TRANSADVOCATE

Why “biological sex” is not real

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Abstract

The post argues that biological sex is often misunderstood as a strict binary, while actual human biology presents a spectrum of attributes. It critiques simplistic views, particularly those reinforced by political figures, and emphasizes that trans and intersex identities possess valid biological attributes, challenging the conflation of thoughts about sex with material realities of bodies.

Article

I know, I know. When you hear me say that biological sex isn’t real, you hear that I’m saying that the sexed attributes of a body aren’t real, that having sex isn’t real, and that reproduction isn’t real.
But here’s the problem: you’ve conflated a map for the terrain.To be clear: bodies and reproduction are material realities; your thoughts about that material reality are just that: thoughts.

The pop media term “biological sex” can mean only two things: the study of living organisms or the life processes of living organisms. To say “biological sex” is to reference the process category of an organism, which is to say, it’s ontology. Ontology is a branch of science that concerns itself with the nature of being. It strives to establish a set of concepts and categories within a subject that describe their properties and the relations between them. Essentially, ontology maps the terrain of a subject.In science, it is essential to map the sexed attributes of an organism. Such should include all the significant waypoints that define an organism’s reproductive capacity. This is an entirely reasonable and scientific way of understanding human reproduction. In this way, “biological sex” does not exist in material reality in the precise way that cartography does not exist in material reality. Bodies and reproduction exist in material reality in the precise way that terrain and geological processes exist in material reality.

January 20, 2025, Trump signed Executive Order 14168, which asserts, “There are only two biological sexes,” defining “Female as the sex that produces the large reproductive cell (ovum), and male as the sex that produces the small reproductive cell (sperm).” Here, Trump has asserted that sperm production is what defines male. While this elementary school-level understanding of “biological sex” might make sense to the cult of MAGA, problematically, and as a matter of actual science, cis boys do not produce sperm for the first decade of their life.

To speak of “biological sex” in pop media is to speak of an imagined body binary wherein bodies come with only one of two discrete sets of sexed attributes. Trump communicates at a 3rd-grade level, and when he uses this term, he is appealing to elementary school ontology, and not anything as complex as the actual science of sex. When pop influencers take to (unintentionally ironic) “intellectual dark web” platforms to laugh at how dumb the left is because we don’t know that sex is only as complex as elementary school biology portrays, they’re demonstrating the Dunning-Kruger effect.People who do not or cannot grasp that the world around them and their thoughts about the world around them are not the same things are people who, I would argue, fall into one of three categories: 1.) those who are not very bright; 2.) those who are profoundly confused about reality; or, 3.) those who are firmly on the road to sociopathy.

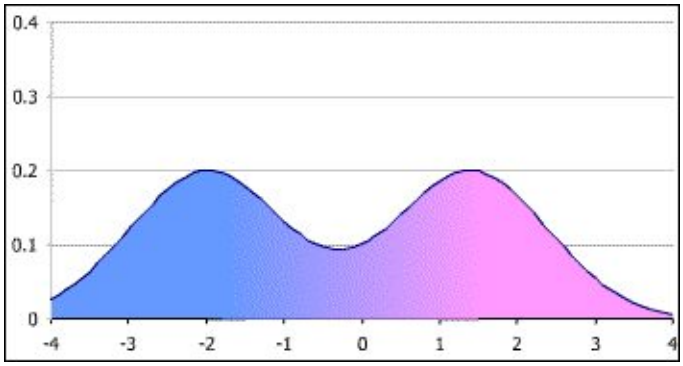


Figure 1. Bimodal distribution

In very, very broad strokes there are around 50(ish) body attributes that present in material reality as a bimodal distribution spectrum. These spectrums include:

1. Genetic Attributes:

Sexed genes patterns: presence/absence/function of SOX9, DAX1, WNT4, FOXL2, SRY, SF1/NR5A1, WT1, DAX1/NR0B1, RSPO1, WNT4, DMRT1, GATA4, AMH/MIS, AMHR2, FGF9, DHH, CYP11A1, CYP17A1, HSD17B3, STAR, LHCGR, FSHR, AR, ESR1/ESR2, PGR, CYP19A1, HSD17B1, SRD5A2, LH?/FSH?, GNRH1, KISS1/KISS1R, HOXA10, HOXA11, HOXA13, LHX9, EMX2, PBX1, the Müllerian-inhibiting genes, FGF8, FGF10, BMP4, BMP7, SHH, ESR1, ESR2, CYP19A1, GNRH1, KISS1, TAC3, TACR3, IGF1, and NR3C1 genes.

2. Gonadal Attributes:
Ovarian tissue patterns: follicles, ova, etc.
Testicular tissue patterns: seminiferous tubules, Leydig and Sertoli cells, etc.
Ovotestes patterns: mixed gonadal tissue in some intersex variations.

3. Hormonal Attributes:
Androgen level patterns: testosterone, dihydrotestosterone, etc.
Estrogen level patterns: estradiol, estrone, etc.
Progesterone level patterns.
Anti-Müllerian hormone level patterns.
Gonadotropins (LH, FSH) level patterns.

4. External Genitalia:
Phallus: penis or clitoris (size, morphology).
Labia majora/scrotum.
Labia minora.
Urethral position (perineal -> penile).
Vaginal opening.

5. Post-Puberty Secondary Sex Characteristics:
Breast development: glandular tissue.
Facial hair/body hair distribution.
Voice pitch via laryngeal growth.
Wider/narrower pelvic morphology.
Fat distribution: hips vs. abdomen.
Muscle mass/strength distribution.
Adams apple prominence.
Skin texture and oiliness.

6. Internal Reproductive Anatomy:
Müllerian derivatives: uterus, fallopian tubes, cervix, upper vagina.
Wolffian derivatives: epididymis, vas deferens, seminal vesicles.
Glands: prostate-specific antigen secreting gland, bulbourethral/bartholin gland.

7. Developmental/Physiological Attributes
Menstrual cycling/ovulation.
Spermatogenesis.
Capacity for gestation.
Ejaculatory function.
fecundity markers.

8. Biological Brain and Behavioral Correlates:
Sex hormone receptor distribution in brain regions (hypothalamus, amygdala, etc.).

Prenatal androgen exposure markers like digit ratio 2D:4D.
Statistical sex differences in hypothalamic nuclei size.

Taken together, these attributes present in each human body as a bimodal distribution. It is simply scientifically false to assert that “sex” presents as a strict body binary.

And yes, I know the above list left out chromosomes. Because there are just XX and XY, right? In material reality, there’s a lot more variation than just that:

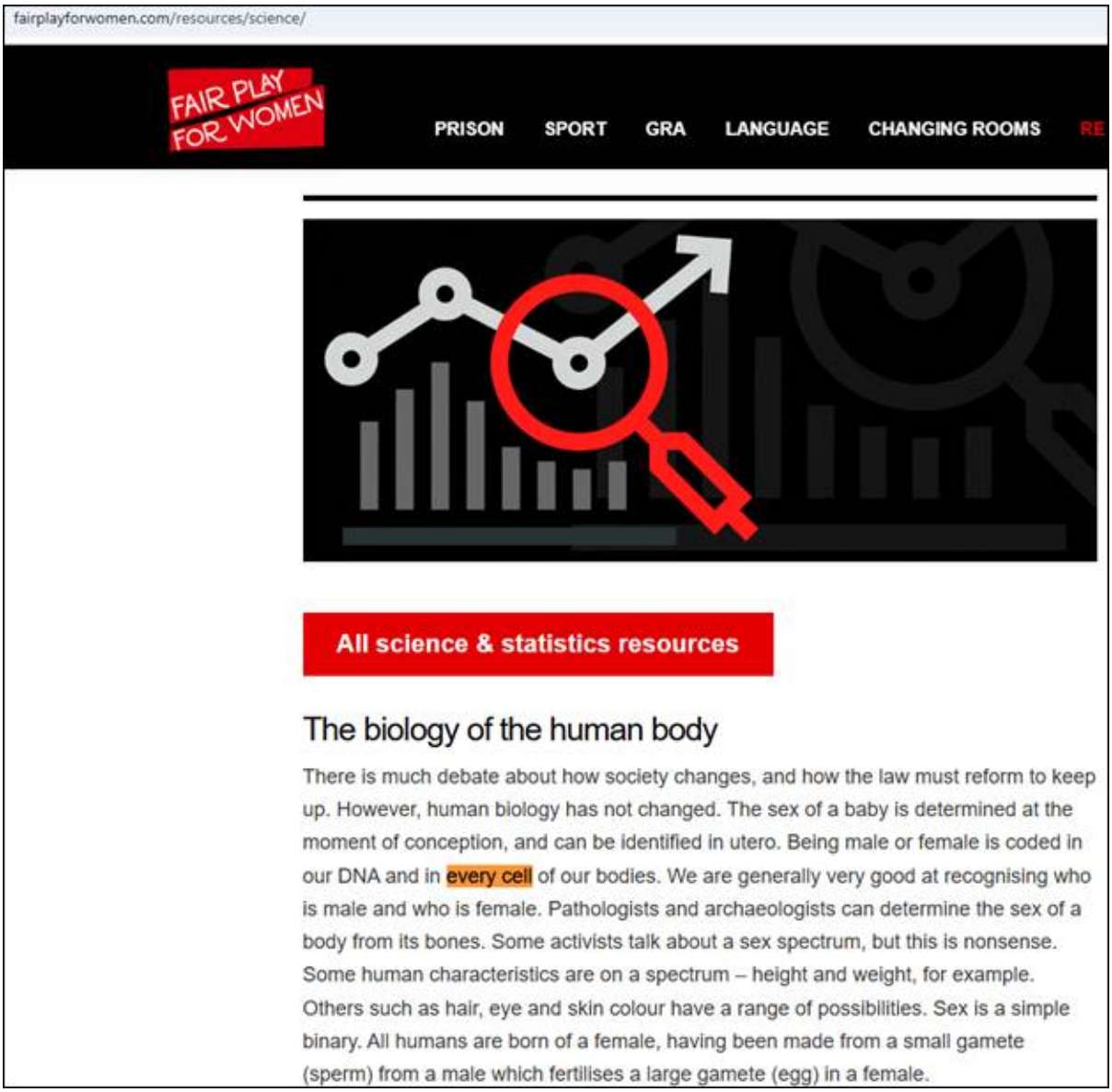
Chromosome	Key Genes	Function in Sex Development	Variation	Phenotypic Effects
Y (Yp11.3, Yq11)	SRY, AZF (DAZ, RBMY, USP9Y)	SRY: Testis determination; AZF: spermatogenesis	45,X/46,XY mosaic, Y microdeletions, Swyer syndrome	Ambiguous genitalia, gonadal dysgenesis, male infertility
X (Xp, Xq)	AR, DAX1 (NR0B1), FOXL2, SOX3, AMELX	AR: Androgen signaling; DAX1: Ovarian development; FOXL2: Ovarian maintenance	Turner (45,X), Triple X (47,XXX), Klinefelter (47,XXY), Fragile X, Ring X	Hypogonadism, ovarian failure, gonadal dysgenesis, infertility
1p36	NR0B2, LHX9	Gonad formation	1p36 deletion syndrome	Ambiguous genitalia
2p23, 2q31	LHCGR, HOXD cluster	LH receptor; external genitalia formation	LHCGR variations	Pseudo-hermaphroditism, Leydig cell hypoplasia
3q23	FOXL2	Ovarian granulosa cell function	BPES syndrome (Blepharophimosis, ovarian failure)	Premature ovarian failure, sex reversal
6q25	ESR1	Estrogen receptor ?	ESR1 variations	Affects puberty, breast development
7q11.23	ELN, LIMK1 (Williams region)	Developmental/behavioral	Williams duplication / deletion	Variable effects, some genital anomalies
7p15.3	HOXA cluster (HOXA10, HOXA11, HOXA13)	Patterning of uterus, cervix, external genitalia	HOXA13 variations (Hand-Foot-Genital syndrome)	Urogenital tract malformations
9q33.3	DMRT1	Testis development, Sertoli cell fate	9p deletion (sex reversal)	XY sex reversal, gonadal dysgenesis
10q26	FGFR2	Gonadal ridge, external genitalia	FGFR2 variations	Disorders of sexual development (rare)
11p13, 11p15	WT1, IGF2	Gonadal ridge, kidney development	Denys-Drash, Frasier syndrome	Gonadal dysgenesis, nephropathy
11q22-23	ARSD	Steroid metabolism	Rare variants	Affects androgen metabolism
11q13	CCND1, NR5A1 (SF1)	Steroidogenic factor, adrenal/gonadal development	SF1 variations	46,XY DSD, adrenal failure
12p13.31	HOXC cluster	Genital patterning	HOXC variations	External genital variations
15q11-q13	UBE3A, SNRPN	Genomic imprinting, hypothalamus	Prader-Willi, Angelman	Hypogonadism, delayed puberty
17q12	HNF1B	Urogenital development	17q12 deletion syndrome	Renal/urogenital variations
17q21.1	SOX9	Sertoli cell differentiation, testis cord	SOX9 duplication/deletion	Campomelic dysplasia, XY sex reversal
17q24.2	SRD5A2	Conversion of testosterone -> DHT	5?-reductase deficiency	Undervirilized variations external genitalia
19p13.2	AMH	Regression of Müllerian ducts	AMH variation	Persistent Müllerian duct syndrome
19p13.3	AMHR2	AMH receptor	AMHR2 variation	Persistent Müllerian duct syndrome
19q13.33	CYP11A1	Initiates steroidogenesis	CYP11A1 variation	Congenital adrenal insufficiency

Chromosome	Key Genes	Function in Sex Development	Variation	Phenotypic Effects
19q13.32	CYP19A1 (Aromatase)	Conversion of androgens -> estrogens	Aromatase deficiency/excess	Virilization, ambiguous genitalia
19q13.12	HSD17B3	Testosterone synthesis	HSD17B3 deficiency	Under/un-masculinization, XY DSD
20q13.2	BMP2, BMP7	External genitalia morphogenesis	BMP variations	Hypospadias, ambiguous genitalia
22q11.2	TBX1	Reproductive tract patterning	DiGeorge syndrome	Cryptorchidism, urogenital anomalies

An elementary school education often simplifies the science of sex down to the notion that the presence or absence of a Y chromosome in a human body will determine sex because only men have bodies with Y chromosomes. In material reality, that’s not factual. Almost all female bodies on the planet have Y chromosomes because most were born with them. Applying an elementary school understanding of sex, this means that most women on the planet are men because only men have Y chromosomes.

The perfectly natural condition is called microchimerism. It means that the bodies of women mostly have XX chromosomes, but fewer XY chromosomes, and the bodies of men mostly have XY chromosomes, with fewer XX chromosomes. Most people alive today have this condition. If you are a cis man, you probably have a body with some XX chromosomes; that doesn’t make you a woman. If you are a cis woman, you probably have a body with some XY chromosomes; that doesn’t make you a man.

A popular claim for those whose sex education never made it out of elementary school will be that somehow “every cell” in your body is sexed and that scientists can determine the sex of a trans or intersex person from their bones. For instance, this right-wing hate group makes this very claim to justify their anti-trans and anti-intersex bias:



Here, the hate group is appealing to the chromosomal DNA in cells. Human erythrocyte, thrombocyte, keratinocyte, lens fiber cells, and, unintentionally ironic to the hate group’s point, spermatozoa (which have no cellular chromosomal DNA) are not, by their own definition of sex, sexed cells. None of these human cells contain their own chromosomal DNA.

This says nothing about the scientific fact that medical transition changes DNA form, which is to say, one’s genotype form. Let me repeat that: it is a scientific fact that medical transition changes DNA form and DNA expression. Trans and intersex people who undertake medical transition do not have the stereotypical DNA of the sex assigned to them at birth. DNA methylation is the chemical addition of methyl groups to DNA, serving as an epigenetic “switch” that regulates gene expression, and it is this sexed attribute that is transitioned during medical transition. Specifically, there are at least 5,657 differentially methylated CpG sites (DMPs) that become female-typical for trans women during medical transition. A CpG site is a place in DNA where a cytosine (C) nucleotide is directly followed by a

guanine (G) nucleotide. DNA is comprised of adenine (A), guanine (G), cytosine (C), or thymine (T) nucleotides.

> My 15 year old daughter also came out as trans several weeks ago. I know my daughter has low self-esteem and does not truly know if she is trans or not. She gets terribly upset with me when I tell her she will never be a boy, no matter how she changes her outward appearance. She will always be a girl, no matter what. You can’t change your DNA and that's what these kids don’t understand. Reading stories of people who have de transitioned

In other words, when people with an elementary school sex education confidently assert that transition doesn’t “change your DNA,” they’re demonstrating their scientific ignorance. As an aside, I wonder what a Venn diagram might look like for the people who claim that transition doesn’t change one’s DNA and those who were very concerned that their COVID-19 vaccination would change their human DNA into non-human DNA.

Regarding bones, even for the cisgender population, sex determination is not accurate. For example, for cisgender men, there’s about a 30% chance that their long bones will not be sexed as male. The notion that transgender and intersex medical transition has no impact on bone development is not consistent with reality. Particularly, for trans youth who undergo puberty blockers followed by medical transition, their bones tend to resemble those of their affirmed gender. Specifically, van der Loos et al., 2021 found that trans adolescents treated with puberty blockers followed by gender-affirming HRT (GAHT) had bone density and geometry consistent with their affirmed gender; Schagen et al., 2020 and Klink et al., 2015 found that GAHT patterns the bones of trans kids to that of their cis peers of the same affirmed gender.

Lastly, I feel it important to state that there is an implicit genocidal aspect to pop culture’s “biological sex” dialectic. To assert that trans and intersex people are not biological in the way that cisgender people are can lead to some very dark places wherein we as a society begin to regard trans and intersex people as something synthetic or inhuman. Sex is genotype and phenotype; the transitioned phenotype and genotype of trans and intersex people are as biological as any cis person’s genotype and phenotype. The transitioned sexed attributes of a trans or intersex person’s body are biological. It doesn’t matter if a child went through a medical puberty or a natal puberty; their resulting sexed attributes are just as biological as any cis person’s sexed attributes are. If you find yourself questioning whether trans and intersex people are just as biological as cis people, you need to do some serious self-reflection because you’re on the road to functional sociopathy.

In sum: Bodies and reproduction exist in material reality; your thoughts about that reality do not.

- Elementary school biology is not science.
- Pop culture biology is not science.
- Thoughts about bodies and reproduction are not the same thing as bodies and reproduction.
- Thoughts about a body’s sexed attributes are gender.

- All people, including trans and intersex people, are biological.

Suggested citation

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