'Queertility'

Daniel Thomas Bixby Sykes
Utah State University

Follow this and additional works at: https://digitalcommons.usu.edu/honors

Part of the Anthropology Commons

Recommended Citation
ABSTRACT

Daniel Sykes, an Anthropology student at Utah State University used his Honors Capstone opportunity to understand the evolution of reproduction over the course of two semesters. During Fall of 2019, he focused on overviewing what Biological Archaeologists, Biologists, and Chemists understand of the evolution of various forms of reproduction from the distant past. During the Spring, he focused on the cutting edge allopathic research in fertility treatments and some of the social implications. Sykes posits that human society has the opportunity to treat infertility in the queer (lgbtqia+) community, given these up-and-coming treatments, even those forms of infertility that arise from queerness, per se. Queertility is a valid form of fertility that can be expanded as research continues.

Queertility
D.T.B. Sykes
‘Queertility’ is dedicated to

Doreen Hotchkiss
ACKNOWLEDGMENTS

I would like to thank:

Dr. Grow, for challenging me, inspiring me to create this project during her Behavioral Ecology class, pushing me to make this project interesting, and for being adaptable enough to ride the rollercoaster we were put through with patience.

Dr. Finley, who cheered me on and came up with creative ways to bridge disciplines.

Colin Anderson, who believed in me when I could not.

Dr. Miller, Amber, Lisa, Andy, and Amanda,
Sarah, New Sarah, Chelsey, Justina, and everyone who has worked in the Honors office during the last five years.

Lia Sorensen, Brett Reges, Dr. D. Andy Anderson, and Dr. Karin DeJongeKannan.

Cassie Bovie, Tess Arnold, Mike Ryan, Ashley Houston, and Kaitlyn Howerton.

And everyone else who made this possible.
QUEERTILITY CAPSTONE
(7475 words)

The purpose of an Honors Capstone Project is to demonstrate the culmination of a student’s capstone experience. I, Daniel Sykes, constructed the following two-semester endeavor to represent a recap of my journey at Utah State University. My undergraduate education began in the department of Biological Engineering, and explored the Social Sciences, as well as Archaeology and Biological Anthropology, my final degree was a General Anthropology emphasis, with Minors in Linguistics and Theatre and several years of Portuguese courses. I have been heavily involved with the Center for Community Engagement (previously the Service Center), the Honors program at Utah State University, the National Residence Hall Honorary, the Office of Global Engagement, OUTspoken panels, the Queer Student Alliance, Residence Hall Association, and the Sunrise Movement among other areas of involvement.

As a member of the queer community and as someone educated in fine arts, the humanities and social sciences, as well as the biological sciences, I have noticed a disparity in the medical treatment of queer bodies. In my Bioethics class, I focused my research on the needs of the intersex community and the discrimination they have faced in the west for millennia. In one study abroad, I researched LGBTQIA rights movements and perceptions of queer family in Peru.

This project was designed to overview the past, present, and future of reproduction. I did so by focusing Fall of 2019 on examples of evolutionary innovations in reproduction that we know from the bioarchaeological record and the comparative and genetic approaches to taxonomy. Then, for the Spring of 2020, I focused on the contemporary medical innovations
being made to the treatment of infertility in both queer couples and cisgender heteronormative couples alike.

**THESIS**

Reproduction is continuously evolving and changing, and has been since the beginning of life. Today, the infertility which is faced by queer couples is just as valid as the infertility which is faced by cisgender heterosexual dyad-conforming couples. With innovation and by furthering our medical knowledge, these conditions of infertility will soon be just as treatable among queer couples as those that are not members of the queer community.

**FALL 2019**

During the fall of 2019, I studied the evolution of reproduction. I had to demonstrate research skills from my courses in both Biological Anthropology, Archaeology, and Biology. This semester lined up a course of evidence for the reality that reproduction is continuously evolving. I demonstrated my learning with Two Bioarchaeological Timeline Powerpoint presentations:

- [https://docs.google.com/presentation/d/1MP1KPPOKuJAUByvpp_LrCs00JU3zoJKjL4xEcybC1o/edit?usp=sharing](https://docs.google.com/presentation/d/1MP1KPPOKuJAUByvpp_LrCs00JU3zoJKjL4xEcybC1o/edit?usp=sharing)
- [https://docs.google.com/presentation/d/1MkJxCSeq08I3DIg61ucB1x0t-CKgoGHE96dUYI_j1A/edit?usp=sharing](https://docs.google.com/presentation/d/1MkJxCSeq08I3DIg61ucB1x0t-CKgoGHE96dUYI_j1A/edit?usp=sharing)
BIOARCHAEOLOGY OF THE EVOLUTION OF REPRODUCTION

Asexual Reproduction innovations from 4bya-3.5bya and onwards

Many single-celled organisms had a phospholipid bilayer, and through Mitosis, a cell can clone itself. Binary fission exists when a parent divides in two to produce two offspring, only prokaryotes reproduce this way.

Haploidy is a feature often found in asexual reproduction but is also present in unfertilized eggs in sexually reproducing species today.

Homologous Recombination: 2 identical or similar pieces of DNA are regularly exchanged to protect the DNA from damage. This produced an advantage for Diploid individuals and is one of the precedents underpinning a context in which sexual reproduction would be selected.

Asexual Reproduction innovations from 3.5-2bya and onwards

Multiple fission occurs in protists like sporozoans and algae. This is where one nucleus splits into many segments, and then as the cytoplasm divides (as is done in mitosis) produces more than two offspring with itself.

Budding offspring are produced as a smaller copy of a usually multicellular parent which has produced the bud. This contrasts subtly with fragmentation in which reproduction occurs whenever the parent organism is broken.

Sexual Reproduction innovations from 2bya-1.2bya (Proterozoic) and onwards
2 billion years ago (bya): single-cell protists use three main (parasexual) pathways:

1. Conjugation: A tube is created between the cells of a single celled-organism and another and the DNA is passed between the two

2. Transformation; is when a single-cell organism picks up a random piece of DNA in its environment

3. Transduction: A virus transfers DNA from one single-celled organism to another.

**Sexual Reproduction innovations from 1bya-1.5bya and on**

Meiosis is hypothesized to have arisen in the prokaryotic ancestors of eukaryotes because of how early in eukaryotic evolution sexual selection arose. These processes resemble the way that archaea have been shown to bio-communicate.

Virus RNA is hypothesized to have begun sexual reproduction because we have evidence today that single-stranded RNAs, such as the flu, and reoviruses.

Partial Predation is a hypothesis that one cell would eat another, and incorporate the DNA instead of digesting the whole cell, but instead use the DNA.

Gamete dimorphism and anisogamy likely resulted from selective pressures against medium-sized and moderately mobile gametes.

Spore Formation is also common during the life-cycle of multicellular organisms. This is specifically an Asexual mode of reproduction where meiosis usually produces haploid spores.
instead of the gametes common in animals and some protists. These haploid spores grow into many cells, and through mitosis create their gametes.

Hermaphroditic reproduction involves parent organisms sexually reproducing with both male and female gametes.

**Oviparity/ Viviparity 1.5bya -.2bya (200mya) and onwards**

Oviparity is a strategy wherein a parent lays eggs. Reptiles were the first to use an egg-shell, although oviparity had been around a while.

Viviparity becomes pretty successful among vertebrates, although mammals often get the credit for live-births.

Oovoviviparity is a non-placental strategy where-in a yolk and egg system sustain offspring in an egg (which is in turn in a parent) until they are ready to hatch and be birthed.

**Sexual Reproduction from .36bya (360mya)- .16bya (160mya)**

Vegetative propagation is a later-evolved asexual reproductive strategy operated by plants in which plantlets or specialized leaves or rhizomes or stolon produce new plants or alternatively bulbs or tubers, some use shoots to create colonies of multiple genetically identical plants.

Gymnosperms are plants that produce naked seeds without an ovary. They have flowers and fruit which have coevolved with insects and vertebrates. Angiosperms have an ovary. This strategy shows up in the record later than gymnosperms.

**Mammal Evolution: Crown Mammals**
Aka. “True Mammals” is the clade that includes all living mammals today and their most recent common ancestor.

An Amniote is any vertebrate that undergoes embryonic or fetal development within an amnion. Reptiles, mammals, and birds can sometimes all be in this category. An amnion is a thin closed membrane sac that contains amniotic fluid.

**Amniotic Traits**

Color vision cones: red, green, and two kinds of blue were present in early amniotes, but crown mammals did not inherit the green one. All species inherited the red ones. All extant species have lost one of the second blue cones. (Monotremes maintain one, marsupials and placentals maintain the other. Cetaceans (a type of placental) lost both.

Teinolophos from the lower cretaceous was the earliest known monotreme. It was very similar to the platypus, so there’s some debate as to whether echidnas diverged prior to this fossil or not. Genetic evidence suggests that echidnas diverged from the platypus line as recently as 19-48Mya (that is when they moved from being semi-aquatic to being terrestrial).

**What is a monotreme?**

Monotremes have features from cynodont ancestors: They have “one hole” for reproduction and waste removal (although it is important to note that they have separate holes for breathing and eating, et cetera). They lay uncalcified leathery eggs like some reptiles.
They do not have nipples, but their bellies sweat a nutritious beverage like unto milk. There is a hypothesis that mammary glands may have first developed as modified sweat glands to moisturize eggs before they began to be used as nutrition for infants.

This can be seen by paleontologists by a dentary bone with a small or absent coronoid process. An external opening for the ear at the posterior base of the jaw. They have a primitive pectoral girdle (coracoids, clavicles, and interclavicles). Sprawling or semi-sprawling forelimbs.

**Theria**

The clade Theria includes Eutheria (aka. Placentals) and Metatheria (aka. marsupials) (and of course their most recent common ancestor). Therians had special shoulder joints and attachments, as well as special ankle joints that distinguish them. They also had tribosphenic molar teeth. Their descendants are what we consider mammals today, although not all mammals reproduce the same way.

**Marsupials (surviving Metatheria)**

Nourishment in the uterus is achieved through a yolk-sack which the embryo is nourished by. Some marsupials also have a placenta-like organ that connects them to the wall of the uterus (Koalas, wombats, and bandicoots).

Pregnancy is very short, and infants are born very small and needy, it has been suggested that this protects the fetus from the immune system. Newborns are born and crawl to a nipple within the pouch. Muscles around the mammary glands pump milk into the newborn because they can’t suckle. The pouch is evidenced in epipubic bones which support the pouch. This is
likely a symplesiomorphic set of bones though because it is found in fossilized eutherians and monotremes as well. Some marsupials have 4 molars, and they all have a palatal window under their skull.

**Placental Mammals (Eutheria)**

Extant placental Mammals do not benefit from epipubic bones. Those bones aid in stability in mobility, but in placental mammals, this was less advantageous as the abdomen expanded to accommodate pregnancy.

There’s a hypothesis that retroviruses helped placentas evolve. There are a few features that are tied to this hypothesis. A syncytium interface between the placenta and uterus (allows for oxygen, nutrients, and waste to pass, but not blood and cells that cause an immune response. These retroviruses also made pregnant women have weaker immune systems overall.

**Placental Taxonomy**

Juramaia is the earliest hypothesized eutherian (160mya), and Eomaia is dated to 125 mya in the early cretaceous. It is controversial because of many ancestral traits that exist in contemporary marsupials and monotremes. These include a narrow pelvic outlet and epipubic bones. All surviving Eutherians are members of Placentalia.
THE STATUS OF RESEARCH INTO “QUEERTILITY” TREATMENTS

In the Spring of 2020, I studied the contemporary and up-and-coming treatments for fertility and compiled tables accordingly. This required me to demonstrate my skills in organization and to research information in cultural anthropology, biology, ethics, and medicine. This system allowed me to exhibit the innovations being made in fertility treatment, reproductive biology, and in the legal structures surrounding infertility treatment.

Queer infertility is not only as real as the infertility experienced by cisgender heterosexual dyad-conforming couples, but medical advancement and research will also allow such conditions of infertility to soon be as treatable among Queer couples as those who are not lgbtqi. My final products are Queertility Treatment Charts, my online presentation of them on YouTube, and an edited transcription of that presentation for those people who are hearing impaired or who would prefer to read my information.

Queertility Treatment Charts:
https://docs.google.com/spreadsheets/d/1Uac3dK-c_JwIyP5VS5PCwipmlmpptDadOsPWkyhLKgc/edit?usp=sharing

YouTube Presentation:
https://youtu.be/L0Wk0SiJJus

Transcription in Anthropology

Cultural anthropologists and many social science researchers rely heavily on recordings and transcription for the work that they do. Transcription is useful for quantifying linguistic data
and for publishing interviews in academic journals. The following transcript demonstrates my
ability to transcribe auditory information. In order to make the transcription more accessible, and
because the purpose of this Transcription is not being analyzed for research, I have also edited it,
so that the information contained within are accessible to the public and are easier to read.
People who do not prefer visual media, as well as those who are hard-of-hearing, can use this
transcript to gain an understanding of what I learned over the course of my research Spring of
2020.
Hello everyone, this is Daniel. I'm here to explain the chart that I made for my capstone project. Under different circumstances (Not during COVID-19), this would have been a poster displayed in both building A of the Living and Learning Community (where the honors office is) but also in Old Main along the sociology anthropology department.

My research, to recap, started last semester. The first phase of the project involved the history of the evolution of reproduction. I catalogued several moments of evolutionary change in the bio archaeological record. This helps us to understand how humans have evolved as well as how other species have evolved over time.

This served as a precedent for me to come into this semester and then say, “Hey, this is where we can go in the future!” I’ve investigated the social implications of these changes in fertility as part of my research as well; however, this document catalogue the options for treating infertility in queer relationships. This excel document is organized in two main tables: The first documents currently available treatments and then underneath that table there is an up-and-coming fertility treatment section. These two graphs are organized so that on the left hand side you have listed identities that could be associated with a person (in either a couple or a co-parenting pair) who wants to carry a fetus, and along the top of each of these tables it lists possible identities for people who do not want to carry a fetus. This enables the reader to pick any identity and follow the graph to understand their fertility options.

If I were to talk about myself and my partner, for example, both of us are cisgender men who (as-far-as-we-know) have the ability to produce sperm. If I have a desire to carry a fetus
with contemporary technologies and legal frameworks, there are no carrying options available to me. That means that the only options that I would have available in order to have a genetically related child to either me or my partner would require an IVF donor egg and a surrogate. Under some legal frameworks, the other option we have in order to have a child is adoption.

For another example let's take Ellen DeGeneres as an example. As far as I know, she doesn't seem to want kids, but she is a cisgender woman who is also married to a cisgender woman. I don't pretend to know things about their fertility status but there are a few options available to them right now. So under a hypothetical situation wherein Ellen wanted to carry a fetus, and wherein Ellen has eggs and a functioning uterus, you can find that category along the left-hand side of the table. Moving horizontally from there, assuming she and Portia both have eggs, then they have the option to have in vitro fertilization (IVF) with donor sperm, or they could adopt, or they could have a donor embryo, or they could also do intrauterine insemination (IUI), so that's another option that's available for them.

To give a non-human example, my family has a few dogs and the two I’ll use as examples are named Winston and Ginger. Both Winston and Ginger have been respectively neutered and spayed. That means that Winston does not have testes and Ginger does not have ovaries. In order to use this graph to see what technologies would be available in reproducing your pets, you would need to recognize that we do not understand the gender of our dogs, so for the sake of discussion, we would need to presume Ginger to be a cisgender woman who does not have eggs but who does have a uterus. We are going to assume that Ginger wants to carry a fetus, this allows us to find her along the left-hand side of the graph under “sterile cisgender woman with a uterus”. Ginger’s hypothetical co-parenting partner in this situation would be Winston who is
effectively a cisgender male. Because Winston is sterile and we are presuming he does not want to carry a fetus, you can find a column for a cisgender male who is sterile along the top of the graph. The next step is to follow the two lines until they meet on the table. What you will be able to see is that they don't have genetic options at the moment because neither of them have eggs or sperm. That means there are no options we pet-owners have in order to get puppies that are a combination of Winston and Ginger, or any cisgender-heterosexual pairing of spayed and neutered pets.

However, in the future that is an option, which brings me to how the lower table works. The second table is titled: “up-and-coming fertility treatments”. There are a lot of these that are really rather radical, so I'll explain them first by talking about Winston and Ginger's options here, and then after listing what those options are, I'll talk about the other options that exist. So we're presuming that Winston is cisgender just because we're able to use the graph for that reason. Ginger is sterile but does have a uterus, so in the future there will be the option to have what is called in vitro oogenesis or in vitro spermatogenesis. To simplify the way that those two forms of gametogenesis work is that a researcher or physician would take a donor's cells (often they are skin cells in mice so far). They have successfully done this technique with oogenesis in mice already at several research centers around the world. These researchers took those skin cells and turned them back into pluripotent stem (iPS) cells, and they differentiated those cells which had come from a male mouse into eggs by placing them into an ovarian environment (in-vitro oogenesis). Stem cells work by taking signals from the environment. In the future, we should be able to replicate those signals ourselves. That is how we know how to make pluripotent stem cells now. However, at the moment we need the (ovarian) environment. Then the researchers
were able to accomplish a ton with the egg cells they had created (from stem cells from skin cells from a male Mouse). The male mouse in question had egg cells, which meant that those eggs were able to be fertilized with sperm cells from another male mouse, and then by using in-vitro fertilization in conjunction with a surrogate female mouse, they were able to actually produce viable pups.

This is one of those processes that is feasible in humans for infertility patients (whether due to their membership in the queer community or because of a number of other reasons). It is feasible in humans because it is feasible in some other animals closely related to us. Researchers haven't yet successfully performed in-vitro spermatogenesis in any animals, but some are working on it and getting close. It's only a matter of time.

Going back to Winston and Ginger, these two of my family’s dogs don't have any kind of gametes because they do not have any kind of gonads at all. In the future we could produce gametes for them from their own skin cells (gametogenesis). We could use these gametes, and through in vitro fertilization they could be fertilized. Then, because Ginger still has a uterus, she could carry the puppies or we could use a surrogate carrier for the puppies. The latter option would be a really interesting social phenomena because there are some typical behavioral changes when dogs undergo pregnancy, so it brings up interesting questions about the choices pet owners may end up making.

What's another example? There are some Youtubers whom I follow that are a couple, and one of them is a trans man. For the sake of discussion I'm going to call him Timothy. Timothy’s fiancee is a cisgender woman, and for the sake of discussion her name is going to be Cynthia. Timothy and Cynthia are about to be married and they like the idea of having kids in the future.
Timothy doesn't want to carry a fetus, but Timothy does still have eggs. Timothy could have frozen eggs in the past as well, but Timothy still has ovaries in this scenario, so on the chart you would find a transman with eggs along the top of the graph. This allows you to follow down the column until the cell you are looking in aligns with a cisgender woman to represent Cynthia.

For the sake of discussion, Cynthia might be having some issues with her uterus. Timothy is a trans man who has eggs, and for the sake of discussion Cynthia also has eggs but her uterus is malfunctioning in some kind of way. You can see on the “currently available options” table that she has the option to have a uterine transplant even now because she is a cisgender woman. To explain, in the last few years, uterine transplants have become accessible to some cisgender women. The way that that works out is either a living donor or a post-mortem donor donate their uterus, and then surgeons attach the donor vagina to the recipient's vagina so that the donated uterus is attached to the recipient’s blood supply. It works out so that physicians still do in vitro fertilization, and the recipient cannot deliver vaginally, so the recipient has a c-section. This means that you have this situation where Timothy and Cynthia are trying to have a baby and (as of now, with contemporary technology) Cynthia can actually get a uterine transplant if she wants to carry the fetus and if they use in vitro fertilization they could have donor sperm that was either from a relative of Cynthia's (with Timothy’s eggs), or the sperm could be from a relative of Timothy's (if they use Cynthia’s eggs). Alternately, if Cynthia wasn't able to afford a uterine transplant, or if that procedure wasn't available to her due to discrimination or other barriers of entry, the other option that this couple currently has access to would be surrogacy or adoption, and there's also something known as embryo transfer that they could do if they weren't able to get donor sperm for some reason. Even though in this latter example, Timothy and Cynthia
couldn't have a child that has their DNA, but Cynthia could experience carrying that child if that is what she wanted. Those options are the status quo right now.

Moving to the next chart, still in Timothy's column (transman with eggs) traveling down to find Cynthia’s row (she's a cisgender woman and her uterus is for the sake of discussion not working, and she still has eggs), we can find the options this couple will have in the future. This couple could still do the uterine transplant, but the lower table only includes up-and-coming treatments. In addition to a uterine transplant, this couple could use spermatogenesis.

To explain some social aspects of their decision, knowing Timothy he probably would prefer to produce the sperm, but in the future it won’t necessarily matter either way physiologically. This couple could even potentially have one kid that has a sperm from Timothy and another kid who has a sperm from Cynthia and each of them could donate eggs at different times. The reason I bring this up, however, is that some transmen today avoid freezing their eggs or would avoid donating eggs or in the future will avoid providing eggs for this in-vitro fertilization process. This is because, in order to retrieve eggs from ovaries, a patient has to be subjected to a bunch of hormones. This hormone cocktail is hard even on a cisgender person’s body. It can be worse though. When a transman is experiencing dysphoria they have this whole layer of psychological states that are involved on top of any physiological changes.

If you were to start injecting all the required hormones in order for Timothy’s ovaries to produce and release tons of eggs to be extracted, that process might cause Timothy a lot of dysphoria. That is one of the reasons that I said that Timothy is more likely to undergo spermatogenesis in order to have a child with Cynthia. So in the future, Timothy would donate some skin or some bone marrow or another cell that is easy to turn into a pluripotent stem cell,
and then after that process the cells would be taken and differentiated into sperm cells in this scenario. After that, through IVF Timothy and Cynthia could actually combine their gametes and produce a zygote that has both of their DNA. Then, with the uterine transplant (if Cynthia didn't have a working uterus and wanted to carry) they could actually have a child in every way that a cisgender man and a cisgender woman could have a child.

Another feature I wanted to highlight are these stars (aka. Asterisks) that I have on the excel document in the “up-and-coming fertility treatments” section. These stars represent all the pairings of identities who in the upper table (and with contemporary technologies and legal structures) actually could have a child who is genetically related to both parents and is carried in the uterus of the partner who desires to carry them in their own uterus. An example that demonstrates this is so an intersex or non-binary person who wants to carry a fetus whose partner is a trans woman who has sperm.

So we would find an intersex or non-binary person with eggs who also has a uterus along the left-hand side of the table. If this person’s partner is a trans woman with sperm, the two of them actually can just have sex and have a baby. This happens already. There are plenty of queer couples who whether if both are trans/intersex or if one of them is trans/intersex and they have compatible gametes they can already have children the supposedly “traditional” way (which doesn’t include traditions like-unto adoption). However, if for some reason they weren't able to specifically have like sex to have like to produce the fetus, then they still could use in vitro fertilization because one of them has sperm and one of them has eggs and if they have an available uterus or surrogate, it all can work out with contemporary technology. Couples or co-parent pairs who have this privilege are allocated with the aforementioned asterisks.
Say that a different transwoman who also happens to have sperm --- let's name her Veronica --- is lesbian, and Veronica’s partner (Regina, a cis-woman) has issues with her uterus, but wants to carry a fetus, but Veronica’s partner Regina does have eggs. Right now we have the technology needed to bring them their desired outcomes. We have the access because of Regina’s cisgender privilege in the medical community at this point in time to get a uterine transplant. Since Veronica has sperm and Regina has eggs, IVF works perfectly fine. As always though, in many countries this couple does have access to adoption. Adoption is in many situations ideal, but a lot of people want a specific social connection and cultural access to legitimacy rather than discrimination. The asterisks in their box indicate that they have everything lined up so that as of now medically they can have exactly their desires. This is only the case though, because Regina wanted to carry a fetus and she's able to do that if she has a uterine transplant. Fortunately for them, Veronica is the one that doesn't want to carry a fetus so she doesn't have to do that so they can both have genetic offspring.

I wanted to go over a section in Red on the Excel sheet that's called “further down the road”. It can be found to the right of the second table. The items listed in this small table are things that are more difficult for the medical community to achieve. These are things that researchers aren't currently doing trials of in the literature, but are theoretically possible. These treatments are not going to be available in the next couple decades.
One example would be growing ovaries for trans women and non-binary folx\(^1\). Ovaries would mess up the hormones of anyone who identifies as a man, so they likely would not be applied to that end. Another success from this research would mean that if a transwoman wanted ovaries there's a good chance that researchers will learn how to grow ovaries for her with stem cell technology in combination with organ printing technology. The medical community can already print hearts, for example, as well as skin and those kinds of organs which don't have many types of tissues in them. This process uses a mold in order to cells in a nutrient bath. Because researchers are learning to print increasingly complex organs, we will likely be able to grow ovaries after several more decades. Similarly, we would be able to grow ovaries for cisgender women who are sterile as well.

Growing testes is a process which would help to treat transmen and/or non-binary and intersex folx and its theoretical basis is on the same foundations as the lab-grown ovary process. Researchers can use lab-grown testes to treat sterile cismen who either don't have functioning testes or don't have testes at all (like if there's an injury or something involved). Again that's further down the road.

Another difficult line of research regards couples without any y-chromosomes. In order for a couple to have a child with a y-chromosome, current and up-and-coming technologies require that at least one genetic contributor have a y-chromosome. Contemporary researchers are

---

\(^1\) The term ‘folx’, is a reclamatory term which emphasizes the existence of non-binary and intersex people. Although the singular ‘folk’ and the plural term ‘folks’ are unisex terms, ‘folx’ serves to validate the historic erasure of non-binary identities in the west and the non-consensual medical disfigurement of intersex bodies. The spelling system of ‘folx’ serves as a virtue signal for those who want to be recognized as allies to the non-binary and intersex communities.

‘Folkx’ is often emphasized by indigenous activists whose communities did not have binary gender systems prior to global european colonialism and imperialism. ‘Folkx’ also has its echoes in the black power movement, where leaders like Malcolm X adopted the surname X, to emphasize the identity erasure perpetrated by the slave trade. In these scenarios, the letter ‘X’ expresses an acknowledgement and rejection of racial and gender apartheid.
working on developing what has been conceptually named “artificial chromosomes”. This technology will be way down the road. Artificial chromosome technology will require extensive ethics testing and testing to see if there are genetic issues it causes. These complications mainly concern epigenetics. It turns out that fertile cisgender women and virile cisgender men wrap epigenomes differently. It is a bizarre set of phenomena, but for some reason cisgender male bodies code different experiences into the DNA than cisgender female bodies do. Researchers and ethicists want to make sure different potential complications like that are comprehensively understood before we use these technologies to treat infertility.

It is vitally important that we get artificial chromosome research to function incredibly smoothly before, for example, cisgender lesbian women are able to have offspring with a y-chromosome. To cite a social dynamic which can compensate here though, there's also the dynamic where one of these cisgender lesbian women can have donor sperm from a relative (as long as she does not use her own eggs). That sperm-donor does share DNA with the woman --- a significant portion of their DNA if they're a sibling especially --- and that would be a way for a lesbian couple to have a child with a y-chromosome who is actually biologically related to both parents.

The last technology I listed here is also on the “up-and-coming fertility treatments” chart. It is indeed an up-and-coming fertility treatment; however there are aspects or applications of it that are more difficult to figure out. These involve political dynamics and dynamics of identity and probability. The technology about which I refer is the application of the uterine transplant process to persons who identify as male and who do not currently have a uterus. Compared to the other technologies in red, in this “further down the road” list, male-uterine transplant technology
could probably get there sooner than some of these others. This technology is also listed in red on the “up-and-coming fertility treatments” chart because of the controversies surrounding it combined with its relative ease of medical application.

To give an example of the differential application of this technology, take a transman who doesn't have eggs but who does have a uterus. Navigating the “up-and-coming fertility treatments” chart, going up to find a row belonging to a sterile transman without a uterus who wants to carry a fetus. For the sake of description, this man is with a fellow transman who is sterile. They would have to do both oogenesis and spermatogenesis. In addition to this, they'd have to do a uterine transplant because this first transman who desires to carry doesn't have a uterus. This transman might still have a vagina depending (we don't know how they were born whatever is the situation there or if they had a hysterectomy or any number of things). So, because this transman might have a vagina, a physician could actually connect the donor uterus and the donor vagina to the recipient (carrying) transman's vagina. That process would facilitate the necessary blood flow to the uterus. This allows the recipient to keep the organ of the uterus alive through the duration of the organ acceptance process, healing, and the duration of pregnancy.

To contrast, a cisgender male like myself has an abdominal cavity. If my partner and I did in-vitro fertilization today, if a relative of either myself or my cisgender male partner wanted to donate an egg to me, we could produce a zygote as a couple. That zygote would have genes related to our family members. The next step that we technically could do, would be to take that zygote and make it an embryo by attaching it to my abdominal wall. THIS OPTION IS NOT CURRENTLY SAFE. Alternatively, the safe thing to do would be for me to use a surrogate. My
partner and I have a few cisgender female friends who have functioning uteruses who have actually offered to serve as surrogates potentially in the future, so what's interesting about this scenario is that I could have offspring related to my family members, and one of my friends could carry the fetus, and we'd have a baby.

However, the point that I'm trying to get to is that because I have an abdominal cavity a physician can take that zygote and put it in my abdominal cavity against the abdominal wall, and my cisgender male body would know to readily supply blood to the fetus. This surprising phenomenon is because that is how mammalian instincts naturally exhibit. Cisgender women have this happen from time to time if the fingers at the ends of their fallopian tubes do not successfully catch the zygote, or if the zygote lodges in the fallopian tubes. All of these phenomena are very dangerous ectopic pregnancies. In this scenario, I would probably die, the fetus would probably die (it is not a great idea), and cisgender women who have this happen have very dangerous pregnancies in these scenarios too. I am not recommending that anyone ever use this as a treatment because of the danger involved.

However, my point is that, biologically speaking, my cisgender male mammalian body doesn't care that I was assigned male at birth. My body does not care that I identify as male regarding pregnancy either. To anthropomorphize my body, it would just respond by saying “Yo, I'm gonna put some blood over there and feed that fetus because that's my job”. So, my body would supply blood to a pregnancy without much prejudice compared to even a cisgender woman's ectopic pregnancy. This feature ties back into the “Queertility” model I have constructed as a whole over the course of these two semesters: Queerness sometimes bestows a
form of infertility, but this experience is just as medically legitimate as the infertility that heterosexual dyad-conforming couples suffer, and it will quickly be equally treatable.

All in all, that is why a uterine transplant probably is an option that people who identify as male who were also assigned male at birth could feasibly undergo. In undertaking cisgender male uterine transplants, as long as researchers designated or fashioned a suitable pre-existing organ which functioned well as an attachment for the uterus from which to get a proper blood-supply connection, a cisgender male body would keep the organ of the uterus alive. However, it is important to note that that process is really complex. The process wherein researchers figure out which organ would be suitable sounds like a science-fiction story to our sensibilities in the here-and-now, but that impression does not mean that this process is not a viable reality.

An important thing I have learned over the course of these two semesters is that (apologies for anthropomorphizing) nature doesn't care who you are. Natural selection regularly takes advantage of flukes of chemistry and DNA-replication in order to produce novel forms of reproduction, whether sexual or asexual. Although it is important for researchers to be prudent and to go through careful, ethical, and logistical preparation, Nature is not going to judge anything If it works it works. From a Western positivist scientific philosophical framework, Nature cannot judge, but the point is that if a novel reproductive process works, it can serve as a social future for the offspring of humanity. What this means is that if researchers and physicians can figure out the medical process behind uterine transplants to cisgender male recipients, then it is a possibility.
The other technology that ties into the accessibility of uterine transplants is that eventually uteri will be able to be printed. It should be emphasized that this process is way down the line, but until then we will only have a finite amount of donor uteri. At our current status quo it is not politically, economically, nor logistically feasible that our society will be able to prioritize and support some of our finite donated uteri going to cisgender men. Men do have access to surrogacy and adoption. Parents can, where it is legal, compensate surrogates well (if they can afford doing surrogacy in general), However, in other places it is illegal for potential parents to compensate surrogates financially. In those countries, surrogates need to be either a friend of the parent, and/or a surrogate that has volunteered. All those scenarios are easier for our collective medical community, because they are easier on our resources. For any of the uteri from our finite supply to go to people who identify as males, that seems highly unlikely in the upcoming decades. We will likely confine access to our resources for carrying fetuses to women and non-binary folx. Even with transwomen it seems quite likely that they will be included in this process eventually, not only because they identify as women, but also because some of them will have a vaginal canal which would allow for the uterus to be attached to a blood supply.

There are plenty of cisgender women who do not actually want to use their uterus to carry a fetus, and they should not have to. Whether these Cisgender women do not want to have kids at all, or even if they simply do not desire to carry children, they should have access to hysterectomies. There are plenty of transwomen today who actually have that desire and would exhibit gender euphoria (the opposite of gender dysphoria) if they were given this opportunity. These women would have gender euphoria about being able to carry a fetus for the first time in their life in-spite of the sex they were assigned at birth (male or intersex). That would be an
amazing opportunity. If a transwoman has undergone bottom surgery (or was born intersex), with contemporary technology, she would have a vaginal canal to which you could connect the donor uterus’ vaginal canal. The transwoman would not be able to deliver vaginally, but that is already the case for many ciswomen.

Those are most of the scenarios that I wanted to share to explain what I have learned during these two semesters about past, current, and future innovations in reproduction. I do have a few questions that should be explored in future research. During my review of the social science literature on the repercussions of further and contemporary innovations in reproduction, I listened to a few podcasts. Some of these podcasts were on YouTube and some of them were on other platforms. One of the social dimensions that I noticed repeatedly coming up in these discussions was that some queer couples who choose to have children today are discriminated against. This is especially true for those potential parents who are currently electing to have children that are genetically related to either both or just one of the parents. This discrimination that queer parents face is not only experienced from outside of the queer community. Within the queer community there is a discourse from some queer people who think that folx who want to become parents are not being “queer enough” if they choose to have children. This perception is especially the case if parents choose to have children in a supposedly “traditional” way (whether there is an emphasis on genetic relationship as “traditional” or the reliance on two-parent social structures as “traditional”). I found those conversations fascinating.

Future researchers, whether they be Anthropology students in the Honors program, professors, et cetera could construct a study to investigate the discrimination faced by queer couples. Researchers could ask members of the queer community (Queer Student Alliance at
Utah State University, other members of the queer community surrounding Logan Utah and research participants accessed online) to list whether and in what ways they have been discriminated against, particularly as it pertains to them wanting kids. This research could analyze both discrimination which queer parents face from the straight cisgender dyad-conforming community as well as discrimination from within the queer community itself. Discriminatory people in the world whether they are discriminating as outsiders or whether they are causing discrimination and division from within the community because of X Y or Z factors.

To give an example of discrimination faced by parents that I know, I have a few friends who are raising their children and waiting for their children to tell them their gender. They do this out of respect for the dignity of their children. One of these friends of mine uses they/them pronouns for their child. To this day, I have no idea how their child identifies, nor what assignments doctors may or may not have made at birth. Eventually that child will be old enough to be able to explain their gender identity to other people. Their identity may line up with their sex-as-assigned birth (intersex, female, male), or it may not. This child is fortunately really lucky to have been able to find a preschool where the instructors have been trained to be accepting and open-minded. It took a really long time for them to find the school because they did face a lot of discrimination. There has not been a ton of research in these areas of discrimination yet, so we do not know the nuances of the experiences that queer parents have as a whole. It would be way cool if the research that I have done here with this project were expanded by future researchers in those ways.

In order to get an understanding of the diverse kinds of parents in the queer community, as well as people who are trying to become parents, it would require a decent sample size for
statistically significant social science research. Even if that weren’t possible, smaller sample sizes can be used to help young researchers to get experience with the methods employed in the social sciences. The researcher would need to navigate the ins-and-outs of IRB approval and would need to gain experience with participants and both in-person and online methodologies. They would need to learn how to quantify data and how to record qualitative factors. The researcher would need to employ robust consent forms and be able to maintain anonymity efficiently and effectively.

Over the last two semesters, this project has done a brilliant job representing my experiences at USU. My first major at this institution was Biological Engineering, and I explored majors for a few semesters because biological engineering did not allow me to take enough classes, nor gave me time to do many extracurricular and cocurricular activities. I was being encouraged by my advisors to not take Anthropology classes, nor Portuguese, Linguistics, nor Theatre classes, and exercise classes. That did not line up with my goals for my undergraduate experience. I really wanted my undergraduate experience at university to make me a well-rounded person with a wide range of skills. When I realized what I wanted better, I changed my major and I really appreciated that choice. After Dr. Dengah's Anthropology of Sex and Gender class, I switched majors to Anthropology with a Cultural Anthropology emphasis. To come full-circle though, my classes in Biological Anthropology and Archaeology actually reignited my interest in the natural sciences. That realization led me to switch majors from cultural anthropology to general anthropology and it allowed me to lean back into those roots I had found in my experiences at university. General Anthropology also allowed me to avoid having prerequisites that would push me into my sixth year of undergrad rather than graduating...
after five years. The next question regards what my next steps in life are. What direction will I take graduate school? It could be Medical Research like this capstone implies, or it could involve sustainable MacroEconomics or Urban Planning. I am very grateful to be able to say that I have a wide knowledge base from which to work.
CAPSTONE REFLECTION

(1447 words)

Education, like so many things in life, sometimes feels non-linear. It can be difficult to see the end of the road when it does not yet exist. This can happen in trying to decide a major, in navigating unfamiliar forms of bureaucracy, and in trying to figure out what the next step is during a pandemic quarantine. Like so many others in the “Class of COVID-19”, this summer of 2020 is uncertain. What doors will be open? How do I move away when traveling is less of an option? What jobs will be open?

I am incredibly proud that I have finished my Capstone. The product has been itching at the back of my mind for a good while now and it is so empowering to see it realized. I managed to create a project that represented many of my interests and most of the classes I took. “Queertility” ties into Anthropology, Biological Engineering, Ethics, Law, Linguistics, and even Socioeconomics. While it did not directly reflect what I learned from my Theatre classes, my final product required skills I learned in the Theatre department at Utah State University. In navigating my many majors, I had no clue that I would be able to pull them together in this project, that was an end of the road that could not be foreseen.

The process of accomplishing the capstone itself worked this way as well. Although I had a topic planned and stuck to that, my advisor and I redirected our efforts towards an emphasis on visual representation of data and communicating my research that way. I meandered through the literature and researched what inspired me, using the plan as a guide and renegotiating anything we needed. Furthermore, as we realized that community spread of COVID-19 had begun in the

Queertility
D.T.B. Sykes
United States, we had to adapt again. That meant that we transitioned to online, and my poster presentation had to be canceled, in order to be replaced by a video presentation of my visual representation of the information I had gathered.

In addition to this, I have struggled navigating the paperwork involved. I have had to get past thinking I was bothering my professors and advisors when I asked them to sign x, y, or z form. I needed to realize that I was being my own worst enemy. Fortunately, I had supportive faculty to reassure me. As I approached the final compiling of the project, there were a lot of final pieces that took me by surprise.

I never thought my graduation would feel this way… like an exhale dissolving into the deep dark night air, or like a piping-hot cup gradually going cold. The challenges of my Capstone project allowed me to center myself on my core passions, and to think proactively about what I need to do next. Most importantly though, it taught me that I am nothing without the people around me. An honors student builds a network of support.

Navigating the honors program the last several years has been difficult in part due to the dissolution of my cohort of honors students. Honors graduations have continued the last five years. The Honors program requirements became more and more robust. The Honors department has become more organized and rigorous and student opportunities have expanded to meet the needs of that complexity., Honors has a wider pool of applicants. To accommodate this upswell in rigor and competition, more faculty and staff have risen to the challenge to support the varied needs of students.
Early on in my time with the University Honors program, most of my friends who had been freshmen with me were dropped from the program, in rapid succession. Many of those remaining gradually withdrew from the program. Over the years, it was difficult to look forward; I was caught up in the moment, I was grieving. Ultimately though, I decided that I could do this. I could accomplish this goal that was important to myself and it meant something more to me. I wanted to do this for more than myself. I was doing this for my cohort, those who were gone, and those few remaining. If I could do this, I could prove that we were worth investing in.

However, ultimately, in order to accomplish this task, I had to learn to rely upon those around me. I needed to build a new network with my fellow Honors students. This journey wasn’t just about the people I’d started with in 2015, this journey was about all of us. I took pride in taking the honors courses I could, as well as book labs, and Honors co-curriculars, and I loved every one of them. I felt so engaged in a way that no other courses can compare.

The main challenge that can sometimes be new to Honors students when they begin their Capstone project is that the entirety of the project is self-guided. Future Honors students should be prepared for this. If some of our Honors students are like me and their motivations stem from connections to other people, there are a few roadblocks that I can give them some advice on.

1. You will lose connections to specific people.
   a. Your friends may leave the program, you may change the emphasis of your capstone, and you will need to start building connections with other faculty-members for your project.
b. In all of these scenarios, the key thing to realize is that we are all a part of a wider web than we expect. Keeping in touch with these old friends may be important and a valuable opportunity to learn from them. If you have lost contact, there will be brilliant people to get to know in the Honors program that come in new waves. Bonding with new mentors and advisors can be some of the most rewarding work you have to do. Each time you invest in those people around you, your social capital will allow you to get through each semester.

2. Sometimes, you will deal with unrelated social isolation.
   a. For me, this exhibited itself most recently in the COVID-19 crisis. This may be the case for some up-and-coming Honors graduates still, but social isolation can come for so many different reasons. Maybe you face a faith crisis, maybe you have family pass away, maybe you deal with a bout of physical or mental illness, maybe you experience a hard break-up, etc.
   b. In all of these scenarios, remember the resources you have. I wasn’t always eager to seek help, I wasn’t always ready to admit I was struggling, and sometimes I worried that I would be bothering others by asking for help. The people who work at the Honors office, the people who work at Counseling And Psychological Services, or the Disability Resource Center, and anyone who works for the University are paid to be a resource for YOU. They are glad to help, and are just waiting to be asked. They can only be a resource for you if you let them know about what is so hard to handle.

3. The path forward is not already built.
a. In my circumstance, I had trouble coming up with a Capstone that applied to an Anthropology major who was not an Archaeology emphasis. I had to think creatively, and use my personal sources of inspiration to fashion a capstone. Even then though, no plans went through as expected. In fact, it is exactly that reality that should be expected.

b. Life is about navigating change. Proactively planning is necessary, but quickly adapting and learning to make fast spur of the moment decisions is a vital part of success too.

All in all, completing this Capstone did not always seem possible, but brilliant and kind people were around to help me along my way, as long as I learned to ask for help. I learned that my success wasn’t just for myself; it represented a win in the Honors program as a whole, and a win for the University. I really appreciated the opportunity to explore a subject I was passionate about, and without this opportunity I would not have learned so much about myself or the world around me.

This project allowed me to learn about how my various interests intersect, and as people read this work, it has the potential to inspire research in many areas of study. Some Honors students could take inspiration from this Capstone in order to fashion their own projects. There are ways this project can inspire work in the Social Sciences, in medicine, in ethics, and law. It will undoubtedly shape the course I take for my future, and I think that was an irreplaceable opportunity.

https://www.ncbi.nlm.nih.gov/books/NBK26898/


https://ucmp.berkeley.edu/glossary/gloss6/asexual.html


https://www.academia.edu/12017068/Viviparity_and_oviparity_evolution_and_reproductive_strategies


https://doi.org/10.1038/nrg1985


https://www.merriam-webster.com/dictionary/amnion


BIBLIOGRAPHY
(SPRING 2020)


inbow-babies-after-32627486


BIO

Daniel Sykes has a General Anthropology (BS) at Utah State University and has a minor in Linguistics and a minor in Theatre. USU has allowed Daniel to go on two life-molding studies abroad, as well as to explore many passions which will become part of Daniel’s life work. Those passions include but are not limited to: Art, Biology, Culture, Economics, Engineering, Ethics, Law, Linguistics, Medicine, Public Policy, Religion, Social Justice, Spirituality, Sustainability, Theatre, and Writing.

Daniel spent 5 years in Residence Life at Utah State University. Three of those years, Daniel served as an Honors House Resident Assistant. Daniel Sykes is a member of and graduate with the National Residence Hall Honorary. Daniel has participated in Alternative Spring Breaks for three years in a row. This last year, Daniel led a trip to Tucson, AZ. Daniel has also remained engaged with the Sunrise Movement and is very active in the community.

Daniel plans to pursue a Master’s Degree in either Macroeconomics, Medical Research Administration, or Urban Planning.