This talk will defend the viability of a social constructionist account of sex differences in human behaviour – not as an *alternative to* an evolutionary account, but *as an evolutionary account.*

I will start with sex, and an explanation of sex differences in terms of a sexual cascade of evolutionary innovations.

In our own species, this evolutionary innovation includes sociocognitive capacities and culturally scaffolded environments that enable hyper-cooperation, including socialized specialization into social roles.

Could this include gender roles? I’ll argue yes, then briefly address and reject three objections: that it is a theoretical impossibility; evidence from clinical populations with disruptions to early androgens; and so-called gender equality paradox findings.

Let us begin, then, with sex – and this part of my talk draws on arguments and examples from philosopher of biology Laura Franklin-Hall.

Males produce small gametes (sperm), while females produce large gametes (eggs). What follows from this can seem to depend on who you ask.

Some academics, quite rightly, point to the fact that this basic difference in gamete size is associated with immense sexual diversity across the animal kingdom, be it in how sex is determined, morphology and especially behaviour.

Other academics, also quite rightly, point to the fact that there are nonetheless clear sex-correlated trends across species – especially in morphology, but also in behaviour.

As Franklin-Hall puts it:

*“that anything is possible does not mean that all possibilities are equally probable. … for a variety of anatomical and behavioral traits, some are much more common among males than among females; for others, the reverse.”*

How do we explain both the diversity and the sex-correlated trends?

Roughly speaking, the familiar explanation of sex differences is that the sex that invests more in offspring is less available for mating. This makes it relatively easy for members of that sex to find a mate. For this sex, it is advantageous reproductively to be choosy, and hold out for the best possible mate. But for the lower-investing sex, for whom access to mates is a constraint on their reproductive success, there is more to be gained from investing resources in traits that help them to be chosen, and beat off the competition.

 However, the parental investment account doesn’t tell us *which* sex should have evolved to invest more in offspring. The existence of species in which males invest equally or more means that it can’t *just* be gamete size.

As Franklin-Hall explains, an emerging account explains cross-animal sex differences in terms of what has been dubbed the “sexual cascade”. The basic idea is that each species lineage can be understood in terms of a sequence of evolutionary innovations. These sequences are shaped by the primordial sex difference in gamete size that makes certain kinds of innovation much more common than others. With male gametes already more mobile than female ones, it is a simpler innovation for male gametes to reach female gametes held inside the reproductive tract than vice versa – thus, female internal fertilization is much more common than male internal fertilization. Once a species has evolved female internal fertilization, a similar story can be run for the evolution of viviparity and gestation. Sea horses and pipefish are rare because, once female internal fertilization has evolved, the evolution of male gestation is surely off the table.

These anatomical evolutionary innovations also shape the sequence of behavioural innovations. In particular, gestation makes female-biased or female-only parental investment much more likely. It is therefore not surprising that there is no paternal care in about ninety-five percent of mammals.

At the same time, sexual diversity reflects the fact that some species take less common evolutionary pathways – such as the approximately three to five percent of mammalian species that *have* evolved paternal care.

So, what about humans?

A brief version of a complicated answer is that we became “evolutionary orphans”. We evolved cooperative breeding: a flexible arrangement of “mothers and others”, as evolutionary scientist Sarah Hrdy put it, including paternal care, along with bigger, smarter brains that develop over the course of an extended childhood.

We also evolved – perhaps before, subsequently, or simultaneously – to be cooperators more broadly. It is widely agreed that human cooperation is extraordinary in its scope, its demographic complexity and its scale, as well as its importance for successful reproduction and survival.

As evolutionary scientist Peter Richerson and colleagues recently put it:

“Biological research convincingly shows that there are a myriad of pathways for organisms to adapt to their environment by optimizing their viability, survivorship, fertility, and mating success. The consensus over the past few decades is that the path taken by our ancestors was the path of increased reliance on cooperation, social learning, and cumulative culture”.

This route involved the evolution of distinctive human socio-cognitive capacities to acquire, create and transmit cultural traits, and extract fitness enhancing information from others through, for example, the use of cues of prestige, sex, and trait frequency.

Consider, for example, a suite of distinctively human capacities and culturally inherited social practices that have been dubbed “mindshaping”, discussed by philosopher Tad Zawidzki.

We are over-imitators and astute teachers and learners. We are also conformists. We rapidly acquire, internalize and enforce norms, including sets of rules and expectations attached to social roles. Motherhood, fatherhood and marriage are social institutions, with rules, standards and expectations that vary greatly across time and place.

We also engage in “self-constituting narratives”, and these self-understandings play an important regulatory role in our behaviour, via personal standards, goals and self-evaluation.These self-narratives pertain not just to our unique personal identities, but our social identities as members of social categories, and our minds can be shaped to match not just real models in our presence, but absent, fictional, mythical or abstractly ideal models. The good mother, the ideal worker, the real man.

According to Zawidzki, mindshaping is a key evolutionary innovation that, by moulding the way we behave to match a target, furnishes humans’ abilities to cooperate, coordinate and specialize.

These mindshaping phenomena are very familiar to sociologists, psychologists and others, not least those who study the social construction of gender roles, and construction and reproduction of social hierarchies.

Consider, for example, Evolutionary Psychology’s main rival in explaining sex differences in behaviour, Social Role Theory. This proposes social regulation of behaviour through gender norms derived from a society’s sexual division of labour, and self-regulation via gender identity. Social Role Theory is routinely dismissed as proposing that sex differences are inscribed on a blank slate. But in fact, it proposes processes that are properly understood as examples of evolved mindshaping practices that make possible the cooperative, coordinated division of labour that is at the heart of Social Role Theory.

Cultural evolutionists offer an alternative to the claim of narrow Evolutionary Psychology that evolution equipped us with many special purpose psychological mechanisms that enabled our ancestors to solve the many different challenges they faced.

In contrast, cultural evolutionists argue that high frequency climate change would have made our ancestral world too irregular for highly specific cognitive adaptations to be successful. Instead, they argue, there was selection for a more modest number of general rules.

Such an account also makes better sense of our elaborate and biologically expensive minds. As philosophers Karola Stotz and Paul Griffiths rhetorically ask:

“why did evolution invent complex and costly features like a mind and an extended period of post-natal development, while making no more use of them than to detect a few cues and respond with predetermined solutions to previously solved problems? (p. 154)

But can social learning and cumulative culture be the right way to explain sex-differentiated behaviour?

At the level of phylogeny, no one doubts that human minds have evolved to solve the problem of reproduction.

At the level of ontogeny, no one doubts that behaviour is the product of both genes and environment.

However, we can usefully carve out different positions within this platitudinous consensus. I’ll briefly present three here, that are neither exhaustive nor mutually exclusive.

As philosopher of biology John Dupré, Daphna Joel and I have pointed out:

“it is often assumed implicitly or otherwise that the cross-generational transmission of [sex-linked adaptive] traits is largely mediated by genetics, with the environment being a source of variability in the development, or ontogeny, of the behavioral phenotype, and a source of selective pressure on genes.”(p. 667).

In such accounts, stability comes from biological sex, which furnishes a relatively stable developmental pathway to an evolved behavioural phenotype. Environmental factors play a secondary role, generating within-sex and cross-population variation that attenuates or amplifies the expression of an evolved phenotype, either adaptively or arbitrarily.

Such a view underlies, for instance, David Schmitt’s account of obligate and facultative evolved sex differences, and claims such as that “culture-level gender roles may serve to amplify or attenuate fundamental sex differences in evolved biology” (Schmitt & Pirlott, p. 199), or that: “Culture has a significant influence on the expression of behavioral sex differences, but culture is not the source of these differences, nor will it erase them completely.” (Hooven, abstract).

A softer version of such accounts is the “developmental cascade,” or “nature-via-nurture”, preferred by some brain organization theory researchers. Here, early hormones give rise to evolved, sex-differentiated behavioural predispositions – proposals include activity levels, propulsion, colour preferences, interest in people versus things – that lead to young boys and girls actively seeking out gender-differentiated environments. These tendencies, and their developmental effects, can be attenuated or amplified by local cultural norms and available environments.

But these are not the only possibilities. As Dupre, Joel and I have pointed out, other evolutionary perspectives, including cultural evolutionary perspectives, argue for the importance of “extended inheritance” beyond genes. Organisms inherit a developmental system comprising both genetic and non-genetic resources for development, including reliably inherited environmental features such as local ecology, other individuals and their behaviour and, particularly in the human case, social constructions.

On this account, and as research with non-human animals shows, adaptive behavioural traits are stabilized by the interplay between internal and external inherited factors. Examples of where the balance lies more towards the latter include cases in which genetic inheritance furnishes the neural capacity to *learn* the trait. For any particular trait, it is an empirical question where the balance lies.

But as a general point, cases in which “the environment is (ontogenetically) crucial in the development of behavior and … relevant aspects of the environment can be reliably generated by the behavior of organisms points to a phylogenetic pathway that is distinct from the familiar genetic one.” (p. 668)

Or to put it another way, a gendered behavioural phenotype can be both a phylogenetic product of evolution and an ontogenetic product of gender socialization. This is importantly different to the idea that gender socialization ramps up or down our evolved biology, or serves as a richer or poorer background within which evolved, biologically bestowed predispositions flourish or falter.

Consider, in light of these points, Anne Fausto-Sterling’s application of ‘dynamic systems theory’ to what she calls gender/sex development. This is an ambitious developmental account, incorporating caregiver interactions subtly imbued with social expectations, the ability to socially categorize others as male or female, the acquisition of gender norms, the emergence of the toddler’s subjective sense of self as a boy or girl, and the internalization of gender norms.

As this second diagram illustrates, earlier states of the infant – which may well include subtle sex differences such as in temperament – are understood as an interim state from which different developmental trajectories are possible.

This third kind of account better reflects the evolutionary perspective on human behaviour that I have put forward here. The infant inherits the potential to develop sociocognitive capacities to be mindshaped – social categorization skills, same-sex copying, the development of group identity, sensitivity to social norms, and so on – as well as caregivers and a social environment richly scaffolded with mindshaping social practices.

In short, it is not just possible, but plausible, that we are evolved gender constructionists.

Let me now briefly turn to three common objections to social constructionist accounts of sex differences in behaviour.

A first objection is that sexual selection makes it a theoretical impossibility that human brains have been wiped clean of all psychological sex differences. This objection has already been addressed. It is surely the case that we have evolved to acquire behaviour to promote reproductive success. However, we are not *born* with the psychological sex differences of interest, but develop them and, for any particular trait, *how* it develops, and how it is transferred across generations, are empirical questions.

A second objection is that we have evidence that prenatal hormones set boys and girls on different developmental pathways, from which they can’t be diverted by socialization that respects the child’s autonomy.

The strongest form of evidence for this claim comes from genetically female girls with congenital adrenal hyperplasia, who experience atypically high levels of androgens in utero. Despite being raised as girls, they show more masculine toy preferences than unaffected girls (to stick to the most robustly established finding).

But such studies have long been criticized for “black-boxing” the development that takes place between hormone exposure *in utero* and the studies and surveys conducted years or decades later. As Rebecca Jordan-Young has pointed out, beyond any effects of hormones on the brain, the condition has a range of consequences: a less feminine and more masculine appearance, metabolic effects, direct and indirect effects of atypical genitals, potentially including multiple genital surgeries, invasive physical procedures, scrutiny of gender and sexuality, potential fertility issues, and the priming of expectations of masculinity in clinicians, parents and the girls and women themselves. Gender identity is often less secure. As recent research by Melissa Hines and colleagues has shown, unlike unaffected children, girls with CAH do not “self-socialize” in accordance with gender norms. In other words, there are good reasons to think that gendered mindshaping processes – from the social expectations of caregivers to the gendered self-concepts and self-constituting narratives of girls themselves – may be markedly unusual in his population, offering an alternative explanation of their more masculine preferences.

A third objection to the social constructionist view comes from studies that find that some sex differences in behaviour are larger in rich, post-industrial countries that score higher on global gender equality indices – the so-called gender equality paradox.

These findings have been taken to suggest that such countries provide environmental conditions in which men and women can freely develop and express evolved psychological sex differences.

Such interpretations assume that relevant features of the developmental context are always less intensely gendered in such countries. But it is far from obvious that this is the case.

Cross and colleagues have argued that rich, capitalist economies provide a greater variety and intensity of sources of cultural information.

Economist Thomas Breda and colleagues point to data suggesting that as norms of male supremacy erode in post-industrial societies, they are replaced by gender essentialist ones.

Sociologists Maria Charles and David Grusky observe that post-industrial economies have experienced contradictory gender-integrating and segregating forces: women were simultaneously pulled into education and the labour market, while pushed into pink collar work in the growing care sector.

Moreover, post-industrial societies are marked by post-materialist values of self-expression. The idea that this self-expression takes place in a mostly post-gender society, in which we develop largely unconditioned by gender constructions, is belied by the current cultural penetration of the idea that a person’s subjective gender identity – psychological identification with one or other sex, neither or both – is a core and fundamental part of the self.

Whatever it is that is going on to produce these cross-national patterns, I doubt it is that twenty-first century Swedes are expressing an accentuated version of their evolved hunter-gatherer selves.

I would like to end by thanking the Santa Fe Boys Educational Foundation for so generously hosting this event, and Marco and Paul for their remarkable feat of coordination.

The detrimental outcomes for which boys as a group are faring worse than girls, the focus of the foundation, are a gendered injustice.

What form could boys’ trajectories take in environments that don’t yet exist? The answer is: we don’t know. But as Zawidzki has observed: “when it comes to social behavior, our species is best distinguished from others by the complexity, subtlety, variety, and broad scope of human mindshaping, and the inordinate amount of time and resources we devote to it.”

We should take that seriously.