homosexuality is "oppositeville" or, in a much older parlance, inversion (Ellis, 1904). Thus, nonbinary children become nonbinary adults, and a homosexual man is understood at least in some measure to veer toward womanhood. This is the same theory that conceptualizes specific regions of the brains of gay men as anatomically intermediate between those of heterosexual men and heterosexual women (Byne, 1998; Byne et al., 2000, 2001; LeVay, 1991). It is a theory that understands SO as a deviation from a binary norm; at the same time, it offers no explanation of the normative, in other words, heterosexual orientation. As Corbett (2009) put it, underlying accounts of childhood gender nonconformity are normative narratives of masculinity and femininity shaped by a context in which a married heterosexual couple raises a child in "a field marked off by the guideposts of the gender binary" (Corbett, 2009, p. 8). The fantasy domestic story surrounding it all is that of an

abstract family: father, mother, and child. Corbett compared this to a contextualized domestic story in which the family is “encased within and permeated by the cultural surround” (p. 8). Finally, Corbett called out the “continued conflation of anatomy with gender,” which in this current review I address by introducing the term *gender/sex* (p. 8).

Theories about gender nonconformity and SO have always faced empirical challenges. The greatest are the large percentages of straight men and women who remember childhood gender nonconformity and the large percentages of gay men and women who remember gender-conforming childhoods. Corbett (2009) envisioned a football field in which the binary (fantasy) story has most people clustered around one or the other goal posts. But virtually all of the studies that show associations between childhood gender nonconformity and adult homosexuality also show a large number of people for whom such an association is absent. Rather than clustering at the goal posts, these unexplained—and, frankly, unexamined—people are scattered all over the field.

Measurement itself presents problems. First, there is the recursive nature of the concept of childhood gender nonconformity. Individual identities involve a domain of interactions. Thus, a child cannot arrive at a stable sense of sameness or difference with regard to gender/sex identity without engaging in dyadic interactions and specific sorts of play activities. Individual identity necessarily entails larger-world interactions that produce contextualized meanings about gender/sex. Thus, for example, “girls are people who play with dolls” emerges as a generally known fact and it follows that, within the closed cultural bubble, you are a girl, or at least you are *girlish*, if you play with dolls. In this nexus, girls are supposed to grow up to play their role in the fantasy heterosexual family story, so people who are girls during childhood grow up to be heterosexual mothers. It is a closed system in terms of measurement and explanation.

Furthermore, there is no uncontroversial way to assess childhood gender nonconformity. Retrospective studies rely on adult memories of childhood behaviors. Delving deeply into the problem of memory as data is beyond the scope of this review, but Bailey and colleagues have tried to establish adult memories as veridical of childhood behaviors (Bailey, Nothnagel, & Wolfe, 1995; Bailey & Zucker, 1995; Rieger, Linsenmeier, Gygax, & Bailey, 2008). Others understand memory as fundamentally (re)constructed such that by using adult memories to understand childhood antecedents, the processes that produced the adult memories would, themselves, require iterative deconstruction and interpretation (Ansermet & Magistretti, 2007). These two understandings of the epistemology of memory and the value of retrospective tools in psychological and sociological research have not really met head-to-head in an academic forum. There are also prospective studies that in theory might be a better bet for understanding links between childhood gender nonconformity and adult SO. Those studies performed to date, however, are also methodologically

flawed because they have relied on preselected populations: children brought to clinics by their parents because they “exhibited extreme gender nonconformity as well as discomfort with or confusion about their gender identity” (Bailey et al., 2016, p. 57).

Despite the theoretical and methodological difficulties that surround a focus on the link between childhood gender nonconformity and adult SO, it is worth looking at several strong efforts that use childhood characteristics to produce a developmental narrative for adult SO. In a first-of-its-kind study and analysis, Bell et al. (1981) tested pathway models for the development of homosexual preference in men and women. Using site-specific advertisements and snowball sampling, they recruited a sample of almost 500 straight and almost 1,000 gay men and women in the San Francisco area during the late 1960s. For their male sample they identified aspects of maternal and paternal relationships that correlated with childhood gender nonconformity, the strongest of which were “mother dominated father” and “negative relationship with father” (positive correlations of .18 and .17) and “identification with father” (negative correlation of $-.27$). Radiating out from childhood gender nonconformity were a variety of much stronger correlations, including “homosexual arousal in childhood” (.38), “felt sexually different in childhood” (.32), and “heterosexual arousal in childhood” ($-.29$). These in turn led directly or indirectly, with varying degrees of correlation, to adult homosexuality (Bell et al., 1981).

The overall shape of the diagram for women differs in that there were more details of family relationships correlating with childhood gender nonconformity. For example, a negative relationship between parents correlated negatively ($-.28$) with identification with the mother. This, in turn, correlated negatively ($-.30$) with childhood gender nonconformity. But, similar to the male sample, childhood gender nonconformity correlated with isolation from other girls (.24), homosexual arousal in childhood (.27), and adolescent homosexual involvement (.41). The latter correlated strongly (.74) with adult homosexuality (Bell et al., 1981).

Bell et al. (1981) constructed a framework that contrasted a biological cause for homosexuality with psychoanalytic family analyses, which suggested a pathological resolution of the Oedipal complex. Duberman (1991) has written movingly about the negative personal impact of the psychoanalytic belief system on men and women growing up gay in the 1940s and 1950s. Thus, I understand as progressive Bell et al.’s aim to move the study of homosexuality into an empirical mode. In finding empirical reasons to dismiss psychoanalysis, though, they invested in a different dualism: social experience versus biology, to which, as with the title to their final chapter, they appended a question mark. Acknowledging that their study did not collect biological data that could confirm a biological cause for homosexuality, they nevertheless concluded that their results “*are not inconsistent with what one would expect to find if, indeed, there were a biological basis for sexual*

preference” (Bell et al., 1981, p. 216; italics in original). They further speculated that any biological mechanism probably “*operates more powerfully*” (p. 216; italics in original) for exclusive homosexuals, compared to bisexuals, and that any biological basis for homosexuality most likely accounts for gender nonconformity. Given an inborn gender nonconformity, familial factors thought to account for homosexuality might instead be the result of “a prehomosexual son or daughter being ‘different’ to begin with” (Bell et al., 1981, p. 218; italics in original).

While Bell et al. (1981) presented evidence that childhood gender nonconformity is in many cases associated with adult homosexuality, they did not argue for a causal relationship. Bem (1996, 2008), however, made precisely this argument. He proposed that childhood temperaments of biological origin influence a child’s interest in sex-typical play and peers. Such typical preferences, he theorized, led kids to feel different from “opposite”-sex children and to see them as unfamiliar. This unfamiliarity then produces a heightened autonomic arousal that ultimately becomes an erotic arousal. A similar process occurs for gender-nonconforming children, who feel different from same-sex peers—a difference which stimulates nonspecific autonomic arousal, which in turn becomes eroticized (Bem, 1996). Bem’s theory is one of the only in this genre that offered an explanation of both hetero- and homosexuality. Nonetheless, his approach has been criticized on a variety of grounds (Peplau, Garnets, Spalding, Conley, & Veniegas, 1998; Peplau & Huppert, 2008). Liben and Bigler’s (2008) critique of linear, causal pathway models of gender and socialization is the most salient for the approach taken in the current review.

Liben and Bigler (2008) took issue with the causation-pathways model. Instead, they divided the concept of gender nonconformity into behavioral, cognitive, and affective domains, each of which may or may not be conforming. They acknowledged as well that what counts as conforming is culturally specific. The behavioral domain includes what children do (e.g., play with cars or dolls) but also how they do it (e.g., using the doll as a pretend gun rather than a pretend baby). For adults, they include sexual behaviors in the behavioral domain. In the cognitive domain, Liben and Bigler considered whether an individual agrees or disagrees with dominant beliefs about gendered traits. Examples here include generalizations such as “men are aggressive” or “women should become nurses but not doctors.” They considered that the affective domain encompasses how an individual feels about gendered aspects of self and other. The affective domain includes people whose sense of their own body (somatic identity) differs from their natal body. It also covers women and girls with masculine identities and boys and men with feminine ones. SO identity falls within the affective as well as the behavioral domain (Liben & Bigler, 2008). For future work that explores links between childhood gender nonconformity and adult sexual preference, it would be important to distinguish the tripartite (behavioral, cognitive, and affective) breakdown of the concept, treating them as separate but also exploring how they overlap and influence one another.

In earlier work, Liben and Bigler (2002) modeled pathways for the development of normative sex-typing. Working with the belief that even toddlers actively engage in this process, they modeled two simultaneously acting pathways: attitudinal and personal. The attitudinal pathway demonstrates how a child’s sex-typed belief about others guides sex-typing of the self. The personal pathway describes the inverse: how sex-typing of self might structure sex-typing of others. For each model they suggested three filters—gender salience, gender schema, and personal interest. These pathways have been tested on middle school children, and it would be of great interest to apply them to prelinguistic and linguistic toddlers (say, ages 12 to 36 months).

The most important features of these models are both how one thing leads to the next and, also, how the next reinforces earlier steps. In this, their model is profoundly iterative and thus falls squarely in the thought domain of dynamic systems. Figure 4, as redrawn from Liben and Bigler (2008, Figure 2, p. 105), illustrates the feedback in their personal pathway model. Upon encountering a person, object, or event, the first thing a child (in this example drawing on their data for girls) does is apply an interest filter (which develops as part of their attitudinal pathway; not reproduced as a figure in the current article). If interested, they forge ahead. Next, the child applies a gender salience filter. If the child thinks the person, object, or event is irrelevant to gender, that feeds back on the interest filter. If the child deems the encounter to be gender relevant, she engages with it, thinking that because she engaged with it, it must be for females. This awareness then reinforces or modifies her gender schema filter, an event which reverberates back to the initial interest filter. Liben and Bigler (2002) insisted that both the personal pathway and the attitudinal pathway work together—and I would add that these events probably repeat multiple times daily, as gender interests build.

Liben and Bigler (2008) listed three core principles that differentiate their model from those of Bell et al. (1981) and Bem (1996). First, their concepts are continua rather than binary. For example, a child can find an object to have varying degrees of gender salience, rather than either having it or not having it. Second, all aspects of gender, be they behavioral, cognitive, or affective, have multiple causes. Thus, there is no single-factor explanation for a particular kind of SO. Finally, they see their pathways as profoundly bidirectional. Because factors have reciprocal interactions, divisions into cause and effect do not make sense. In summary, Liben and Bigler insisted that childhood gender nonconformity does not cause homosexuality; nor is it inevitably associated with a particular type of sexual orientation. Rather, they saw nonnormative SO as one of many possible types of “nonconforming” behaviors (Liben & Bigler, 2008).

Conclusion

In the first act of the stage version of the musical *South Pacific*, Ezio Pinza sings about attraction and love at first sight:

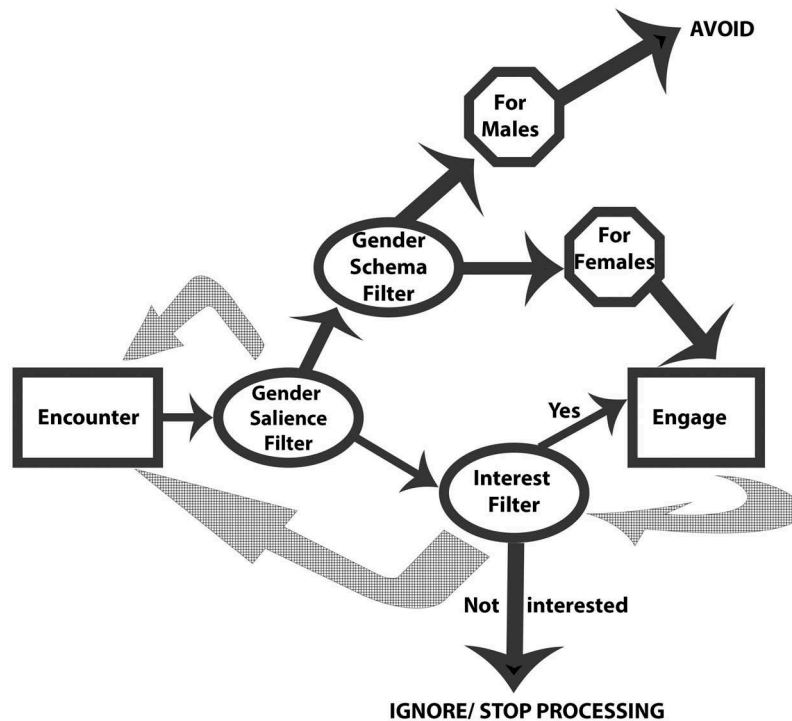


Figure 4. An illustration of the feedback in Liben and Bigler's (2002) personal pathway model for the development of gender conformity.

"Some enchanted evening, you may see a stranger, / You may see a stranger across a crowded room, / And somehow you know." Pinza's character sings of a moment most people experience many times in their lives. In an instant, they are attracted to a complete stranger. The attraction does not begin cognitively; rather, the body tells the brain about how it is feeling. Many elements combine in the potential lover/beloved to produce this embodied reaction. The presented gender/sex, the physical build of the body, the person's expressiveness, and many unknowns. Not all moments of intense attraction are at first sight. Regardless of this, SO is embodied. In this review I have tried to provide a knowledge scaffold—to build a platform to support thinking about what embodied SO means, how it might relate to gender/sex, and how it might develop.

I summarize by considering body maps. Marshall and Meltzoff (2015) proposed that infant maps that chart the relationships between sensations at the body surface and the sensory cortex of the brain (somatotopic maps) perform a kind of double duty. Of course, they serve to flesh out (as it were) the infant's own body schema. As such, they are part of a neural process that enables an infant to tell the difference between itself and another. This ability, they suggested, may facilitate feelings of attachment to others. Beebe and Lachmann (2002) operated in a different register—that of the dyadic interactions that facilitate an infant's prelinguistic development of a sense of time, space, proprioception, facial affect, and arousal (see Figure 3). Thought of at yet another level of abstraction, perhaps the body maps described by Marshall and Meltzoff and the dyadic mapping studied by Beebe and her colleagues have

a relationship to Money's lovemaps. He defined these "as a personalized, developmental representation or template in the mind and in the brain that depicts the idealized lover and the idealized program of sexueroetic activity with that lover as projected in imagery and ideation, or actually engaged in with that lover" (Money, 1988, p. 127). Van Anders (2015) offered a more contemporary approach to mapping that she called "a socially situated phenomenology of certain kinds of sexual diversity" (p. 1201).

In common parlance, SO, being gay or straight, can be seen as a suite of behaviors, body states, and emotions that extends far beyond sexual encounters or attractions. Bailey et al. (2016) referred to this as adult gender nonconformity (AGN). They included patterns of movement, speech, and physical presentation, including dress and hairstyles. These authors asked whether this adult gender atypicality results from the self-fulfillment of cultural expectations. Maybe watching too many episodes of *Will & Grace* brainwashes gay men. Without evidence, they simply stated, "[W]e think it is highly unlikely that gender nonconformity in LGB populations represents a self-fulfilling prophecy due to cultural beliefs"—although they do allow that (what I call) too much *Will & Grace* might exaggerate adult gender atypicality (Bailey et al., 2016, p. 59).

Here, again, one is confronted with a binary choice. Again, I take an orthogonal turn by urging us to see AGN as a set of embodied behaviors and a particular expression of gender/sex that interlaces with SO. Bailey et al. (2016), as well as Bell et al. (1981), see a throughline between unknown "intrinsic factors," or the biological underpinnings or predispositions to atypical gender presentation in

children and adults. This throughline is also understood as a causally connecting thread or aspect of homosexual orientation. But what if one understands stereotypical bodily presentations as embodied habit that gradually develops, starting in infancy, as described in earlier sections of this article?

It is important to note here that heterosexual orientation also entails stereotypical habits—loud and aggressive masculinity, manspreading, talking over people for many straight men; demure self-presentation, vocal hesitation, occupying as small a physical space as possible for many straight women. Be it in homo- or heterosexually oriented individuals, these are all examples of what West and Zimmerman (1987) called “doing gender.” They defined this as “creating differences between girls and boys and women and men, differences that are not natural, essential, or biological. Once the differences have been constructed, they are used to reinforce the ‘essentialness’ of gender” (p. 137).

The gender work named by West and Zimmerman (1987) and Bailey et al. (2016) may be better understood as embodied habit, constructed and—once constructed—essential. I find Grosz’s (2013) discussion of phenomenologist Henri Bergson’s notion of habit especially useful. Most of what we do in the world is habitual. We go through a wake-up ritual, we reach for the silverware drawer in the kitchen, we drive home from work each day—all without conscious thought. These embodied movements develop through repetition and make it easier to function in a world with many regularities. Individuals remember the past through habit, which Bergson says carries all past events into the present, just as a snowball rolling downhill picks up and preserves every object it encounters. An individual’s past exerts a force in the present in two ways: through embodied habit, which is more or less automatic, and through conscious memories of specific events or episodes. Habit and conscious memory combine to construct an image in the present (Grosz, 2013). Finally, Bergson believed, habit provides a solid basis for the emergence of subjectivity, which he saw as creative and unpredictable. In the context of thinking about SO, subjectivity would include many aspects of self-labeling or identity.

Sarah Ahmed (2006) directly considered SO as a phenomenological question. She suggested that SO is not something that we just have but something that happens over time. “To become straight means not only that we have to turn toward the objects given to us by heterosexual culture but also that we must turn away from objects that take us off this line” (Ahmed, 2006, p. 554).⁶ Ahmed detailed how these heterosexual objects (family, expectations for future heterosexual marriage, toys, dress, styles of play) are things that we are oriented around. They are so mundane that they disappear from view, just as heterosexuality itself, as a thing that

requires explanation, disappears in most sex research. Nevertheless, these objects all “stick” to heterosexuality and become background components of adult desire. Desiring another of the same gender/sex, being oriented as a lesbian instead of a straight person, for example, means living in a different body, one that is not on the straight line of heterosexuality with all of its attached hidden objects. As Ahmed wrote, “[A] shift in sexual orientation is not livable simply as a continuation of a line” because “such orientations affect other things that bodies do” (p. 564).

Adrienne Harris (2005) gets the last word. We can link Ahmed’s pathway through a field of objects and expectations that produce heterosexual bodies and desire, to infants, dropped into an immediately complex and stimulating world with some skills, to be sure, but with a comparatively small suite of abilities. Harris called an essential characteristic of nonlinear dynamic systems that individuals find within them “powerful regularities of patterning in experience” (p. 150); but a pattern that at one level seems essential and monolithic may, at closer look or at one point in time, be graded, variable, and chaotic. The “powerful regularities” allow sex researchers to measure events in populations and test hypotheses statistically, while the variability and chaos speaks to each uniquely developing individual. Harris (2005) wrote of gender that it “will become a patterned, complex self-state, but under many distinct and idiosyncratic conditions” (p. 150). The same may be said for sexual orientation.

Acknowledgments

The author is grateful for the resources and assistance provided by the Kinsey Institute, located at Indiana University. The Kinsey Institute houses one of the only libraries in the United States where one can find scientific literature that openly discusses infant sexuality. Liana Zhou, director of library and special collections, and Justin Garcia, research director, went out of their way to provide me with copies of material and show me around the library. I am also grateful for insights provided and struggles to understand offered by the participants in the Pembroke Center for Teaching and Research on Women, postgraduate seminar on embodiment, held at Brown University in 2002. Two anonymous reviewers helped strengthen the original manuscript submission. Finally, a series of focused e-mail exchanges with Sari van Anders, Canada 150 research chair in social neuroendocrinology, sexuality, and gender/sex (July 2018), helped me to think more deeply about gender/sex and identity formations.

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⁶ Consider that this turning away also shows up in Liben and Bigler’s (2002) path diagrams; refer to their Figure 5.

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