

# Sex Education for the Masses

## Stuff “Conservatives” Prefer You Didn’t Know

This discussion aims to answer the question “How did we get here?” First in the sense of “Mommy, where did I come from?” Then in a different sense where we will explore why there are “sexual minorities” and why the likes of Ron DeSantis have staked their political careers on forcing those “sexual minorities” to conform to rigid gender roles.

A typical attempt at Sex Education might start with a religious message restricting what the recipient may do with the information they are about to receive. Other attempts might immediately plunge into diagrams of internal female anatomy or cross-sections of male anatomy so as to quickly get past the parts of the discussion which make sexually uptight folks especially squeamish.

We will begin our discussion differently: with Caviar.

What is Caviar?

Caviar is the cleaned and salted eggs of the Sturgeon Fish. Caviar is considered a delicacy and commands a high price.

The unprocessed eggs of Sturgeon are called “Roe” as are the eggs of many other fish such as Salmon.

What are eggs?

For the purposes of this discussion fish eggs are little packages containing two important things. One of those things is all the chemical energy and building materials needed to construct a tiny new fish. The other important thing is approximately half the genetic instructions needed to construct a tiny new fish.

Sturgeon are not the only critters which produce eggs fancied by humans as food. Chicken eggs are so popular as a human food that we do not even bother specifying what kind of eggs are being eaten when we’re eating chicken eggs. We refer simply to eggs with the assumption that the eggs are from Chickens. Chicken eggs share one of the key characteristics of the fish eggs. That characteristic is all the chemical energy and building materials needed to construct a tiny new chicken. The chicken egg will also have at a minimum about half the genetic instructions needed to create a tiny new chicken. Unlike the fish egg, a natural chicken egg is likely to have a complete set of the genetic instructions needed to construct a tiny new chicken.

A key difference between fish eggs and chicken eggs is the hard protective shell of the chicken egg. That protective shell allows the chicken egg to develop safely in what would otherwise be a very precarious situation on dry land.

Let's skip back to the fish for a moment. The National Geographic Society and the BBC have produced many beautiful nature documentaries. More than a few of those documentaries feature the dramatic leaps of wild Pacific Salmon making their way upstream to spawn. This marks an important point in the lifecycle of the Salmon. The female Salmon will be heavy with eggs. When the salmon arrive at their destination she will scoop out a depression and release her eggs into the depression. The male Salmon immediately follows and releases his milt over the eggs.

What is milt?

Milt is the term used to describe the sperm (male sex cells) of fish and many other water-dwelling creatures. Sperm have two important components. Recall that the fish egg has two important components: all the chemical energy and materials needed to construct a tiny new fish plus roughly half the genetic instructions needed to construct a tiny new fish. The fish sperm cell carries the balance of the genetic instructions needed to construct a tiny new fish. The other key component is flagella. Flagella are whip-like extensions of sperm cells. The flagella enable the sperm to move about rather than simply drift in the currents. The sperm moves around using its flagellum until it encounters a fish egg. The sperm then penetrates the egg's outer membrane and injects its payload of genetic material. This union of egg and sperm is called fertilization.

After fertilization the egg cell is known as a zygote and begins to divide into multiple cells. Each division doubles the number of cells. The resulting cells are smaller and smaller with each division. When there are enough cells then the cells begin to differentiate and organize. Differentiation refers to cells changing from generic cells into things like muscle cells and nerve cells. You may have heard debates about the use of "stem cells" in medical research and medical practice. This is the term for undifferentiated cells which have the capacity to become many different types of cells. After a degree of differentiation and organization is achieved the zygote is called an Embryo. Eventually the embryo becomes a tiny fish and breaks out of the egg membrane. Adult Salmon provide no help to their offspring. In fact, for Pacific Salmon spawning is quickly followed by death of the adult fish.

The union of fish egg and fish sperm to create a new fish is a very basic version of reproduction. The reproduction of chickens is a bit more complex but involves the same general process.

A key difference between the fish egg and the chicken egg is when the union of egg and sperm occurs. The hard shell of the chicken egg would prevent the sperm from fertilizing the egg after the shell is added to the egg. Consequently, the union of the egg and sperm must occur before the hard shell is added to the egg. This means the sperm must be introduced into the female chicken before the hard shell is added.

Humans have many names for animals that are specific to males or females of the species. A female chicken is called a Hen. A male chicken is called a Rooster. The Rooster has anatomy

very similar to the Hen in that most everything exiting the body passes through a single opening. That opening is called a vent or Cloaca.

Things exiting the Chicken via the Cloaca are digestive waste, Urine, Eggs and Sperm. Clinical lingo for the digestive waste is “feces.” Urine is the waste removed from the bloodstream by the Kidneys. Sperm originate in the Testes of the Rooster. Eggs originate in the Ovaries of the Hen.

The sperm from the Rooster is transferred to the female during a mating ritual in which the Rooster’s Cloaca is pressed very tightly against the Hen’s Cloaca. Once the sperm are transferred, they spread out with some making their way to the Hen’s egg producing parts. A successful union of egg and sperm there produces a fertilized egg. The familiar hard shell of chicken eggs is then added before the fertilized egg is expelled from the Hen’s body via the Cloaca.

Humans often interfere with the fertilization of Chicken eggs. Humans obtain a large number of unfertilized Chicken Eggs by keeping Roosters separate from Hens. The unfertilized Chicken Eggs are then used as a convenient food by Humans. This is why Chicken Eggs are often produced with only about half the genetic information needed to construct a tiny new chicken.

Hens provide significant care to their eggs and newly hatched chicks. This care includes “incubation” which is basically sitting on the egg to maintain a steady warm micro-environment for the developing egg. This contrasts with the salmon which abandon their eggs.

Nature has quite a few variations on the basic Egg-meets-Sperm reproductive process.

Sea Turtles are air breathing animals which spend almost all their lives in the ocean. However, their eggs are those of an air-breathing land dweller. This is because their ancestors were air-breathing land dwellers. This is not unique to sea turtles. Many sea creatures had land-dwelling ancestors. Sea Otters, Porpoise, Whales, Seals and Walruses are all examples.

Female Sea Turtles venture out of the ocean to bury their fertilized eggs in the sand above the high tide level. This prevents the developing eggs from being drowned at high tide. This egg laying venture on the beach is also the subject of numerous nature documentaries. The nature documentaries reveal that the female Sea Turtle essentially abandons her eggs. Adult Sea Turtles provide no care to their young.

Sharks are sea dwelling creatures with an extraordinarily long history. The fossil record suggests that Sharks have been swimming around the oceans for 450 million years. That means sharks were swimming around for about 190 million years before the first dinosaurs walked the Earth. Dinosaurs evolved and then went extinct while sharks continued. There are many kinds of modern-day sharks. Some Sharks produce elaborate egg cases. These may have spiral extensions or tendrils which serve to anchor the egg case so that it is not washed ashore. Other Sharks are viviparous. Viviparous means the Female gives birth to live young.

There are some variations on this model. Some Sharks simply retain conventional eggs until the eggs hatch. Other sharks have placenta-like structures which transfer nutrients from the female shark to her developing embryos. We'll learn more about the Placenta later. Another variation involves the production of extra eggs which are then eaten by the young sharks developing inside the mother shark. The end result for all viviparous sharks is the same - small live sharks from the female shark instead of eggs.

Sharks are similar to Chickens in that males and females have a single vent or cloaca through which most everything exiting the body passes. But male sharks have some additional anatomy to aid in the transfer of sperm from Cloaca to Cloaca. The additional anatomy is a modification of the pelvic fins, The specialized structures are called Claspers. The modifications are symmetrical so the male shark can use the right or left modified pelvic fin to transfer sperm to the female's Cloaca.

Mammals represent another set of variations on the basic egg-meets-sperm reproductive process.

Mammals are distinguished from other animals by the presence of mammary glands in adult females. Mammary glands produce milk which nourishes the offspring of the mammal.

Mammals are generally grouped into three categories.

Monotremes are considered the most primitive type of mammal. Monotremes are also uncommon. The example you've most likely heard of is the Platypus. Monotremes are egg producing mammals.

Marsupial Mammals are more common than Monotremes. Marsupial Mammals are also generally considered more advanced than Monotremes. Familiar examples of Marsupial Mammals include Opossums and Kangaroos. Marsupial Mammals are generally restricted to Australia and New Zealand except for Opossums which occur in the Americas.

Kangaroos and Koala Bears are both iconic Marsupials. They have similar reproductive means so we will focus on one of the two. The egg of the female Kangaroo is fertilized inside the female and retained until it becomes a very tiny new Kangaroo. The very tiny new Kangaroo exits the genital opening of the mother and travels to the mother's pouch where it latches onto a nipple and continues its development. The trip from the mother's genital opening to the mother's pouch can be treacherous. The mother remains very still during the process. She aids the transfer by licking her fur to make it lay flat and mark the path that the very tiny new Kangaroo must follow. Once the tiny new Kangaroo arrives at the mother's pouch it will begin feeding from one the nipples located there.

The third type of Mammal is the Placental Mammal. Placental mammals are by far the most common type of mammal. Placental Mammals are distinguished by the presence of a placenta during the development of the fertilized egg. The placenta transfers oxygen and nutrients from the female to the fertilized egg through all except the very earliest stages of

development. The placenta also carries away carbon dioxide and metabolic waste. In addition, the placenta isolates the immune system of the mother from the immune system of the developing offspring.

Placental mammals have been very successful from an evolutionary standpoint. They occupy a great many environments and a great many ecological niches. Examples range from tiny flying bats to gargantuan Blue Whales - the largest of marine mammals. Antelope and rabbits are adapted to arid biomes. Polar Bears spend much of their adult lives hunting for baby seals on the floating ice of the Arctic Ocean.

Humans are placental mammals - and clearly the most successful of all animals from an evolutionary standpoint. Humans have long inhabited every continent except Antarctica. As of 10,000 years ago humans and their domesticated animals represented about 2% of the terrestrial vertebrate biomass. This means that if all the land-dwelling things with backbones had been divided into two containers - with one container having all the humans along with their dogs, sheep, horses, chickens and what-not, then the other container would have needed to be about forty-eight times larger. The other container would have had everything from Antelope to Zebras. That other container would have included quite a few species which don't even exist today. The Dodo and Passenger Pigeon were clearly driven to extinction by human activities. Humans are also implicated in the extinction of numerous other species.

Today the volumes of those two theoretical containers would be reversed. Humans, their pets, and their livestock now account for 98% of the terrestrial vertebrate biomass. Compared to the time scales of evolution this change from 2% to 98% is practically instantaneous.

Placental Mammals have a number of advantages conferred by their means of reproduction. Eggs are not abandoned to predators as we saw with the Salmon and Sea Turtles. There are no opportunities for predators to chase away a parent and raid a nest where eggs are being actively incubated. Other advantages are less dramatic, but small advantages compound over generations.

The difference between species which abandon a large number of eggs and species which concentrate resources on a relatively small number of offspring may be thought of as a trade-off. At one extreme are animals which abandon a large number of eggs and invest no further resources in their offspring. Other animals invest a great deal of resources in very few offspring.

Humans fall near one extreme of this scale. It takes approximately nine months from fertilization until the tiny new human is pushed from the mother's body. But that time and those resources represent only a fraction of the total time and resources that will go to that one small new human. The small new human is entirely dependent on food and protection provided by its mother for years. That dependence gradually decreases, but without modern social constructs a child would have very little chance of survival if abandoned or if it lost its mother before reaching seven to ten years old.

Many attempts at sex education plunge right in to diagrams of internal anatomy as noted at the beginning of this discussion. Now that we have discussed eggs and sperm, we are now ready to explore some anatomy. There are many places we could start that portion of the discussion. We'll stick with our unconventional approach and start with the chest of the human male.

The chest of the human male is adorned with seemingly useless nipples. He shares this characteristic with most other male mammals. The number of nipples vary among species. Humans and our nearest relatives have two - one on each side of the body.

One key difference between the nipples on the human male and nipples on the human female is exposure to sex hormones at key points in development.

Before we get into the details of that, we should discuss sexual dimorphism and the related topic of sexual hormones. Sexual dimorphism is the variation between the male and the female bodies of a given species.

There are many commonly cited examples of sexual dimorphism among birds. The showy bright red plumage of the male Cardinal is an example. The bright red plumage is a signal to potential mates. The potential mates (female Cardinals) are much less showy. This gives the female an advantage in escaping the notice of predators. This is an important advantage when she needs to avoid drawing attention to her nest.

Peacocks are an extreme example of showy plumage used to signal health and vitality to potential mates. Again, the female has comparatively drab and practical plumage. That is one extreme. Penguins are near the other extreme. A casual observer would be hard-pressed to distinguish between male and female Penguins. This is likely driven by the need of both male and female Penguins to successfully hunt fish in the ocean. Any kind of showy plumage would severely disadvantage the male in hunting fish and evading predators. After making these observations, we may assume Penguins have developed other means for females to choose healthy mates.

There are also many excellent examples of sexual dimorphism among mammals. The manes sported by mature male lions are one example. Other examples include the large antlers of Moose and Deer. The antlers serve primarily for sparing with rival males and impressing potential mates. Among primates (our nearest evolutionary relatives) we see that male Gorillas are on average much larger than females. Evolutionary pressures have favored genes for larger male gorillas which could successfully compete for control over a family of Gorillas.

What are hormones?

Hormones are chemicals secreted by the body to control some function - with the controlled function often in a part of the body distant from where the hormones originated. Insulin is an example with which most people should be familiar. Insulin is produced in specialized cells in the Pancreas. The Pancreas is part of the digestive system and is located just behind the

stomach. In a normally functioning body, the specialized cells detect levels of glucose in the blood. If glucose levels rise above ideal levels, then the specialized cells release insulin. The Insulin signals cells throughout the body to increase uptake of glucose. As glucose is taken up then levels of glucose in the blood drop and the specialized cells in the Pancreas produce less insulin. This simple feedback loop serves to regulate blood glucose levels near the ideal level in the bloodstream.

An additional thing to understand about hormones is that they work by attaching to specialized structures on the cell membrane of target cells. These specialized structures are called receptors and each type of hormone has a corresponding receptor.

There are many different hormones in the body. These regulate many functions - from growth to how much water the kidneys should remove from the blood. We are going to focus on a subset of these hormones. Hormones relevant to our discussion are those involved in sexual functions. The ones which most people have heard of are Testosterone and Estrogen. The general perception is that Testosterone is male and Estrogen is female. Reality is a bit more complicated - involving other sex hormones and the fact that both Testosterone and Estrogen are found in both males and females. The details of this are beyond the scope of this discussion. At this point in the discussion, we need to know only that proportions of male and female sex hormones affect the development and behavior of males and females and that timing of hormones is relevant to different stages of development.

Sex hormones are active from the very earliest stages of fetal development. One of the very first results of hormonal activity is causing the precursor cells for gonads to become either ovaries or testes. Testes are the source of male sex cells (sperm) while ovaries are the source of female sex cells (eggs). Later as the child approaches sexual maturity there are other hormone-mediated changes. As an example, boys will begin to see facial hair as they near sexual maturity. The term for this time in human development is called puberty. Sexually mature adults will experience sexual desire. This is generally referred to as libido and is driven by the same sex hormones that mediated all the other changes that distinguish males from females.

The takeaway from our initial discussion of hormones is that sex-specific hormones are responsible for the many differences between males and females in general. And this applies equally to human males and females.

Now that we have covered sexual dimorphism and the related topic of hormones we can return to the seemingly useless nipples adorning the chest of the human male.

The nipples observed on the human males are basically the undeveloped precursors to human mammary glands. If these undeveloped precursors had been exposed to feminizing proportions of hormones at puberty then they would have developed into human mammary glands. In adult human females these glands are called breasts. In normal development females see their breasts start to grow and change during puberty.

Another key difference between the nipples on the male human (a man) and the nipples on the female human (a woman) is something we will call “cultural imperatives.”

If presented with photographs of the chest region of infant female humans (girls) and the chest region of infant male humans (boys) then an observer would be unlikely to guess which was which with better than 50% accuracy. There are essentially no differences in appearance. The little girl is likely to be allowed to run about with no clothing covering her chest. But as the girl gets a little older there will likely be “cultural imperatives” that increasingly restrict when and where her nipples may remain uncovered.

This reaches a point where it interferes with “biological imperatives” related to the natural purpose of women’s nipples. The natural purpose is of course to efficiently transfer chemical energy and nutrients from mother to infant. This transfer is accomplished through the secretion of milk which is consumed by the infant. The associated behavior is called breastfeeding. It should be considered an ultimately natural act. Yet public breastfeeding is met with open hostility across multiple cultures.

Covering the nipples of the woman is an example of a cultural imperative. This particular cultural imperative is part of a complicated social construct where the mature breast is covered by clothing but also often accentuated by the very same clothing. This focus on the breast as a defining characteristic of women is so pervasive in modern societies that Aaron Lynch refers to a “mandatory breast fetish” in his book “Thought Contagion - How Belief Spreads Through Society.” This idea of a “Mandatory Breast Fetish” is relevant to our discussion, so we will return to the idea later.

The seemingly useless nipples adorning the chest of a man may have seemed like an odd place to begin exploring human sexual anatomy. However, starting here provided an introduction to several important ideas: sexual dimorphism, hormones, and cultural imperatives.

Cultural imperatives sometimes work to augment biological imperatives. However, we will see many instances where cultural imperatives work against biological imperatives. We have already discussed our first example of a cultural imperative working against a biological imperative. Breastfeeding of infants has been a biological imperative for humans for most of our time on Earth. In the absence of infant formula, failure to breastfeed would have led to malnutrition or death of infants. According to the core rules of selection pressures and evolution, genes for optimal breastfeeding would be passed on at a higher rate than genes for deficient breastfeeding. This is Evolution 101. Cultural imperatives which discouraged breastfeeding would seem like a self-limiting situation because such a culture would appear to be at a reproductive disadvantage. Yet some of the most widespread and successful cultures on Earth stigmatize the natural act of breastfeeding and thereby relegate it to the shadows.

The subject of sex and human reproduction is relatively complex. Thus far we have discussed biological and cultural imperatives as well as sexual dimorphism and hormones. With these building blocks of knowledge, we can continue with our exploration of sexual anatomy.



If we venture down from the chest toward the waist we will find the navel. This is sometimes referred to as a “bellybutton.” It is common to males and females. The navel marks the point where the umbilical cord connected to the developing tiny new human while still inside his or her mother. We have briefly mentioned the placenta as the defining characteristic of placental mammals. The placenta connects to the developing tiny new person via the umbilical cord. Until birth, the umbilical cord was the source of oxygen and nutrients from the mother. The terms “birth” and “delivery” are used to describe the process where the tiny new human is pushed from the mother’s body. Prior to birth, the umbilical cord also carried away carbon dioxide and metabolic wastes. After the tiny new human is pushed from the mother’s body the lungs take over as the source of oxygen. The lungs also take over the role of getting rid of carbon dioxide. Similarly, the kidneys take over the role of removing metabolic from the tiny new human.

Prior to delivery, the tiny new human is referred to as a “fetus”, “unborn baby”, or simply “baby”. The choice between these terms often depends upon the setting and the cultural alignment of the speaker. After the tiny new human is delivered it is known as a baby or infant.

Prior to the baby being born, the combination of placenta and umbilical cord provided nutrients taken from the mother’s bloodstream to the developing baby. This source is replaced after delivery with a combination of several things: milk from the mother’s breasts, a “rooting reflex”, and the baby’s gastro-intestinal tract. Milk from the mother’s breast is obviously the new way of getting nutrients from the mother’s bloodstream and making it available. The “rooting reflex” causes the baby to latch on to the mother’s nipple and begin sucking. The gastro-intestinal tract wasn’t active during gestation. The term “gestation” refers to the time between fertilization of the egg and delivery of the baby. This inactive state during gestation is similar to that of the lungs and kidneys.

The very first milk produced by the breasts after delivery is different and has a special name. It is called “colostrum.” This special milk has antibodies to help jumpstart immunity in the baby. It is also very nutrient dense to allow time for the baby’s stomach to expand and allow for a larger volume of milk at subsequent breastfeeding sessions.

So the navel is an artifact of gestation. It serves no purpose after delivery other than to cause young humans to ask their parents embarrassing questions.

With that, it is almost time to continue south on the anatomy tour.

You may have noticed that this discussion has been entirely devoid of illustrations. Illustrations and pictures are extremely upsetting to some people. To avoid being upset these folks try to censor illustrations which offend their sensibilities. Bans of certain books are often the result. Leaving out the illustrations doesn’t eliminate the possibility of censorship here, but it might reduce it in some situations. If you have access to the World Wide Web then illustrations and pictures shouldn’t be a problem. The next stop on the tour involves more external anatomy, so if you’ve got a mirror and open-minded friends of the opposite sex

you might not need the World Wide Web just yet. When the time for illustrations does arrive be sure to apply the lessons regarding Credibility of Sources. Hopefully some of your teachers taught you the skill of distinguishing between reliable and unreliable sources of information. Choose results from your searches from reputable Universities or authorities like the World Health Organization. Information published alongside religious messaging is probably not reliable for purposes of sex education. We'll learn why that is later in the discussion.

Traveling south from the navel on a male we will first encounter the penis. On a female we will first encounter the upper portions of her labia. The Labia are fleshy lip-like structures to the right and left of her urinary and genital openings. There is an additional bit of anatomy concealed between the labia. The clitoris is located just above a woman's urinary opening. Remember how we described the seemingly useless nipples on a man's chest as "undeveloped precursors" to breasts? Well, the clitoris is the "undeveloped precursor" to a penis. A key difference between a clitoris and a penis is exposure to masculinizing proportions of sex hormones at critical stages of development.

Recall how male sharks were equipped with "claspers" to facilitate the transfer of male sex cells to the female shark's cloaca? The penis has a similar role in mammalian reproduction. A key function of the penis is transfer of sperm originating in the testes to the female genital opening. Through a quirk of evolution, the penis is also where urinary waste exits the body of male mammals.

The penis has two states. In clinical discussions these states are known as flaccid and erect. The erect state may be referred to as an erection in clinical terms. There are a multitude of slang terms for the erect state. An erect penis is caused by specialized structures in the penis which fill with blood. As blood vessels in these structures relax they expand and cause the structures to increase in size and stiffness. When in the erect state, a penis is ready to transfer sperm to the female genital opening. This transfer of sperm is through a tube inside the penis called the urethra. When the penis is flaccid the urethra serves as the path for urinary waste to exit the body.

Conveniently enough, the female genital opening is our next stop on the tour of external sexual anatomy. This opening is referred to as a vagina or vulva in clinical settings. As with the penis there are a great many slang terms for the vagina. We mentioned labia earlier. There are actually two pair. There is an inner pair closely flanking the vagina and urinary opening. The inner pair is properly referred to as Labia Minora. The outer pair of labia are properly referred to as Labia Majora. There is some natural variability in the proportions of the labia. Consequently, the Labia Minora may or may not protrude.

The last stop on our tour of external sexual anatomy is the scrotum. This bit of anatomy is not present in females. The scrotum is an extended sac-like structure which contains the male testes (testicles).

Recall how the clitoris is an undeveloped precursor to a penis? This relationship is known as a homology. That means the clitoris and penis may be described as mutually homologous to one

another. A homologous relationship occurs whenever two structures share a common precursor.

The scrotum is homologous to the labia majora. If one closely examines the scrotum there is a roughly vertical line between the right and left sides. This visible line results from the fusion of what would be the right and left Labia Majora in females. To understand this setup, it is helpful to understand evolution. Therefore, we will take a brief detour from the subject of external anatomy to get a bit of critical knowledge regarding evolution.

A correct understanding of evolution includes understanding a species as the most recent iterations of previously successful recipes. The recipes are the pieces of instructions found in the genetic makeup of a species. These recipes occur in long unbroken lineages. These recipes are composed of instructions for making everything from blood and bones to brains and hormones. In evolution, successful means best at getting copied into the next generation. It is important to understand that evolution has no foresight. So be wary when you hear things like an extinct species being described as a “failed evolutionary experiment”. “Experiment” implies forethought and is an inappropriate anthropomorphism.

Because evolution has no foresight there are instances where the successful recipes might not seem to have been the best recipes. But recall that evolution requires only relative success at the business of being copied into the next generation. Nothing more and nothing less.

So, way, way back in time there were some ancestors to modern birds and there were some ancestors to modern mammals. There was a problem for both of these ancestral species. This problem was a sperm production system inherited from cold-blooded reptilian ancestors which was temperature sensitive. A warm-blooded existence offered many advantages so higher metabolic rates and genetic instructions for higher body temperatures became more prevalent. This adversely affected the reptilian sperm production system. One solution - one likely to be adopted by a hypothetical “intelligent designer” - would be to adjust the sperm production system to function adequately at higher temperatures. Another solution would be to move the sperm production system away from the source of problematic heat. Birds evolved in that first way. The testes of birds operate just fine located inside the main body cavity. Average internal temperatures of birds range from 106° to 109° Fahrenheit. This is obviously higher than the typical human operating at a nominal 98.6° Fahrenheit.

The other successful lineage of recipes gradually moved the sperm production system away from the warmest parts of the body as species moved from being cold-blooded to being “endothermic.” “Endothermic” refers to an animal with a constant temperature higher than that of the environment. Precursors to modern mammal stumbled on this successful recipe instead of stumbling on the recipe found in birds. So, we can imagine a series of recipes for successful animals that were gradually warmer with testes relocated closer and closer to the cooler skin. With each generation the testes would on average be further from the warmest parts of the body until the testes were eventually located outside the main body cavity. The

testes of most modern mammals hang outside the body despite this making the testes more vulnerable to injury.

Now back to modern humans and our tour of external sexual anatomy.

The testicles of humans hang outside the main body cavity - just as they do in all the furry mammals which are our evolutionary kin. In early development - while the male baby is still inside the mother - hormones cause the precursors for gonads to become testes and cause the migration of the testes to the scrotum.

With this we have bridged between external and internal sexual anatomy. This is because the testes originated in the realm of internal anatomy and migrated to part of what can be observed as external anatomy.

But that doesn't mean we are quite done with the subject of testicles. Understanding the path of migration for testicles will aid in understanding the internal anatomy of women. Specifically, the path taken by the testes is the precursor for the internal sex organs of women.

So far, we have learned that women have a genital opening and that the opening is called a vagina. We have also learned that in men that opening is covered over by the scrotum and that the scrotum contains the male gonads (testes).

The vagina serves multiple purposes. It serves to receive the penis and to receive sperm deposited by the penis. The vagina also serves as the path taken by the baby as it is pushed from the mother's body. The cervix marks the connection point between the vagina and the uterus. The uterus is sometimes referred to as the womb - most often in religious contexts. The uterus is where the developing baby is located until it is born.

Bilateral symmetry.

Bilateral symmetry refers to anatomy where the right and left side are "mirror-image" reflections of one another. We first saw this with nipples on the man's chest - one right and one left. Breasts are also bilaterally symmetrical. The penis, clitoris, and vagina do not occur in pairs, but they do occur on the centerline of the body and one side is the "mirror-image" of the other.

Up to this point we haven't mentioned bilateral symmetry because we could see it in our own bodies, the bodies of others, or in images seen in various mediums. However, unless we are medical students, surgeons or other medical practitioners, we are unlikely to observe the bilateral symmetry of internal human sexual anatomy firsthand.

So now we will explicitly define human sexual anatomy as bilaterally symmetrical. The uterus is like the vagina in that it exists on the centerline and one side is a mirror-image of the other.

The uterus connects to the next parts of the female internal reproductive system at the upper left and upper right. This might be an opportune time to search your credible sources for a relevant illustration - remember to consider credibility of sources in your image searches. The connections to the uterus are bilaterally symmetrical and are to the Fallopian Tubes. Fallopian Tubes are also bilaterally symmetrical. The Fallopian Tubes are the way eggs travel from the ovaries to the uterus. If sperm are present, then fertilization of an egg typically occurs in the Fallopian Tubes. The fertilized egg normally continues to the uterus where it adheres and begins developing into a baby. As you may have guessed from mention of ovaries, the Fallopian Tubes end at the ovaries. And with that our overview of human sexual anatomy is nearly complete.

The ovaries and testes arise from the same precursor cells. Ovaries don't really go anywhere once hormones cause the gonad precursors to become ovaries. But recall that Testes migrate. That path of migration is along what would become Fallopian Tubes and a uterus in a female. The testes then pass through what would become the vagina and birth canal in women. In normal male development the precursors for the labia majora have fused to create a scrotum by the time the testes arrive at their final location.

The prostate gland is our final stop on our tour. The prostate gland arises from the precursors which would become the uterus under the influence of feminizing proportions of sex hormones. The prostate connects to the urethra in males. The prostate produces the majority of the contents of semen. Semen is a mix of sperm and fluids which carry and protect the sperm. One of the functions of semen is to adjust the acidity of the vagina. The vagina is normally somewhat acidic to protect from disease. Semen temporarily neutralizes some of that acidity to make the vagina a safer environment for the spermatozoa.

Now that we have an overview of the parts, we are ready to review the reproductive process. Because the reproductive process is cyclical, we could jump in anywhere. But some points in the process are more logical places to jump in than others. We will start with ovulation.

What is ovulation?

If one knows enough etymology to know that one egg is an ovum and that multiple eggs are ova, then one might guess that the root of the word ovulation has something to do with eggs. This would be a most excellent guess.

In humans, ovulation normally occurs in harmony with one of the most ancient of natural rhythms. Ovulation occurs approximately every twenty-eight days in women and young women. This roughly corresponds with the orbital period of the moon. Many sea-creatures still spawn in accordance with this ancient rhythm. Some spawn under the light of a full moon. Recall that tides on Earth are the result of the Sun and Moon's gravity acting on ocean water. The new moon and full moon are associated with some of the highest tides each lunar cycle. Other sea creatures spawn under cover of the darkest nights when the sliver of moonlight provides little help to predators. A young woman's first ovulation will occur as part of reaching sexual maturity. This reaching of sexual maturity is called puberty and can happen

as early as age 10. By age 14 most girls will have reached puberty. If there is no medical intervention or pregnancy, then she will ovulate approximately every twenty-eight days until menopause. Menopause marks the end of her reproductive life and typically this happens between age 50 and 55.

Normal ovulation in humans is the release of one egg from either the right or left ovary. Fraternal twins can occur when more than one egg is released. If ovulation does not result in fertilization of the egg and pregnancy, then the system resets for the next cycle.

This reset of the system is called menstruation. Blood held in readiness by the uterus is released as part of the reset process.

The reset is what happens if ovulation doesn't result in pregnancy. So, what happens to result in pregnancy? The answer to that involves a variation on one of the egg-meets-sperm stories which we covered earlier in this discussion.

In order for pregnancy to occur, the egg must meet a spermatozoa sometime between when the egg begins its journey down the fallopian tube and when the female reproductive system resets to prepare for the next cycle. In order for the egg to meet sperm, the sperm must have been introduced into the vagina.

So far, we have learned that sperm originate in the testes and that an erect penis deposits the sperm in the vagina. Our discussion will assume consensual sex although, quite unfortunately, this is not always the case. A receptive woman or young woman will likely become sexually aroused. This may be marked by increased blood flow in the clitoris and lubrication of the vagina. Sexual arousal in the male is marked by increased blood flow to the penis. This may be accompanied by some discharge of seminal fluid from the urethra. The discharge of Seminal Fluid may aid in making the penis slippery enough for insertion into the vagina.

Erection obviously makes the penis longer and increases its girth. Erection also greatly increases the sensitivity of nerve endings in the penis. Thus the sensations resulting from inserting his penis into her vagina will be extraordinarily pleasurable for him. The only thing likely to be more pleasurable for him than inserting his penis is to partially withdraw his penis and then thrust it in again. Consequently, he will be naturally driven to partially withdraw and then thrust again over and over. He will eventually experience a build-up of sexual tension followed by an even more intensely pleasurable release of that sexual tension. During the release muscles will rhythmically contract causing several spurts of semen to be deposited in the vagina. This release of built-up sexual tension is referred to as orgasm. The spurts of semen are referred to as the ejaculate in clinical settings. Continued thrusting would tend to pump semen out of the vagina, so evolution has favored genes that make the penis overly sensitive at this point. His genetic programming may however predispose him to sleepiness and efforts to persuade the female to rest with him. This evolution-driven tactic gives his sperm time to fulfill their mission without interruption.

Once the semen is deposited in the vagina, the race is on. Some sperm will find their way through the cervix and cross the uterus. The sperm will then fan out through the Fallopian Tubes. If an egg is encountered, then the sperm will engage and inject its genetic material into the egg. The surface of the egg then rapidly changes to prevent any additional sperm engaging the egg.

The fertilized egg continues toward the uterus at the same time as cell divisions start. The fertilized egg is now known as a zygote. It will adhere to the uterine wall and begin releasing a hormone called Human Chorionic Gonadotrophin (HCG). The HCG signals the mother's reproductive system and prevents menstruation and reset.

The zygote passes through a few more stages and officially becomes an embryo. The placenta and umbilical cord form during this time. The expectant mother may experience "morning sickness" during this time. This is part of a successful recipe for survival. To understand why "morning sickness" is part of a successful recipe for survival we need to understand something of the complex relationship between humans and our food. Plants would have been a major part of the human diet for most of our evolutionary history. Plants have an array of defenses to discourage animals from eating them. We can see and feel some of the defenses like thorns. Other defenses involve toxins. In an evolutionary arms-race many animals have developed chemistry to allow the consumption of many toxic plants. However, some of those toxins which can be safely eaten by adults would cause birth defects in the developing embryo. To prevent this, the embryo releases chemicals which make the mother feel mildly nauseated. This discourages the mother from consuming many foods which might be harmful to the embryo during critical stages of pregnancy.

Fetal development.

Much of the recipe of genetic instructions play out during fetal development. All the different kinds of cells needed to create a tiny new human are created by cell differentiation. These cells organize to form all the parts of a human body. These parts include everything from blood and bones to a spinal cord and a brain. Some of the instructions cause the fetus to become either male or female. If female, then the genetic recipe calls for hormones to make the fetus female. The feminizing proportions of sex hormones will cause the precursor gonads to become ovaries. As covered earlier other precursors develop into a uterus and other components of the female reproductive tract and external genitalia. If male, then the genetic recipe calls for hormones to make the fetus male. The masculinizing proportions of hormones cause the precursor gonads to become testes. The hormones cause development of male characteristics. The precursors that could become labia majora or a scrotum grow and fuse to form a scrotum. The precursors which could form a clitoris or a penis grow and form a penis. All the other features which distinguish male from female develop in a similar fashion.

When gestation is complete the baby is pushed from the mother's body. This process involves contractions of the uterus. These contractions are properly referred to as labor. Fun fact: the uterus is among the strongest muscles in the human body. There are multiple criteria which

might be used when talking about the strongest muscle in the body. If the criteria is sheer power then typically something like the gluteus maximus tops the list. The gluteus maximus is the largest constituent part of the human buttocks. It is proportioned to lift and propel and as such needs to be relatively large with a relatively high power-to-weight ratio. However, if the criteria is the highest power to weight ratio then the muscles which close the jaw top the list. Other folks will place the uterus at the top of the list due to the pressure it can generate during labor.

#### Pertinent Religious Dogma:

Popular religious traditions hold that womankind is punished for the original sin allegedly committed by a woman named Eve. The punishment relevant to this discussion from the KJV: “in sorrow thou shalt bring forth children.” The alleged sin involves Eve eating fruit of the tree of knowledge of good and evil and corrupting a guy named Adam by offering him the same fruit.

The first thing to know about the alleged sin is that the Bible often speaks in parables. The term parable in a religious context refers to a story which speaks to a subject indirectly by means of analogy or comparison. A common example is the parable of the sower. In the parable, the sower distributes seeds. Some seeds fail while other seeds grow and prosper - depending on whether the seeds fell on fertile ground or not. The seeds in the parable represent the “Word of God” - sometimes falling on deaf ears and sometimes being heard and gaining a foothold. I submit that the entire drama regarding Eve and the fruit of that tree is something like a parable. Eve did not eat an actual fruit. What Eve did do was to offer herself to Adam as an object of sexual pleasure. This is how Adam and Eve learned that it felt good to do things with the parts they would later attempt to cover with the fig leaves. The language still “knows” that fruit is a stand-in for those very same parts. Underage girls are sometimes referred to as forbidden fruit. Children are the fruit of one’s loins. The “original sin” for which Eve was scapegoated is at the root of sex guilt. This is super relevant later in this discussion, so don’t be surprised when we return to the topic of religiously mediated sex guilt.

Another thing to understand about pain in childbirth is that it has absolutely nothing to do with punishment and is entirely the result of the rules of evolution. The idea that childbirth would be painful for humans may at first seem counter-intuitive. We can look around and see many other mammals give birth to young with relatively little stress. What makes the process different for humans?

Recall that evolution is driven by slight variations in successful recipes repeated over time. Two relevant factors are favored in humans. Babies born with larger brains were more successful at getting their genetic instructions copied into subsequent generations. At the same time women who were better able to walk on two legs and still evade predators were also better at getting their genetic instructions into subsequent generations. This sets up a balancing act between the two factors. This is because there is no intelligent designer at



work. Humans share body structures traceable all the way back to dinosaurs. If one visits a museum of natural history, then one can see the skeletons of these ancient creatures. There are many similarities between their skeletons and our skeletons. One can see that there is a spine composed of vertebrae that don't appear markedly different from our own. There are a lot more of those vertebrae in dinosaurs, but individual vertebrae bear a non-coincidental resemblance to our own. There is a similar observation to be made relevant to the pelvic girdle of dinosaurs and humans. The pelvic bones of dinosaurs and the pelvic bones of humans both feature large attachment areas for the muscles which move the legs.

But dinosaurs had a different posture. Bipedal dinosaurs such as velociraptor probably moved much like modern day roadrunners. The spine would have been close to horizontal and the long tail would have acted as a counter-balance. Swinging the tail to one side would have aided quick changes in direction. Human posture is with the spine held close to vertical. The tail in humans is vestigial - with only the fused bones of the coccyx serving as evidence of our ancient ancestors which had tails. So, the version of bipedal locomotion seen in humans is not comparable to that of dinosaurs.

One of features of the pelvic bones of dinosaurs is the pubic symphysis. This feature has persisted all the way from dinosaurs to us. The proportions were different, but that important structural feature is still there. If you press just above your labia or penis, then you can feel the hard bony structure where the left and right pubic bones are joined by an inflexible connection.

The ilium are the large hip bones which you can feel by pressing your side about halfway between your lowest rib and your hip joint. As mentioned earlier, these serve as attachment points for some of the muscles which move the upper leg. The female dinosaur had a reproductive tract that passed between the right and left ilium - just as the reproductive tract of human females passes between the right and left ilium. This means a woman's reproductive tract passes through an inflexible bony orifice - just as it did for her ancient dinosaur relatives.

The human male needs relatively little space between the right and left ilium. The largest thing passing through that bony orifice in males is the lower portion of the gastrointestinal tract. However, in females that same orifice must accommodate the passage of the baby from uterus to vagina. This sets up the balancing act for the recipe with the instructions for the female pelvic girdle. The orifice needs to be large for the birth of babies with big brains and big skulls. The orifice needed to be small for most of our evolutionary history so that the woman could successfully evade predators.

If an intelligent designer were involved, then it would be a simple matter for that intelligent designer to reroute the human birth canal above the pubic symphysis. As is, the uterus must generate enough force to slightly deform the skull of the baby and push it through that bony orifice. But there is no intelligent designer - only the simple rules of evolution. Lacking foresight, the rules of evolution have given women sorrow in childbirth.

This discussion was opened with the promise of answering the question “Mommy where did I come from?” along with questions regarding the existence of sexual minorities and the “culture wars” centered on those sexual minorities. We have largely answered the first version of that initial question. However, we will return to follow the growth of our newborn human later in the discussion.

This discussion began with the idea that we would answer the question “How did we get here?” First in the sense of “Mommy, where did I come from?” Then in the sense of “How did we get to a place where there are sexual minorities?” We have the basic framework of the answer for the first version of the question, so it is time to move on to the second version of the question.

So far, we have only discussed babies born clearly as either a boy or a girl. However somewhere between one in 1500 and one in 2000 babies are born as “intersex.” Intersex refers to people born with “ambiguous” genitalia. There are many different causes of intersex births and many different manifestations of these causes.

There are several abbreviations that collect some of the more common and well-known sexual minorities. You may see LGBTQIA+ or one of the similar variations. If expanded, then LGBTQIA+ means Lesbian, Gay, Bisexual, Transgendered, Queer, Intersex, Asexual, plus all the less common or less familiar sexual minorities. For now, we will simply note that there is a list and that the “I” in LGBTQIA+ represents Intersexed persons.

One of the more easily understood causes of intersex births is Androgen Insensitivity. But before we get to that we need an additional building block of understanding.

Up to this point we have only made vague references to the genetic instructions which play out to create tiny new fish or tiny new chickens or tiny new humans. In humans these instructions are organized into forty-six strands of deoxyribonucleic acid (DNA). These strands are arranged into twenty-three pairs. The DNA is commonly referred to as “genes” or “chromosomes.” Roughly half of a human’s DNA is inherited from each parent. The chromosomes of other animals are also made up of DNA, but the DNA is organized in different numbers and lengths of strands.

The twenty-three pairs of human chromosomes are bound near the midpoints of each strand. This gives most of the pairs a shape reminiscent of the letter “X.” In fact, for females every pair has that X-like configuration. Males have one pair that is different. That pair is shaped like a “Y” because one of strands in the pair is about half the length of the other strand.

So females are XXXXXXXXXXXXXXXXXXXXXXXX while males are XXXXXXXXXXXXXXXXXXXXXY. There is a commonly used shorthand that defines female DNA as XX and defines male DNA as XY.

In intersex humans the instructions may be corrupted. There are other possible causes such as unintentional exposure of the fetus to sex hormones for the opposite gender.

In Androgen Insensitivity the XY human has appropriate levels of masculinizing hormones (androgens), however receptors for those hormones are missing or fail to cause the proper response to the hormones. In situations where the insensitivity is complete then the XY human may be born with external genitalia resembling a normal female. This particular type of intersex human may not become aware of their condition until puberty. The prevalence of full Androgen Insensitivity is estimated to be around one in 20,000 births. Partial Androgen Insensitivity often leads to more complicated outcomes. Parental anxiety and cultural imperatives often result in unnecessary and/or premature surgical intervention. The often panic-driven surgery is typically “cosmetic” to give the intersex child an unambiguous gender appearance. This typically results in XY type humans being raised as if they were XX type humans. In less enlightened cultures the intersex child may have even been killed - due to cultural imperatives that demand each person fit into one of only two permissible genders. More enlightened cultures now wait until the child can make their own decisions regarding surgery unless there is a compelling medical reason to intervene. An example of a compelling medical reason would be the absence of an external opening for the urethra.

Once one acknowledges the existence of intersexed people then one must acknowledge that not every human neatly fits into the religious narrative of exactly “male” or exactly “female.”

At this point we’ve at least touched on all the important points of the human reproductive cycle. But for clarity we will complete the loop here.

Our initial look at the reproductive cycle started with ovulation and fertilization of the egg. Then continued through the implantation of the fertilized egg in the wall of the uterus and delivery of the tiny new human. We left off with breastfeeding of the tiny new human.

Breastfeeding is a very successful recipe from an evolutionary vantagepoint. The digestive tract of a mature female is leveraged to enable rapid weight gain of the infant. In non-mammals the parent is limited to bringing food to their offspring. This means the growth rate of non-mammal offspring is limited to what the growing digestive tract can accommodate. The offspring of mammals have a tremendous advantage - instead of consuming adult foods they consume a concentrated power food.

The experience of boys and girls are biologically very similar at this point. During fetal development we saw that some basic sex organs were set up. From a strictly biological vantagepoint the experience of boys and girls will remain very similar until puberty. They will gain weight and height. They will gain language skills. But at puberty things change.

During gestation hormones were active and caused XY babies to become boy babies and XX babies to become girl babies. Then sex hormones backed off and weren’t very active. At puberty sex hormones become very active again. And here the biological experiences of girls part ways with the biological experiences of boys.

Sex hormones act on many parts of the body. Sex hormones cause young women to have their first ovulation. Sex hormones cause the nipples of young women to develop into breasts. Sex hormones cause pubic hair to start growing in young men and young women. Hormones act on the brain to cause “sexual awakening” in young women and in young men. This generally manifests as a new interest in, and attraction to, the opposite sex. Hormones act on young women to cause them to carry a higher percentage of body weight as fat. Hormones act on young men to maintain a higher proportion of body weight as muscle. Young men will grow for longer, resulting in a larger average height and weight than young women. Hormones cause young men to begin having penile erections. Hormones also cause one of the more obvious signs of sexual maturation in young men - the growth of facial hair.

This continues a pattern where hormones cause all the differences between male bodies and female bodies. Some of these differences are relatively subtle and difficult to define.

The faces of men and women are different. Much of the difference in the faces of men and women are attributable to more prominent bones around the eyes of men. The hips of men and women are slightly different too. This is partially attributable to the way fat is normally stored on the female body compared to the fat distribution on a male body. But there is also an important difference in the underlying bone structure. The ilium in men is proportioned nearer the ideal for upright bipedal locomotion. Recall that the ilium is the bony plate which can be felt about halfway between the hip joint and lowest rib. A major function of the ilium is to serve as an attachment point for muscles which move the upper leg. The ideal for bipedal locomotion means higher and narrower hip bones. The ilium in the woman is lower and wider - an evolutionary compromise to accommodate pregnancy and childbearing.

After puberty a young woman is biologically ready to conceive and bear children. After puberty a young man is biologically ready to father children. However, in many modern societies pregnancy and fatherhood are postponed until after full maturity and legal adulthood.

With that we have completed the journey around the human reproductive cycle - at least from a biological perspective. However human biology and human culture are entangled. This means that no attempt at sex education is complete without an examination of the interplay between our biology and our culture.

We now have the building blocks of understanding needed to return to the topic of LGBTQIA+ humans. Earlier in the discussion we saw that the existence of Intersexed Humans logically forced open a space between the purely male and the purely female. We will now see why that space is logically expanded to accommodate a whole range of LGBTQIA+ humans.

There is a popular religious narrative that says a deity created the first man and then created the first woman. The narrative includes the ideas that every human is descended from those first two and that every human is either a male or a female.

We saw earlier how the verifiable existence of Intersex humans forces acknowledgement of a space between the purely male and the purely female. The Intersex person is different from the other people represented by “LGBTQIA+” in that there is often visual evidence that they are what they say they are. Persons represented by the other letters in LGBTQIA+ can only tell us what they feel - leaving open to probability that the listener will reject what they have been told in favor of personal/cultural biases. While considering Intersexed humans we also saw how less than optimal hormone function was the most likely cause.

After acknowledging the existence of Intersexed persons, it is but a small step to understand why the space between the purely female and the purely male must also include space for Transgendered persons, Lesbians, Gay Men and Bisexuals.

We have seen how hormones cause all the differences which make a body male or female. Hormones affect many parts of the body. We saw that hormones are responsible for the generally heavier boning in the brow line of adult males. We saw how hormones cause the hip bones to be shaped a bit differently between men and women. We also discussed differences in musculature and fat distribution which were mediated by sex hormones. What we haven't covered is how hormones act on the seat of human consciousness and desire.

The brain may generally be thought of as a stimulus sorter. A brain responds to many different stimuli. Stimuli may be things seen or heard. Other sources of stimulus may include signals from the body such as hunger signals from the stomach. The brain takes all these various inputs and prioritizes responses.

Some responses are relatively simple. The response to an unanticipated sound is to turn the head so that the eyes and ears may collect more information. These types of stimulus and corresponding responses may be observed in humans and many other mammals. Other responses can be a bit more complicated. A hungry moose need do little more than see favored plant parts, move toward the favored plant parts and eat the favored plant parts. A hungry lioness must coordinate with others in her pride. “Pride” in this sense refers to a family unit of lions. The Pride is generally composed of closely related females. There is also a single dominant male or a pair of cooperating males. If there is a cooperating pair of males then they are usually brothers. There may also be cubs which will want to be fed. Returning to the hungry lioness: she will coordinate with the other females to find and stalk prey. The hunting group will engage in relatively complex tactics to isolate their chosen prey, capture it, and then kill it.

Humans have domesticated some smaller relatives of lions. The domestic housecat is easily observed, so we will use them as our next example. When we observe the mating habits of domestic cats we can see an important difference between them and humans. The female cat clearly “knows” when it is optimal to attract a male cat for procreation. This is also observed in the nearest wild relatives of our housecats. These wild relatives lead solitary lives. Consequently, evolution has favored genes for females which made vocalizations signaling her readiness for reproductive behavior. This makes sense in a species where individuals lead

solitary lives except for mating. The take-away for our discussion is that the brains for these cats must have receptors for sex hormones. There is a response when the brain of one of these cats receives a stimulus in the form of hormones associated with impending ovulation. That response is scent marking and vocalizations. Any male cat encountering her scent or hearing her calls will respond to those stimuli by following the scent and sound to find and mate with her. The responses to these stimuli are of course prioritized by the brain of the male cat.

The human female is different from the female cat in a key regard. The brain of the human female has no information regarding her current ovulation status. The human female is different from most other animals in that she is equally receptive to sex whether or not it is the optimum time for procreation.

The brain is obviously a key component of human reproduction. The brain is where sexual desire is experienced. The brain is where we experience the reward/pleasure for acting on those desires. We can see that sex hormones affect the brain in other ways as well. One of the examples with which you might be familiar is “roid rage.” Roid Rage is seen in body builders using steroids in an effort to gain more muscle. The use of steroids for muscle gains is often accompanied by increased aggression in the user.

We should now consider what would happen if masculinizing hormones or feminizing hormones fail to have the corresponding effect on brains while in the womb or at the time of puberty. One should easily imagine that an insensitivity to sex hormones in the brain would result in an adult with no sex drive - an asexual - and the letter “A” in LGBTQIA+. We may further imagine what would happen if there were a fault in androgen receptors or the chemical pathways associated with androgen receptors in the brain. Recall that for purposes of this discussion we did not plan to delve into the minutiae of human sex hormones, but that we would be aware that male and female hormones are both present in males and females. The takeaway for the purposes of this discussion was that Testosterone and Estrogen were the sex hormones with which people were most likely to be familiar. We generalized that there were masculinizing proportions of these hormones along with feminizing proportions of these hormones. We will slightly expand our paradigm to include that there are receptors present for sex hormones of the “opposite sex” in both males and females. The presence of receptors and pathways to action related to hormones for the “opposite sex” means there are additional ways in which masculinization or feminization of the developing brain could “go wrong.”

Thus, we see the possibility that an XY human might end up with a brain partially or fully “oriented” as female. Likewise, we should see the possibility that an XX human might - through “faulty” gene expression - end up with a brain partially or fully “oriented” as male. In the case of an XY human with a somewhat female “oriented” brain we might see Bisexual behavior - the “B” in LGBTQIA+. Likewise, an XX type human with a somewhat male “oriented” brain might also exhibit Bisexual behavior - again the “B” in LGBTQIA+.

The “T” in LGBTQIA+ represents Transgendered persons. Transgendered persons are generally of two types and these two types each have acronyms associated with them. One type of Transgendered Person is “Female to Male” or FTM. FTM type transgendered persons sometimes prefer the terms “Trans man” (singular) or “Trans men” (plural). The other type of transgendered person is “Male to Female” or “MTF”. It is easy to keep track of which acronym applies because the first letter represents the gender “assigned at birth” - usually male for XY-type humans and female for XX-type humans.

Lesbians are women who are attracted to other women as sex partners - and are represented by the letter “L” in LGBTQIA+. In this discussion we are going to look at Lesbian and FTM-type Transgendered Persons as different manifestations of a similar underlying circumstance. In this discussion we will use the term “Gay” as the preferred non-pejorative way of referring to homosexual men. For consistency we must note that “Gay” is represented by the letter “G” in LGBTQIA+. We are also going to consider Gay men and MTF-type Transgendered Persons as different manifestations of a similar underlying circumstance.

Gender identity often becomes an issue at puberty. This is the time when most young people begin to experience sexual attraction and the sexual attraction is most often heterosexual. Heterosexual attraction means attraction to the gender which is different from their own gender - males sexually attracted to females while heterosexual females are attracted to the male gender. However, this is not the experience for roughly six out of every one hundred people. Those six people will experience a significant attraction to people of their own gender - a homosexual attraction. That attraction may range from being partially or equally attracted to persons of the same sex to being sexually attracted exclusively to persons of the same sex/gender.

For people living the experience of equal or near-equal attraction to people of the same and opposite sex, they are likely to self-identify as Bisexual.

Living the experience of being an XY-type human who is mostly or exclusively sexually attracted to other XY-type humans can be traumatic - particularly at the time of puberty and the associated “sexual awakening.” The same may be said for XX-type humans who feel attracted mostly or exclusively to other XX-type humans. Societal pressures to conform to gender norms can be intense. The XY-type human living this experience can respond in one of several ways. The response will of course depend to some degree on the particulars on what their brain “wants.” Sexual attraction and sexuality is not a one dimensional thing. For example, one may observe a strong “nesting” desire in some gay men while other gay men don’t appear to have that desire which is most often associated with XX-type humans. Ultimately the response is likely to fall into one of four categories. One response is to hide and give in to the societal pressure to conform. That response may or not be durable. Hollywood gives us a few examples of what can go wrong when that response is not durable. One example is the character Colonel Frank Fitts portrayed by Chris Cooper in the movie “American Beauty.” The character’s internalized self-loathing and hyper-masculine over-compensation did not bode well for other characters in the movie. The storyline for the

character Ennis Del Mar (portrayed by Heath Ledger) in the movie “Brokeback Mountain” isn’t really that different from the storyline of Colonel Fitts. In the storyline, Del Mar tries to conform to societal pressure with the result being a largely unhappy life and a trail of hurt feelings and broken lives in his wake. As a critical part of the backstory for Del Mar, the movie “Brokeback Mountain” also gives us a gruesome and extreme example of the societal pressure to which a young person might be subjected.

Another possible response to same-sex attraction is to resolve to live a life of abstinence. This is akin to trying to conform to societal pressure in that the person tries to avoid offending gender norms. The obvious way to avoid offending gender norms without embracing those norms is to abstain from sexual contact with others. As with giving in to societal pressure, the resolve to abstain from sexual activity with others may or may not be durable. The 1994 British film “Priest” explores what can go wrong when the resolve to abstain does not prove to be durable. The storyline for the character Reverend Greg Pilkington is essentially the same as the storyline for Brokeback Mountain’s Ennis Del Mar. Pilkington leads an unhappy life and leaves hurt feelings and broken lives in his wake. Pilkington is portrayed by Linus Roache. In my opinion this is an excellent film and well worth seeing. However, I am not an expert film critic. If you’re not familiar with this film and wish to see it, then do not confuse it with the 2011 horror film with the same title. One final thought on “Priest” - this film is best watched as your language arts teachers wished - actively considering tensions and repercussions of what you are viewing on the screen.

A third response to same-sex attraction is to simply give in to it. The young person will eventually figure out that they can give and receive sexual pleasure and gratification with the body and body parts they were given. People responding to same-sex attraction in this way are the Lesbians and the Gays in the acronym LGBTQIA+. There are now catalogs of films and television series exploring their lives in general and their “coming of age” stories in particular.

The fourth category of possible responses to same-sex attraction is to basically conclude that one is a member of the opposite sex - but trapped in a body of the “wrong” gender. In clinical terms this is sexual dysmorphia. This person will be a “trans man” or an MTF-type Transgendered person. Until recently, Trans people were not as present in the public imagination as Gays and Lesbians. This is likely due in large part to the desire of Trans people to blend in while leading the life associated with their inner self rather than calling attention to their disconnect with the gender they were “assigned” at the time of their birth. Transgendered persons are less likely to see portrayals of people like them on television or the big screen. Notable exceptions include the character of Mrs. Madrigal in Armistead Maupin’s *Tales of the City*. Anna Madrigal is delightfully portrayed by Olympia Dukakis. There are references to a dark past, but the storyline for Mrs. Madrigal is largely about her leading her best life. Other portrayals of the lives of trans people are darker. One such film which comes to mind is “Boys Don’t Cry.” This film is based on the life of Brandon Teena - a trans man brutally murdered at age twenty-one after being gang-raped. Brandon was not accepted



as a man by his mother and there was no silver-lining in the real-world story or the film adaptation of Brandon's story. Hilary Swank won the Academy Award for Best Actress in 1999 for her portrayal of Brandon Teena. A portrayal of an MTF-type Transgendered person hit the big screen in 2005 with the release of "Transamerica." This was a groundbreaking moment for the Transgender community and for them was something like gays finally seeing a non-judgmental portrayal of people like them in "The Adventures of Priscilla, Queen of the Desert" in 1994. The lead character in Transamerica was portrayed by Filicity Huffman. Her portrayal of Sabrina "Bree" Osbourne earned her an Academy Awards nomination.

If you don't know any LGBTQIA+ people and want to better understand their life experiences, then viewing some of the films mentioned here might be one place to start.

A little housekeeping is in order as we wrap up the part of our discussion related to all the letters in LGBTQIA+.

First, there is no "D" in LGBTQIA+. Some people mistakenly equate Drag with being gay or transgendered. The exact origins of the term "drag" are lost to the veils of time. Some believe it was derived from early theater shorthand. This would have been back in times when theater was performed on a rake where upstage meant to move away from the audience and downstage meant to move toward the audience. It may have been common then for female characters to be played by men "Dressed As Girl." Modern drag is an exaggerated caricature of female clothing, jewelry, makeup, hairstyles and affectations. Drag performers are most often gay but can be heterosexual. MTF-type transgendered people dress in female attire and aim to appear female - but their interpretation is not the exaggerated caricature seen in modern drag. Transgendered "T-girls" are most often interested in presenting somewhere in a range between ordinary or believably glamorous women.

You may have noticed that we haven't covered the "Q" in LGBTQIA+. That is because our discussion has to this point been linking each letter to a sexual identity which is rooted in biology. The "Q" represents Queer people. Queer has been used a pejorative against gay men in the past. Some people now claim Queer identity as a way of signaling rejection of traditional gender norms as well as the labels associated with the "L", "G", "B", and "T" in LGBTQIA+. So the "Q" in LGBTQIA+ is more of a political or cultural thing and less of a biology thing. Consequently, we will simply note that Queer exists as a sexual identity and move on.

Earlier in the discussion we noted that roughly six out of every one hundred people identified as one of the "flavors" represented by the letters in the acronym LGBTQIA+. I suspect that the fraction should be substantially higher. That is because there is likely a huge number of people in denial. You can identify these people because they are the ones quite adamant in their claims that homosexuality is a choice. I submit to you that when someone claims that homosexuality is a choice that you should believe them - but only as it applies to the person making the claim. They have just told you that they are a "latent bisexual." That is to say they are making the claim based on their own bisexual nature and the experience of choosing

to act only on the heterosexual urges they experience while trying to “pray away” other urges which they experience.

At this point an inquisitive reader should be asking questions - with the most obvious question being why all this LGBTQIA+ stuff appears unique to homo sapiens. Other species appear much more sharply focused on efficiency of procreation and don't seem to “waste” any resources on non-procreative sexual behavior.

The answer to that question is entanglement with our culture. But to understand that we are going to look at some of our technology first.

Our technology exempts us from many of the constraints which are imposed on other species by the core rules of evolutionary biology. In medieval times about one of every four children died before reaching their first birthday. Vaccination and other medical technologies have reduced that mortality rate from twenty-seven percent to less than one percent. The takeaway is that vaccination means optimal disease resistance is no longer a major factor in who survives and is thereby able to transmit their genes to subsequent generations. This is to say that our technology blocks “survival of the fittest” from keeping the gene pool clean of genes for deficient disease resistance.

Visual acuity is no longer required in humans. If “faulty” genetics cause poor visual acuity then corrective lenses are prescribed. The person with poor visual acuity may then live and reproduce at the same rate as people with excellent visual acuity - and in reproducing pass along genetic instructions for poor visual acuity.

This idea extends even to couples which require medical intervention such as “in vitro fertilization” to conceive children. Their children - conceived with the aid of medical intervention - are more likely to require similar medical intervention to conceive their own children.

We can see how technology interferes with the rules of evolution as it applies to homo sapiens. Our culture also exempts us from many of the constraints which are imposed on other species by the core rules of evolution.

One key way in which culture exempts homo sapiens from the usual rules of evolution is the religious drive to “be fruitful and multiply.” This comes into play when biological drives to procreate are not optimal when considered from the perspective of an evolutionary biologist. When considering this line of thought one must keep in mind that there was a significant change in society at the end of World War II. Prior to World War II communities were able to pressure everyone to conform - grow up, get married, have children. But the great wartime sloshing of humanity caused a situation in which communities lost that control over many people. At the end of the war unneeded soldiers and sailors were discharged in large numbers. Many of these soldiers and sailors remained in big cities where they were discharged - New York and San Francisco being among the places where many soldiers and sailors were released from military service. Many gay men chose to remain in those cities instead of

returning to lives of sexual repression in small communities where they grew up. Before World War II the most common allowable deviation from marriage and procreation was to join the priesthood. After World War II a critical mass of gay men collected in cities like New York and San Francisco. These gay men formed networks and friendships. Certain bars became meeting points where like-minded men could meet one another. On June twenty-eighth of 1968 there were riots in response to a police raid on one of these bars - the Stonewall Inn. Those riots are generally viewed as the beginning of the modern gay-rights movement.

The takeaway is that culture enforced procreation for most of time since the dawn of human civilization - meaning that biological drives to procreate need not be optimal.

At this point we have seen how religious/cultural imperatives might keep nature from weeding out genes associated with other than 100% heterosexual attractions.

But we shall soon see that culture/religion hasn't just kept "survival of the fittest" from weeding out genes for sub-optimal drives to procreate. We will see that our culture/religion selects for these sub-optimal genes for procreation. This may seem to be a wild assertion and to be absolutely counter-intuitive. But, following the evidence reveals that religion is the reason for the anomalous level of same-sex attraction homo sapiens.

There are a lot of steps to understanding how and why religion/culture has selected for genes leading to same-sex attraction and other "sub-optimal" procreational drives in humans. The first step is understanding the rules of evolution in a way that may be new for many readers.

Which came first, the chicken or the egg?

The answer to this may seem like a "slam dunk" because everyone should know that things were hatching from eggs long before the first chicken walked the Earth. Consequently, in order to get at the core of the question, we must refine the question. That refinement is to ask "which came first, the chicken or the chicken egg?" Spoiler alert: the answer to this question is going to be ultimately unsatisfying. The answer is that the question can only be answered if an impossibly precise definition of "chicken" is provided.

Biologists are generally quite keen on naming new species and categorizing living things. That preoccupation with categorizing is not helpful in attaining a systematic understanding of evolution. To really understand evolution, one must think of a species as a "snapshot" of a gene pool at a particular time. That is because a gene pool is constantly changing to optimize and adapt to changes to the environment in which the gene pool exists. Let's consider a hypothetical bird on continent like modern-day Africa. This hypothetical continent is being split apart by plate tectonics and something like the Great Rift Valley forms. The hypothetical continent is split in two and its rift valley becomes a new mid-ocean ridge. Our hypothetical bird species had roamed the entire continent. But the gene pool for that species is now split in two - there is no gene flow across the ever-widening expanse of ocean separating the two pieces of our original hypothetical continent.

Meteorologists have an understanding of the atmosphere which involves something called Hadley Cells north and south of the equator. These Hadley Cells cause a zone of relatively dry sinking air approximately 30 degrees north and 30 degrees south of the equator. This relatively dry sinking air is responsible for major deserts around the world. The area where the northern and southern meet near the equator is known as the intertropical convergence zone. A key characteristic of the intertropical convergence zone is convection driven by the heat of the sun bearing down from high angles near the equator. The resulting convection causes lots of rain in the intertropical convergence zone. If one looks at a globe, then one will see that tropical rain forests are found all around the equator.

Let us assume that the center of our hypothetical continent was near the intertropical convergence zone. Let us further imagine that the pieces have drifted such that one remained centered on the intertropical convergence zone while the other is mostly under the influence of relatively dry sinking air at 30 degrees north or south of the equator. All the gene pools on the second piece are going to begin adapting to the dryer conditions. This includes our hypothetical bird.

This is a work in progress - quite a bit of content will go between here and the bit below. In addition, the bit below will need to be considerably expanded. This paragraph serves as a sort of marker, with the preceding paragraphs mostly ready to go. While the following material is definitely “work in progress.”

If you are familiar with the name Brian David Mitchell, then it is most likely as the man who kidnapped and sexually assaulted Elizabeth Smart. She was age fourteen when she was kidnapped. Brian David Mitchell is less well-known for a manuscript titled “The Book of Immanuel David Isaiah.” The Book of Immanuel David Isaiah cast Mitchell as the latest Prophet bringing the latest “Word of God” to the people.

The Book of Immanuel David Isaiah doesn’t really represent anything new. It was an update meant to be appended to The Book of Mormon. The Book of Mormon in turn borrowed some key characters from the Christian Bible. The Christian Bible was in turn based on content of an older collection of religions. Together with the Islamic religions these religions comprise the Abrahamic branch of the evolutionary tree of religions.

Human history is often presented as a series of wars and the intervals between those wars. Human history is indeed largely about war. But in among all that bloodshed is also recorded a history of our various religions.

There are some simple rules governing biological evolution. These rules can be summed up as descent with change where the variations best at getting copied into the next generation will dominate. Other variations are consumed, starved or crowded out of existence. At the core,

there is a similar ruleset which governs religion. Religions best at getting copied to new hosts dominate. Less successful religions are crowded out. It is not coincidental that when religions are mapped out based on relationships to previous religions that the result resembles the familiar illustrations of the biological evolutionary tree.

However, evolution of religions is only somewhat analogous to biological evolution. The key difference between the two is the presence of “Intelligent Designers.” As covered previously, biological evolution has no foresight and no intelligence. In contrast, religion has had quite a few “intelligent designers.”

One such designer was L. Ron Hubbard. He wrote a book about “Dianetics” and created an accompanying religion called “Scientology.” Detractors of Scientology largely dismiss it as an extraordinarily successful tax-evasion scheme.

Joseph Smith is another well-known name among the “Intelligent Designers” of religion. The religion he created survives as The Church of Jesus Christ of Latter Day Saints (the Mormons) and numerous cult-like sects of Mormonism. The cult-like sects are typically involved with practices of the original LDS Church such as a “plural marriage.” Plural marriage allowed men in the original LDS Church to have multiple wives - with newer wives typically being quite a bit younger.

A student of religious history should see a common characteristic where an aspiring religious leader claims that a deity has communicated with them. That direct connection to the imagined deity gives the aspiring religious leader power. That power may be leveraged to the benefit of the aspiring religious leader. Those benefits may range from collecting tithes to authorizing extra wives for the aspiring religious leader.

A successful religion gains adherents - religions gaining adherents at a slower rate are crowded out of existence. Religions generally gain new adherents in two ways. One way is to recruit by sending out evangelists, missionaries, or proselytes to convert existing humans. The other way is to pressure current adherents to produce as many new humans as possible.

Experts shy away from defining evolution of religion. However, it should be obvious that there are some similar underlying rules governing “syncretism” or whatever else one might call the evolution of religions.

We will now consider two more concepts discussed by Aaron Lynch in his book “Thought Contagion : How Belief Spreads Through Society.” These concepts are “Quantity of Parenthood” and “Quality of Parenthood.” “Quantity of Parenthood” refers to characteristics of a complex thought contagion which encourage large families. An extreme example of this is observed in the modern-day Quiverfull Movement.

In archery there is a wearable container for arrows. Think of the character Legolas in Tolkien’s “Lord of the Rings: The Return of the King.” That wearable container is known as a quiver. In the Quiverfull Movement each new baby is to be received as a gift from their deity

- and that baby is also received as an arrow in the quiver of the Deity's army. Eight or more children per mother is not uncommon among adherents of the Quiverfull Movement.

We see somewhat less extreme examples in the "Pro Life" movement as they try to limit abortion and prevent access to birth control.

All those extra children will not benefit religion as new adherents if proselytes from a competing religion divert the potential adherents to the competing religions. Science education also represents a significant threat to the supply of a religion's potential hosts.

This is where the concept of "Quality of Parenthood" comes into play. "Quality of Parenthood" refers to characteristics of a complex Thought Contagion which tend to limit contact with fact-based learning or competing Thought Contagions. Religions generally have components forcing the religion of the parents on their offspring.

Examples of characteristics of "Quality of Parenthood" are plentiful. One need look no further than news accounts of the latest attempts to ban access to books about LGBT+ topics from public libraries. "Home Schooling" is also a means used to limit education and replace education with religious indoctrination.

It may seem that we have strayed far away from the promised explanation for sexual minorities and the political pressure on those sexual minorities to conform to rigid gender roles. The answer has quite a few interrelated elements. Please be patient as we cover those elements.