

# Sex-Gender in Life-Science Research: Conceptual Renegotiations and an Enactivist Vision<sup>I</sup>

ALEX THINIUS

In her book *Sex Matters*, medical doctor McGregor recalls the following case from her practice in an emergency room:

“I’ll never forget the day that a thirty-two-year-old woman almost walked out of my emergency department while having a heart attack. [...] Julie, the young woman I met that day, had visited her primary care doctor several times prior to coming to the emergency department and had also seen at least two other physicians in the previous forty-eight hours. She was experiencing discomfort in the region of her chest and shortness of breath that worsened markedly the more agitated she became. [...] Her other doctors had attributed Julie’s symptoms to a combination of anxiety and stress to her heart due to her obesity. [...] She was having panic attacks, and her weight was compounding the issue. End of story. [...] In fact, women’s cardiac symptoms are often described as “atypical” and “unusual” in medical literature. [...] [H]ere was sweet, thirty-two-year-old Julie presenting with a condition that was likely to kill her in weeks, if not days, if left untreated—and *no one had thought to look for it because her symptoms and risk factors weren’t consistent with the classic male model of a heart attack.* [...] To me, Julie’s case was significant because she actually presented with male-pattern heart disease, but in a distinctly female way.”  
(Original emphasis, McGregor 2020, Chapter 1)

Sex and gender (sex-gender) are increasingly recognized as crucial variables to improve life-science research and health care practice (Legato and Glezerman 2017). Differences in heart-attack diagnosis in men and women have become the symbol of the urgency to transform health care related research and practice. As McGregor puts it in *The Guardian*, “There’s this

assumption that women's health is wrapped up in their reproduction. Women were men with 'boobs and tubes'" (Moore 2020). With Gender Medicine, health and life science is wrapping its head around the notion that there might not be one model of "mankind." This critique quickly turns into a view of sex as a radical difference between men and women. For example, *The Guardian* writes, the "takeaway message is that women's bodies are different to men's from cellular level onwards, yet our medical model is based on knowledge gleaned from male cells, male animals and male humans" (Moore 2020). In McGregor's words:

"Physiologically, neurologically, cognitively, socially, and experientially, women are unique. Every system in our bodies operates according to a biological imperative fine-tuned to our womanhood and the daily functions that womanhood necessitates. We are not simply men with breasts and ovaries – or, conversely, men who lack penises and testicles. We are not a genetic offshoot of men, as literal interpretations of scripture might imply. We are unique in every single cell of our bodies."  
(McGregor 2020, Chapter 1)

McGregor's manifesto, as well as the public uptake in *The Guardian*, may be hyperbolic, however, they express a widespread approach to gendering in medicine and life-science research. In the move to taking sex-gender seriously, sex-gender differences are usually conceptualized as stable, dichotomous, and distributed in two (or three) groups: males and females, and the derived category of the intersexed (cf. Shai, Koffler, and Hashiloni-Dolev 2021).

However, in research on the biology of the sexes, as well as on trans\* and intersex medical care (Zeeman et al. 2018; Schneider et al. 2018; Voß 2010), the growing consensus is that sex is nuanced, variable, and entangled with gender in complex ways. On the one hand, this complexity calls for much greater attention to contextual differences (Richardson 2021), in what different researchers refer to with terms like "sex," as well as in how sex traits are embedded and enmeshed with other aspects in different researched contexts. For example, a closer look at the widespread idea that men are "more likely to die of Covid" (Ghorayshi 2022) not only demonstrates the inadequate character of concepts such as "men" and "women"; it also reveals that analyzing the findings for contextual differences is:

“weakening the evidence for a primary causal role for biological sex in these patterns. [...] We emphasize that understanding the role of gender and sex in COVID-19 disparities requires comprehensive, accessible, and transparent data on COVID-19 outcomes that include not only sex, but also gender identity, race, class, comorbidities, occupation, and other relevant demographic variables, in combination with quantitative and qualitative data on gendered behaviors, occupations, and comorbidities that may be associated with COVID-19 outcomes.”  
(Danielsen et al. 2022, 10)

Context sensitivity can help us use our coarse-grained sex-gender concepts more carefully – this would already go a long way. However, careful use hardly turns a sledge-hammer into the sort of yarn that we need for understanding the realities of our sex-gendered lives. This creates the urgency that the concept of sex be “redefined” (Ainsworth 2015).

## **Conservation Approaches to Reconceptualizing Sex-Gender Face Epistemic Problems**

Reconceptualizations of sex-gender can have two different aims: conserving or replacing the notion of sex as binary. Conserving some notion of binary sex, much research aims to integrate any complexities into established binary research paradigms. This faces three difficulties: pathologizing variation (cf. DuBois and Shattuck-Heidorn 2021; Cullin, Vitzthum, and Wiley 2021); compromising individualized health care aims (cf. DiMarco et al. 2022) and, thereby, saving the theory at the cost of the “phenomena.” These approaches are in obvious practical and normative tension with providing and seeking appropriate medical care for everybody. Moreover, they face a less obvious epistemological problem: both in the design of research and the interpretation of findings, it is unclear how this line of research could possibly find out if sex was not “basically” binary. Even when not outright defining sex as binary difference (“Sex, Noun” n.d.), the assumption – or oftentimes, conviction – that sex-gender is “typically,” “basically,” or, in a similar sense, “normally” binary and stable rarely motivates research into the processes that manifest and maintain what fits a putative statistical normality (see, for a similar argument, Fausto-Sterling 2012,

2020). Moreover, this frames attention for counterindications only as “deviations” and “anomalies” – i.e., at best as “problems” for the theory. One might think of this as a less severe epistemic difficulty if, in principle, the notice of such “anomalies” could seriously challenge the research paradigm. But the interpretative framework of “definitionally,” “basically,” or “typically” binary difference in sex suggests that this is not the case: the framework comes with conceptual strategies that explain away *any* complexities as irrelevant, either as individual rather than sex differences, or as pathologies. Indeed, when counterindications can that easily be discarded, it is unclear which empirical impact could possibly prove it wrong – or, consequently, demonstrate its adequacy.

The task ahead is thus more difficult than merely “fitting” a few atypical males and females, intersexed, and trans\* folks of different sorts into basically binary concepts of sex-gender. Instead, we need approaches that do not decide already from the outset that we have to find sex-gender to be binary at some point. This is crucial for doing justice to those of us who register as “problems” and “exceptions” to the basically-binary definition of sex. Moreover, not presupposing binarity will allow assessing when actual people in concrete contexts are distributed in a more or less dichotomous way.

## Replacement Approaches for Reconceptualizing Sex-Gender

Given these problems with holding on to a binary notion of sex, other research aims at replacing static and binary notions of the sexes. Seeing sex as more and less stable sets of processes helps these approaches work in two dimensions: First, beyond the sex versus gender binary, they seek to integrate dynamic interactions and entanglements of organic, social, psychological, and environmental elements. Secondly, beyond the male versus female binary, they aim for a pluralist non-pathologizing picture of how sex-gender is distributed.

Approaches in science studies and the philosophy of science offer, by now, a broad and complex heterogenous field of conceptual research that supports life-scientists in researching sex in processual, dynamic, and pluralist terms, without pathologizing or blending-out complexity from the outset. Critique of overstatement and bias remains a core task: for example, correcting popular yet flawed narratives of genetic or postgenomic

determinism (Vasterling 2007; Voß 2010; Richardson and Stevens 2015). Moreover, approaches in science- and gender-studies (New Materialism and Posthumanism) aim at long-term shifts of fundamental ontological and epistemological frameworks (Haraway 2016b; 2016a; Braidotti 2013; Barad 2007; Wynter 2007). While the translation of these conceptual transpositions into empirical life-science research often leaves ample room for interpretation, another family of approaches (Feminist Empiricism and Philosophy of Science in Practice) aims at the piecemeal reengineering of conceptual frameworks that are already operational in life-science research practice (Richardson 2010; Crasnow and Intemann 2021; Chao and Reiss 2017; Ankeny et al. 2011).

The latter approaches speak differently to the two dimensions of the reconceptualization of the sexes. Going beyond the sex/gender binary, I want to highlight dynamic, developmental, and complex systems theories of sex-gender (Oyama 2000; Fausto-Sterling 2021) who offer powerful tools to research “biology in a social world” (Fausto-Sterling 2012). Accounting for the way in which social gendered meanings affect both research practices and the living bodies that they are researching, the “biology in a social world” paradigm helps us better understand interactions across different levels of complexity, e.g., genetic, physiological, organisms, systems, and populations. For example, changing the research question from “How do abnormalities develop?” or “Which interferences cause abnormal development?” to “How do statistically normal developments emerge?” goes a long way in not already presupposing the relevance of a distinction between “biological” and “social” factors or a binary distinction between male and female. Moreover, this sort of research affords investigating how different levels in the organization and moments in the development of an organism, a group, population, environment, etc. may be interacting. For example, one’s bones are formed under conditions that are partially determined by social practices such as gender-differentiating nutrition (Fausto-Sterling 2005; 2008).

While processualist approaches beyond the sex/gender dichotomy are gaining traction (e.g., Ah-King and Nylin 2010), less conceptual attention has been paid to going beyond the male/female binary definition of the way in which sexual difference is differentiated (Griffiths 2021). Note that the difficulty, today, is less conceptualizing that individuals might not fall neatly into two groups with shared properties: over the past hundred years, various hermaphrodite-, contrary sexual feeling-, third sex-, inter-

mediaries-, intersex-, and trans\*-concepts were conceivable as mixed manifestations of a sexual difference that was defined as binary. Two conceptualizations stand out in this regard: conceptualizing sexes themselves as a multi-spectral continuum (Baltes-Löhr 2018; Castleberry 2019; a “sea of gender,” Fausto-Sterling 2020) and treating the sexes as statistical clusters at the population-level that feed back into individuals who then appear as mixed “mosaics” (Joel and Vikhanski 2019). While these approaches have merits, as they stand today, they can easily be interpreted on the basically-binary definition of sex as well. This is similar to various earlier ideas of sex as a “continuum” of “intermediaries.” Thinking the sexes as a spectrum between normally developed full-males and full-females (Hirschfeld 2015), who would develop into gendered personalities by a process of identification, repression or direction, came at the price of restabilizing the basically-binary conception of the sexes – a spectrum of sex, at which individuals would be intermediaries; or typical sexes of which individuals would be mixtures. So-considered “full males and females,” as well as “real homosexuals,” would become the paradigm cases for defining the poles of the spectrum of the sexes, registering a great variety of classed, pathologized, criminalized, and – as “oriental” or otherwise racialized – “deviations” at its intermediaries (Mehlmann 2006 and 2000; Sengoopta 1992; Somerville 1994; Stein 2015; Heaney 2015; Hinchy 2019; Çetin, Voß, and Wolter 2016).<sup>2</sup>

If a contemporary non-binary reconceptualization of sex-gender difference wants to build on these potentials, it needs to thoroughly understand what allowed defining the sexes in racialized terms, and make sure not to “buy” any refined notion of sex-gender at the cost of postulating (possibly idealized) “full male and full female” as the defining paradigms of the sexes.

## **A View Ahead: How Can Enactivism and Critical Phenomenology Help?**

What if the multi-spectral “sea” of sexual difference could dynamically be linked to the clusters and “mosaics” of sex, via a version of the “biology in a social world” paradigm that understands us as dynamic systems within multiple levels of other dynamic (or more complex) systems? I have recently developed such an account of gender: I have suggested that we can understand gender in a similar way as “genres,” precisely when it comes to the

way in which individuals, groups, and the genders-themselves are dynamically coupled (Thinius 2021). Like aesthetic genres, gender emerges in a dynamic between classes (men “as a group”), practically operative concepts (“men”), and individual instances that manifest, reinterpret, and develop the former two. Binary, or non-binary gendered properties are thus enacted at various levels of our social organization of existence by arrays of embedded people whose “kind membership” is ambiguous and a matter of a communicative shift.

As an account of gender, it is about how people (want to) participate in each other’s life, how they make sense with one another in encounters, and how this relates to the way in which larger social contexts and populations are systematically structured. However, this does not mean that it is not also about the “fleshiness” of us as living bodies. Recall the “biology in a social world” framework: human organisms form in a world that is already materially structured by social practices, including the idealizations and phantasms about desirable sex-genders that people are communicatively sharing in the population in which they are engaging. While these dynamic and complex systems perspectives stress the interactions between different levels of analysis (Fausto-Sterling 2019; Haslanger 2022), my account of gender requires this perspective to be upgraded with a further ingredient. For understanding sex-gender all the way up and down, we need to factor-in agency, and we need to be able to integrate agency as part of the systems-view of “biology in a social world.” This is not as easy as it might seem: dynamic and developmental systems change and develop; some include agents. However, thinking of water-circulation or waste-disposal systems, it is evident that while systems can have powerful effects, they are not necessarily agential in the way in which people are.

Luckily, there is a way to translate phenomenological and other descriptions of the perspective of agents like you and me into the abstract and third-personalistic models of systems-theorizing: enactivism. This translates *a description of the structures of our differentially shared experience* into *the structure of a specific sort of systems model*. Roughly, enactivism names a family of approaches in the emerging field of 4EA cognition – embodied, embedded, extended, enactive, affective – at the cross-roads of cognitive science, life-science, and philosophy of mind (Ward, Silverman, and Villalobos 2017; Newen, Bruin, and Gallagher 2018). Major enactivist programs – Radical Enactivism (Hutto and Myin 2017) and Linguistic Bodies (Di Paolo, Cuffari, and De Jaegher 2018) – converge (Rolla and

Huffermann 2021) and diverge on many issues (Thompson 2007; Villalobos and Palacios 2021; Meincke 2019; Chemero 2009). They share the view that cognition occurs when agents, conceptualized as bodies of a certain behavioral structure, and their environments co-emerge in an ongoing, dynamic, interactive process, as modeled in systems-theoretical terms.

As a translation, this cannot substitute descriptions and reflections of agency as experienced from the perspective of agents; however, enactivism can help factor-in some important aspects of people's embodied agency into systems research, which can, in turn, help us reflect on our lives. This is most obviously interesting for developing research on how our fleshiness and the material world characterize our actions and interactions as bodily gendered people, at the levels of personal identity, intersubjectivity, and dynamically stabilized "self-reproducing" social systems, including the ways in which physiological and genetic elements of embodied agents shape and are shaped by these other elements (Fausto-Sterling 2020; 2021; Merritt 2010; Ayala and Vasilyeva 2015; Halsema 2020; Maiese 2021; Chapter 2, Thinius 2021). To cut, for example, Fausto-Sterling's long and complex story short: a sex-gendered environment, and the intersubjective interactions that shape it and are shaped by it, are crucial elements in the gradually emerging self-organization, enabled by and in engagement with the pregnant person in their social world, in which a human organism becomes a specific infant that becomes a person with a gradually more stabilized gendered identity, including sex-gendered body schema, metaphorical gender associations, gendered toy preferences, gendered skill sets, physical capacities, brain organization habits, peer-affiliation, and symbolic gender/sex (2020, 268-313). In my view, the formations of sex-gendered bodies can then be understood along the lines of genres, with the quasi-binary or non-binarily pluralist distributions that emerge in such practices.

Does this hold for the sexes in a narrow sense as well? Is the development of the core dimensions of what we aim to understand with "sexual difference" – a genetic, gonadal, genital differentiation with reproductive functionality – dependent on a similar dynamic? At this point, these are open questions, both conceptually and empirically. However, thinking of the sexes perhaps in a somewhat similar way to genders and genres can open the view for researchers to not "automatically" apply a male/female concept of sex in their data collection and interpretation; it also asks researchers to be more precise in defining what it actually is that they are

measuring in their particular research context. The point is: this would turn us from questions of definition towards empirical questions within a limited context, bound to a more thorough theoretical reflection on the concepts that are operational in this sort of research. Rather than defining the sexes along the lines of two complementary halves or a rainbow-spectrum between two poles, we might then conceptualize reproductively relevant characteristics as dynamically changeable, locally differentiated, and somewhat like color wheels or color spheres: multi-spectral continua without fixed primaries or poles that set the stage by definition.

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### Notes

- 1 I am indebted to Veronica Vasterling, not the least for showing me how queer feminist philosophy and hermeneutic phenomenology can have good discussions with the life-sciences. Much of this project draws on my RMA thesis titled, “Sexual Difference as Binariness: Is Critical Work on Concepts Futile?” supervised by her.
- 2 To my knowledge, there is still insufficient research on the relation between, on the one hand, these racialized historical definitions of “full males and females” for medical and anthropological reference, and, on the other hand, today’s “athletics” bias against women of color who appear to “fail” such sets of criteria for femaleness more often than others (Karkazis and Jordan-Young 2018).

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