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Introduction

> **Trans·gen·der** – *adjective*
> Denoting or relating to a person whose sense of personal identity and gender does not correspond with their sex assigned at birth.

For as long as human civilization has existed, there have been people whose experience of their internal gender does not align with the physical features of their body. The Gala, a middle gender priest class of the Sumerian empire, existed over 4,500 years ago. The Indigenous cultures of North America recognized a third gender far before European colonialism, and still do to this day. Roman emperor Elagabalus (218 AD) insisted on being referred to as Lady rather than Lord, and even put forward a ransom for anyone who could conduct genital reconstruction surgery.

In spite of this, however, the modern understanding of the transgender experience has only existed for approximately 130 years. Even the word "transgender" only dates back to 1965, when John Oliven proposed it as a more accurate alternative to David Cauldwell's term "transsexual" (coined in 1949), which itself replaced Magnus Hirschfield's term "transvestite" (1910).

To be transgender is to have a gender identity which does not match the gender you were presumed to have based on the genitalia you were born with. This can mean a person born with a penis is actually a girl, that a person born with a vulva is actually a boy, or that a person with either genital configuration may not wholly fit either side of that spectrum and is non-binary.

A trans person can come to recognize this at *any point* in their life. Some children identify it at as soon as they are able to grasp the concept of the differences between the sexes, others don't start to feel anything until the onset of puberty, and still others do not realize that anything is wrong at all until they are fully adults. Many people are simply never exposed to the idea that their gender could mismatch their birth sex, or what that feels like, and thus simply accepted their fate.

Even more common is a perception that even tho they have feelings about being unhappy with the gender they were assigned at birth, they believe that this is not the same as what transgender people experience. Some may feel that a wish to be transgender and have transition available is some kind of disrespect towards "real" trans people who knew they were actually boys or girls "born in the wrong body." These narratives of the transgender experience that have been spread by popular media create a very false impression of just what it means to be transgender and what growing up transgender feels like.

This experience of discontinuity between the internal and external self is what we describe as Gender Dysphoria. Every trans person, regardless of their position within or outside of the gender binary, experiences some form of Gender Dysphoria. This is something of a political topic within trans communities, as different groups have their own ideas of what Gender Dysphoria is, how it manifests itself, and what qualifies a person as being trans. By and large, however, this debate is feckless and fruitless, as the definition at the top of this page encompasses the beginning and the ending of how these terms intermingle.

The purpose of this site is to document the many ways that Gender Dysphoria can manifest, as well as other aspects of gender transition, in order to provide a guide for those who are questioning, those who are starting their transgender journey, those already on their path, and those who simply wish to be better allies.

Title artwork based on works by Jumpei JP Ueoka

What is Gender?

If you trace the etymology of the word to its Latin roots, gender simply means “type”. The Norman French term **gendre** was in use in the 12th century to describe “the quality of being male or female.”

Many people attribute the term to psychologist John Money, who proposed using “gender” in 1955 to differentiate mental sex from physical sex. However, Money was not the first to do so. Cultural Anthropologist Margaret Mead used the term in 1949 in her book “Male and Female” to distinguish gendered behaviors and roles from biological sex. The American Journal of Psychology (vol. 63, no. 2, 1950, pp. 312) described the book thusly:

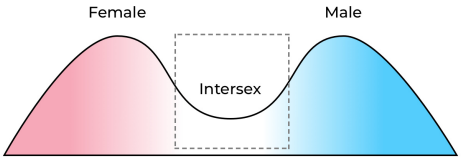
> A book, moreover, which gives beyond its premise; for it informs the reader upon **‘gender’ as well as upon ‘sex,’** upon masculine and feminine roles as well as upon male and female and their reproductive functions.
>
> Margaret Mead moves from the specific delineation to the more general comparison of male and female in several communities, finally coming to an analysis of sex-patterns in our own midst and for our own time.

Human Sex (the adjective, not the verb) is broken down into three categories:

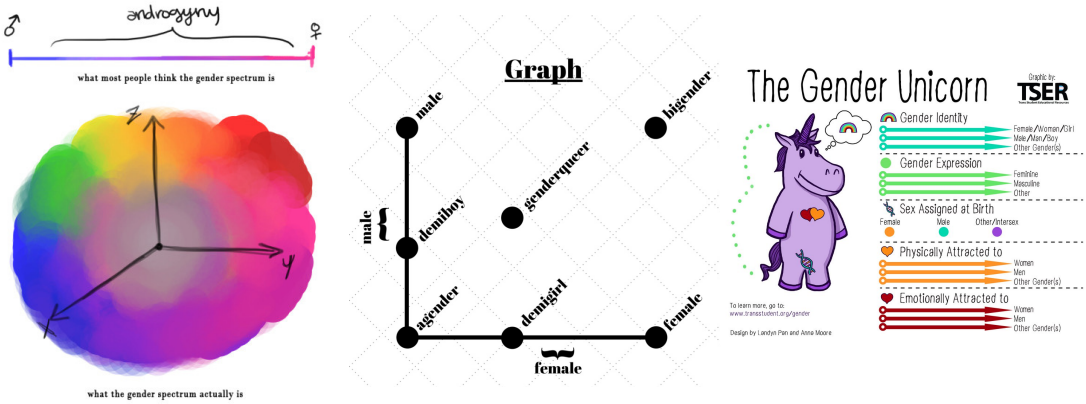
- **Genotype**: The genetically defined chromosomal kareotype of an organism (XX, XY, and all variants there of)
- **Phenotype**: The observable primary and secondary sexual characteristics (genitals, fat and muscle distribution, bone structure, etc)
- **Gender**: The internal mental model of a person’s own sex.

Any of these three aspects can fall into a position on a range of values. Your elementary school health class probably taught you that Genotype is binary, either Female (XX) or Male (XY), when the reality is that there are a dozen other permutations that can occur within human beings.

Likewise, many people believe that Phenotype is also binary, but biology has recognized for hundreds of years that when you plot out all sexual characteristics across a population, you actually end up with a bimodal distribution where the majority of the population falls within a percentile of two groups. This means that some people will, simply by nature of how life works, fall outside of the typical two piles. Many people fall in the middle, with characteristics of both sexes.



Gender, however, is a lot more… esoteric. There are a lot of different ways that people have attempted to illustrate the gender spectrum, but none have quite thoroughly captured it, because the spectrum is itself a very abstract concept.



The short of it is, some people are very male, some people are very female, some people feel no gender at all, some people feel both, some are smack in the middle, some land along the edges. Some people oscillate all over the spectrum in unpredictable ways, changing like the wind. Only an individual can identify their own gender, no one else can dictate it for them.

Gender is part social construct, part learned behaviors, and part biological processes which form very early in a person's life.

Present evidence seems to suggest that a person's gender is established during gestation while the cerebral cortex of the brain is forming (more about that in the Causes of Gender Dysphoria section). This mental model then informs, at a subconscious level, what aspects of the gender spectrum a person will lean towards. It affects behavior, perceptions of the world, the way we experience attraction (separate from sexual orientation and hormonal influences) and how we bond with other people.

Gender also affects the expectations that the brain has for the environment it resides in (your body), and when that environment does not meet those expectations, the brain sends up warning alarms in the form of depression, depersonalization, derealization, and dissociation. These are the brain's subconscious ways of informing us that something is very wrong.

On the social side, gender involves presentation, how we communicate, what our expectations are from life, and the roles that we fulfill as we walk through life. These are all cultural factors, things which have developed within the population over time, but regardless of being essentially "made up", they are still connected to a gender identity. A person tends to connect to the social aspects of their internal gender, without even realizing they are doing it, and when they are denied access to those social aspects, this results in discomfort with their social position in life.

John Money's experiments attempted to confirm his belief that gender is entirely a social construct, and that any child can be raised to believe themselves to be whatever they were taught to be. His experiment was a massive failure (see the Biochemical Dysphoria section). Gender does not change, every human is the same gender at 40 that they were at 4. What changes is our own personal understanding of our gender as we mature as individuals.

These negative symptoms (depression, derealization, social discomfort) are the symptoms of Gender Dysphoria.

What **Gender is *not*** is sexual orientation. We describe orientation using terms relative to one's gender (homosexual/heterosexual/bisexual), but gender itself does not affect sexuality and sexuality has no role in gender.

In generalist terms this essay will be describing gender in a sense of binary identities (male/female) vs non-binary identities (agender, bigender, genderqueer, etc), but this is purely for the sake of writing simplicity. Please know that the depth of gender experience and expression is far, far more complicated than this simple breakdown.

What is the Cause of Gender Incongruence?

To put it bluntly: We don't know, not firmly. Science and modern psychology has proven that it is **not** caused by nurture; no one *becomes* transgender, gender identity is congenital, solidifying before we even exit the womb. It also appears to sometimes be hereditary; transgender parents have a higher likelihood of having transgender children, and many times they realize this in reverse. The child comes out to the parent, and that helps the parent realize they can come out as well.

Here is the science that is believed to influence gender identity. This does not mean that it *defines* gender identity, nor does it fully encapsulate one's gender, as so many aspects of gender are cultural and social. None of this is prescriptive of a person's identity, none of it is cast in stone.

If you've seen Jurassic Park then you may remember this scene:

This isn't science fiction, although it is very simplified.

The gonads in human fetuses initially develop in a bi-potential state, meaning they can become either ovaries or testes. The SRY gene on the Y chromosome releases a protein called Testis Determining Factor (TDF). This protein then starts a chain reaction with SOX9 production (another protein), which causes the gonadal cells to form into the Sertoli and Leydig cells that make up the testes. If TDF is never produced or is interfered with then the gonad cells form into the Theca cells and Follicles which comprise the ovaries.

Once formed, the testes then begin producing a testosterone surge which typically starts in the 8th week of gestation and continues until the 24th week. This surge, combined with another hormone from the placenta, is responsible for the development of the penis and scrotum. Genitalia formation starts around week 9 and becomes identifiable by the 11th week. If the surge does not occur, or the body does not respond to it (such as in the case of Androgen Insensitivity Syndrome) then the genitalia form into the vulva, vagina and uterus instead.

If there is an interference in this process then you can end up with the wrong bits, and this is the result of many intersex conditions. Often times this is a partial development, where the external genitalia only partially form, but functional gonads still exist. Sometimes the child comes out with fully functional male or female genitalia, but mismatched gonads. Sometimes the TDF protein fails to release and the fetus grows completely functional female reproductive organs, despite the presence of a Y chromosome.

This is known as Swyer Syndrome, and an unknown number of women may have this condition. In 2015 an XY woman with Swyer Syndrome who was born without ovaries successfully carried and gave birth to a child via IVF. Usually Swyer Syndrome results in completely non-functional ovaries, but in 2008 a woman was found with Swyer Syndrome who had gone through puberty, menstruated normally, and had two unassisted pregnancies. Her condition went undiscovered until her daughter was found to also have it.

The fact is, the vast majority of the population has never been tested for genetic karyotype, so we don't know how common these cases actually are. Where does this come into affect for gender identity? Well, the exact same process that causes the external genitals to differentiate also occurs for the brain.

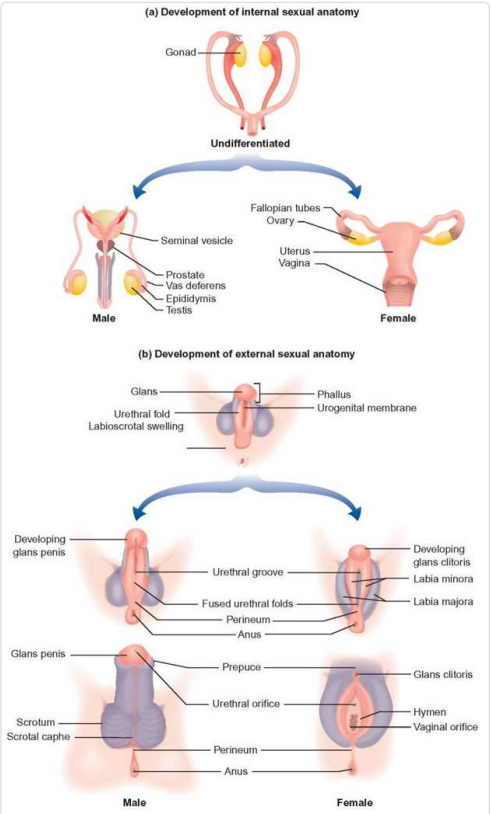
Brain Split

The prenatal brain doesn't really start to develop until between week 12 and 24. The cerebral cortex, the thin outer layer of the brain that contains most of what we think of as consciousness, grows substantially during those periods of time. Prior to that, the structure present is more like a scaffolding, the basic parts of the nervous system necessary for bodily function. The primary sulci (the wrinkles in the cerebral cortex that allow for more surface area) start to form at week 14, well after the genitals have developed.

It has been confirmed multiple times via MRI studies that there are small but significant differences between cis male and cis female brains, differences which align with the gender identities of trans people in the study. Note, **this does not mean that anyone with those differences will have that gender**, because gender identity isn't that simple, but it provides evidence that there is a clear difference in masculine and feminine brains. There is also evidence that brains can have mosaic combinations of these differences, which may be the case in non-binary people.

A change in the testosterone levels in the fetus after the 11th week can directly impact the masculinization of the cerebral cortex, as well as changes in other parts of the brain structure. This has been examined over and over again in studies of female assigned children with CAH (congenital adrenal hyperplasia) and CAIS (complete androgen insensitivity syndrome).

> We found a significant relationship between fetal testosterone and sexually differentiated play behavior in both girls and boys.
>
> — Fetal Testosterone Predicts Sexually Differentiated Childhood Behavior in Girls and in Boys



Source

An excess of testosterone in the mother's body during the second trimester can (and does) cause masculinization of the brain in an externally female fetus, and an interference in testosterone production or uptake can (and does) cause feminization of the brain in an externally male fetus. This interference does not have to be external in origin, either. Any number of genetic traits can cause the brain to respond differently to testosterone.

A fairly large study of transgender individuals released in 2018 found several key genes which were statistically more likely to be longer among trans women (longer, as in having more repeated fragments). Individually these genes may not have an impact strong enough to cause a malfunction of masculinization, but collectively they absolutely could reduce the ability for the fetal brain to masculinize. These genes are all passed from parent to child, giving credence to a tendency for trans parents to have trans children.

Gender is Biological

Sadly, western society has actively prevented a deeper understanding of gender. Ancient civilizations understood it well, but colonialism wiped them off the map. 100 years ago, scientists in Germany were actively studying transgender medicine and made extraordinary advancements, until the Nazis burned it all in 1933. Conservative and fascist pressures in the modern day have hindered advancements in transgender healthcare whenever possible.

Yet, progress continues, and every few years we learn a little bit more.

What we know for certain is that it is not a psychological condition, it is not something caused by trauma or by any external influence, nothing can make a person transgender. It happens in the womb, and is not something that a person can choose to be, any more than they could choose their race or their eye color. It has nothing to do with sexual orientation, it has nothing to do with kinks or fetishes, and it has nothing to do with social influences from their parents or from their peers. Transgender children are as firm in their identities as cisgender children are.

And it gets even weirder!

Lisa T Mullin
@LisaTMullin

Normally the Y chromosome carries 27 genes, only 4 are related to sex. One, the SRY, determines (via the SOX9 gene) whether testes or ovaries form in the early fetus. Another 3 determine sperm production if testes form.

The SRY is just a signaler to 3 dark DNA areas to produce more SOX9 genes, above a certain threshold testes form, below that ovaries.

But that is just the start of the story. If ovaries form then another gene, FOXL2, keeps them as ovaries.

FOXL2 works with estrogen receptors to keep the ovary as an ovary without which it would turn into testes and start producing testosterone by inhibiting SOX9 production.

Male and female mammals produce SOX9 as far as I know all their lives (I need to check up on that) and even if there are already ovaries if the level becomes high enough then the ovaries will turn into testes.

But FOXL2 production depends on enough estrogen and/or the estrogen receptors working correctly. If something goes wrong with either then SOX9 production increases and existing ovaries will turn into testes and produce testosterone.

So there is a feedback loop: No SRY means less SOX9, thus ovaries form. They produce estrogen which causes FOXL2 production which suppresses SOX9 production to keep the ovaries as ovaries. Is something goes wrong and SOX9 levels climb enough then those ovaries will become testes

11:00 AM - Feb 2nd, 2020

But the Chromosomes!!!

There are dozens of ways that chromosomes can be much more complex than XX and XY. Medically these are referred to as DSDs (Disorders of Sex Development). Not all result in an intersex condition, and many only manifest at the onset of puberty.

- De la Chapelle Syndrome (46,XX Male) occurs when the SRY gene from the sperm parent crosses over into a non-Y-bearing sperm during spermatogenesis. When the egg and sperm merge, it results in an XX embryo with an SRY gene, creating a phenotypical male child with two X chromosomes.
- Swyer Syndrome (46,XY Female) produces a phenotypically female child with an XY chromosome. This results from a dozen different genetic conditions, including:
  - Absence or defect of an SRY gene
  - Absence or defect of DHH synthesis
  - Absence of the SF-1 protein due to adrenal failure
  - Absence of or defect the CBX2 gene, preventing TDF cascade
- XX Gonadal Dysgenesis is very similar to Swyer Syndrome, except occurs in XX children and results in nonfunctional ovaries.
- Turner Syndrome (45,X) produces a phenotypically female child with numerous abnormalities. It occurs when neither an X or Y chromosome crosses over from the sperm.
- Klinefelter Syndrome (47,XXY) results in a phenotypically male child with more feminine traits. In extremely rare cases it appears in female assigned children as well, resulting in feminized testicles instead of ovaries.
- 49,XXXXY Klinefelter Syndrome is often fatal, but when it isn't, it will always results in a sterile child.
- Trisomy X (47,XXX), Tetrasomy X (48,XXXX), and Pentasomy X (49,XXXXX) all result in a female child, but with progressively more intense health issues.
- XXYY Syndrome results in male children (due to two SRY genes) which often experience hypogonadism, needing testosterone supplements, but otherwise seeming like a typical male
- Mosaicism results when some cells in the body have one set of chromosomes and other cells have another due to a mutation of the genome during gestation. This may be XX/XY (resulting in a dual set of genitalia), X/XY (a milder form of Swyer or Turner syndromes) or XX/XXY (a milder form of Klinefelter syndrome).
- Chimerism occurs when two fertilized embryos merge together into one zygote, causing half of the child to contain one set of DNA and the other half to contain another. This can result in an otherwise completely typical human being of either male or female phenotype, even capable of producing offspring, but which comes back on a kareotype test as not matching their phenotype based on where the sample was taken on their body. In extremely rare cases this can result in two full sets of reproductive organs.
- Congenital Adrenal Hyperplasia(CAH) is masculinization of the female genitals in an XX child due to overactive adrenal glands.
- Androgen Insensitivity Syndrome(AIS) is a total or partial resistance to all androgens, preventing masculinization of all organs, save for the testicles, in an XY child. AIS subjects typically develop a female gender identity, but some partial cases may be male.
- 5-alpha-reductase deficiency(5ARD) is a failure in the body's ability to metabolize testosterone into dihydrotestosterone (DHT), preventing masculinization of the genitalia until the onset of puberty, when the child suddenly grows a penis.
- Aromatase Deficiency causes masculinization of an otherwise female child due to excess levels of testosterone (and can bleed-over into the mother during gestation).
- Aromatase Excess causes feminization in an otherwise male child, as all testosterone is converted into estrogen.

Open Ocean Exploration
@RebeccaRHelm

Friendly neighborhood biologist here. I see a lot of people are talking about biological sexes and gender right now. Lots of folks make biological sex sex seem really simple. Well, since it's so simple, let's find the biological roots, shall we? Let's talk about sex...[a thread]

If you know a bit about biology you will probably say that biological sex is caused by chromosomes, XX and you're female, XY and you're male. This is "chromosomal sex" but is it "biological sex"? Well...

Turns out there is only ONE GENE on the Y chromosome that really matters to sex. It's called the SRY gene. During human embryonic development the SRY protein turns on male-associated genes. Having an SRY gene makes you "genetically male". But is this "biological sex"?

Sometimes that SRY gene pops off the Y chromosome and over to an X chromosome. Surprise! So now you've got an X with an SRY and a Y without an SRY. What does this mean?

A Y with no SRY means physically you're female, chromosomally you're male (XY) and genetically you're female (no SRY). An X with an SRY means you're physically male, chromsomally female (XX) and genetically male (SRY). But biological sex is simple! There must be another answer...

Sex-related genes ultimately turn on hormones in specifics areas on the body, and reception of those hormones by cells throughout the body. Is this the root of "biological sex"??

What does this all mean?

It means you may be genetically male or female, chromosomally male or female, hormonally male/female/non-binary, with cells that may or may not hear the male/female/non-binary call, and all this leading to a body that can be male/non-binary/female.

Biological sex is complicated. Before you discriminate against someone on the basis of "biological sex" & identity, ask yourself: have you seen YOUR chromosomes? Do you know the genes of the people you love? The hormones of the people you work with? The state of their cells?

Of course you could try appealing to the numbers. "Most people are either male or female" you say. Except that as a biologist professor I will tell you...

The reason I don't have my students look at their own chromosome in class is because people could learn that their chromosomal sex doesn't match their physical sex, and learning that in the middle of a 10-point assignment is JUST NOT THE TIME.

5:45 PM - Dec 19th, 2019

plant lesbian
@alicemiriel

@RebeccaRHelm As a fellow genetics lab teacher, this is the same reason my department stopped chromosome testing in lab. A really cool experiment would turn into guys getting freaked out they have XXY, etc.

4:23 PM - Dec 20th, 2019