

Blue House Monthly



Framing Trans
Prison Reform

Saigo Takamori:
The Last Samurai

**Understanding Vocal Transition:
The Science of Speech Production
and Perception**

by Pomegranate

Volume 3 Issue 2

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About the Cover

“Propaganda Poster 2” by Miku (@its_a_comedy.)

This artwork came to life from an examination of our community's unique structure, with roles ranging from a "democratically elected president" to the "propaganda department." I looked at historical parallels, opting for a World War II era propaganda poster. To bring my concept to life, I did some image editing and digital collage, embarking on a search for suitable visuals. This entire process demanded meticulous adjustments in color, contrast, and blending techniques to ensure a cohesive final product. Elements from the original inspiration were reimaged to reflect Blue House themes. The anonymous figure from the original cover morphed into the head of our community, Lapis. Likewise, the symbol from the original was replaced by a whimsical yet poignant representation: the trans plushie shark, Blåhaj. Every detail, from the alteration of the sky's hue to the choice of characters, was purposeful. The shift from a golden sky to a vibrant pink not only accentuated the prominence of Lapis and the Blåhaj but also symbolized inclusivity, particularly for our transfem members. In its entirety, this artwork serves as a testament to the collective strength and empowerment the trans community within Blue House. It encapsulates the spirit of unity and resilience that defines our shared space, fostering a sense of belonging and celebration of our diverse membership.

Community News for March 2024

- Heather got her gender marker changed on her documents
- The Blue House Canada meetup happened in Toronto
- The community Minecraft server was rebooted

About Next Issue

The upcoming May issue will have the usual submission criteria. This has now been added to the bottom of the blue house monthly page and is organized by category via drop-down menu. Categories include: feature articles, standard articles, cover art, and supplementary art. This month there is a plan to reorganize the 'previous issue pdf archive' and to create a citation standard and style guide for BHM that emphasizes readability and is reflective of the chosen publishing medium. This will be complete and published prior to the submission deadline for Vol 3 Issue 3 (April 25th). A 'Table of Contents' as seen on page 1 will also be included in all issues going forward.

Blue House Canada Meetup Recap

By Cat (@generic.catgirl)

At the end of March 2024, three Blue House members consisting of Jade (@auwutism), Bella (@bellamustdie), and myself embarked on a journey to spend the Easter weekend together in Toronto in order to have some fun and make lasting memories. This marked the first of what will hopefully come to be annual Canada meetups for the server. A fourth member was originally going to join us, but some unforeseen complications prevented her from being able to attend.

Arriving a day ahead of schedule afforded Jade and I the opportunity to make the most out of the additional Thursday evening. We opted to meet with one of my local friends who conveniently lived a short walk from our hotel. Our resident guide graciously showed us around her neighborhood, highlighting a few clothing boutiques and sharing valuable insights about the city's nightlife as we walked. Our exploration led us to two bars, the first of which was a place that seemed deceptively worn by its exterior, but inside revealed a dive bar that was very lively, albeit uncomfortably warm. The three of us soon left to find a bar where we could play some billiards, which led us to one that catered to the local university crowd. After a couple of pool and a raucous evening of drinking, the three of us retired for the night.

That Friday afternoon, Bella got into town and our trip finally began in full. We decided to have a late lunch at a nearby ramen restaurant. From there, we went to the Canadian National Tower (better known as the CN Tower) only to realize we would be there for much longer than anticipated, however it was too late to back out, so we stuck with the plan while settling on an itinerary for the rest of the evening. Despite the long queue dampening our mood, the view from the tower was wonderful, offering an aerial 360-degree view of the city, and of Lake Ontario. There was a lower section that had a glass floor panel to see the street below, but only one of us was brave enough to stand on it due to mortal fear for life and limb.

Come nightfall, the three of us went out to our first planned pub crawl. This was an epochal occasion, as it was Bella's first time going out to bars. Initially, we went to an English pub, but it appeared to prioritize food over alcohol. We quickly departed to an Irish pub that featured a live band playing some Irish folk music, as well as the classic "Country Roads." The establishment was very enjoyable, and the band seemed to be a big hit with the patrons, but since it was getting late, our group decided to return to our hotel. Along the way, we made an impromptu detour to a Korean hotpot restaurant. After successfully

avoiding being kicked out for almost an hour after it closed, we finally shambled back to our rooms.

Saturday morning would mark the final day of our trip but would prove to be the most eventful of them all. Like the previous day we began by having lunch, this time at a Michelin-starred Thai restaurant that played a finely curated Taylor Swift playlist. The waitress was initially skeptical of our ability to handle the spice level we ordered but brought us what we desired.

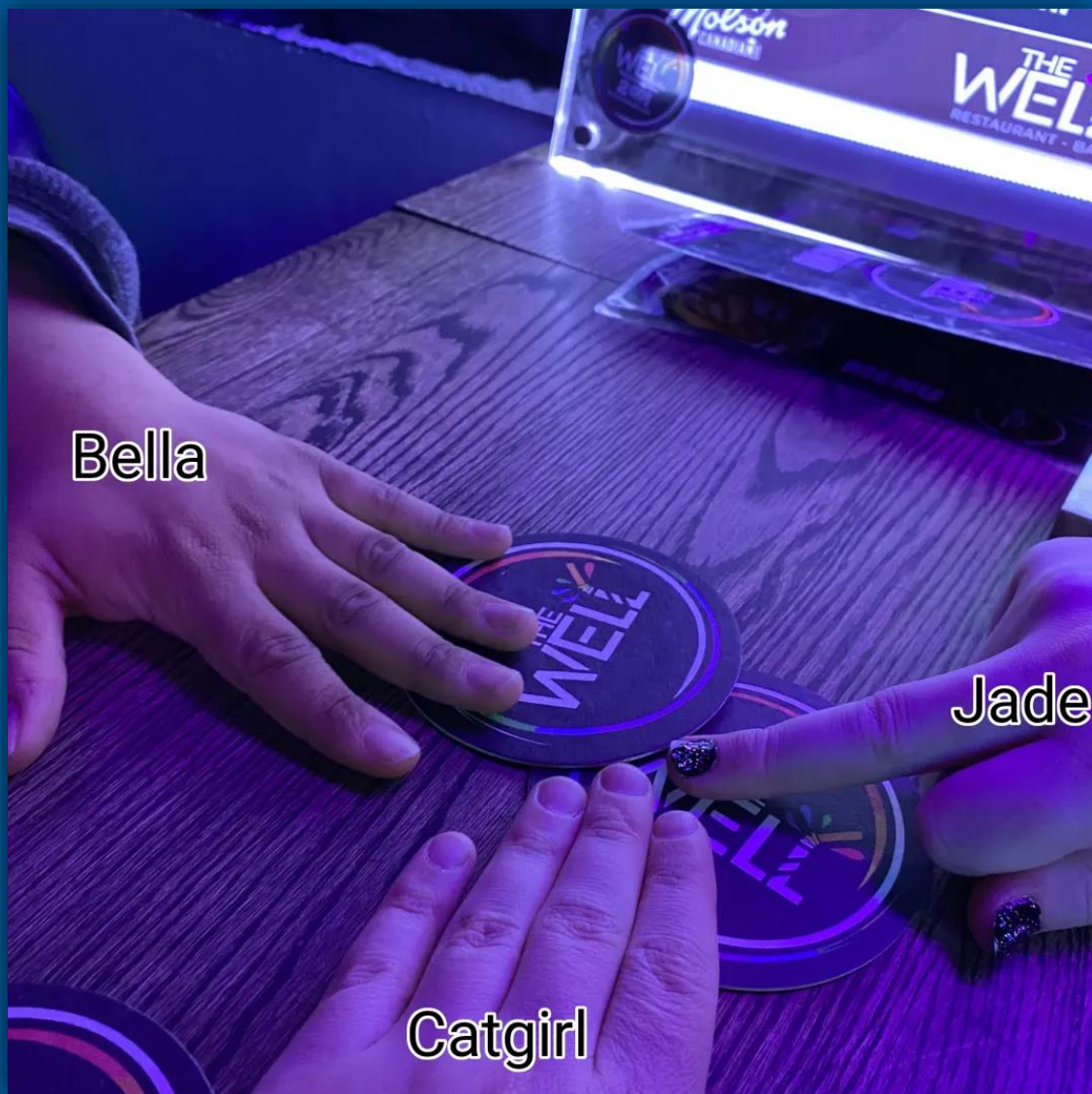
We spent the rest of the day on a quest to the zoo to see otters, monkeys, and capybaras. Unfortunately, once we got there, we found that some of the exhibits we had planned to see were closed. Additionally, we didn't have enough time to reach the far end of the zoo before it closed for the day. We did, however, get to see the otters, polar bears, and a variety of animals native to Africa and Oceania. With our zoo trip not entirely a waste, we sauntered back to our hotel to begin plotting our final night of drinking.

We had the idea of doing something a little bit different and chose to visit exclusively LGBT bars for our finale. The gay bars we visited stood in sharp contrast to the other more traditional bars we'd gone to up to that point. Apart from the obviously different clientele, they seemed much brighter, and people seemed more talkative. Our first stop was at a place that seemed to be having a drag night, which was a bit amusing, however wasn't what we were looking for, so we went to the next one, which was more our speed. The friendly bartender was entertaining and provided us with a few recommendations for the rest of our crawl. After drinking more than we should have, we went to one of his suggestions. Fortunately, we were dissuaded from going inside by the French bouncer, as he let us know it would essentially be a sex club, with the adage and a grin that feminine people typically do not have a good experience. We thanked him and settled for going to another bar for the rest of the night.



View from the CN tower, courtesy of Bella

The next morning, we went our separate ways. The trip didn't exactly go as planned yet accomplished just what we had set out to do- make lasting memories. I had a lot of fun and hope that I can make it to the next one or hang out with Jade and Bella again. Thank you, guys, for being great friends! ♡



Framing Trans

Prison Reform

By Lapis (@lapis_lazuli)

In recent years the rights of trans people have become a flashpoint in politics in the United States. While the battle certainly continues, most of us would be hard pressed to not acknowledge we are facing a steady backslide towards social conservatism as protections are rolled back and previously assumed rights are being legislated away.

Nationally, this is most visible post-Trump in the Supreme Court with the confirmation of Neil Gorsuch in 2017, who has a history of anti-transgender rulings (1) followed by the death of Ruth Bader Ginsburg in 2020 and subsequent confirmation of Amy Coney Barrett the same year. Ginsburg, while most well known for fighting for women's rights and reproductive freedoms was also widely acknowledged as being an ardent defender of LGBTQ equality. (2) Ginsburg's replacement, Amy Coney Barrett, has been called "an absolute threat to LGBTQ rights" by the Human Rights Campaign and is known among other things for opposing the Supreme Court's prior ruling in *Obergefell v. Hodges* that affirmed marriage equality (she opposed gay marriage), saying Title IX^I protections don't extend to trans people, and for having a proclivity for referring to transwomen as "physiological males" while hinting they are a threat to young girls in washrooms. (3) Finally no discussion of the Supreme Court's regression would be complete without Justice Clarence Thomas, whose relatively recent concurrence in *Dobbs v. Jackson Women's Health Organization* (the case that overturned *Roe v. Wade* and a pregnant person's right to an abortion) implied the potential ability of, and his willingness to strike down *Lawrence v. Texas* (a 2003 ruling that struck down laws that banned sodomy and other gay bedroom activities) in addition to *Obergefell v. Hodges* using the *Dobbs* ruling's narrowing of the principle of substantive due process^{II}. (25) To rephrase without the technical jargon, Clarence Thomas wants to dismantle two of the biggest legal protections for LGBTQ people. As of 2020, conservatives possess a super-majority of 6 to 3 on the Supreme Court. (27)

At the state level, the backslide is most visible in the legislature, I would argue largely due to *Rucho v. Common Cause* which was a 2019 Supreme Court ruling that established "all partisan gerrymandering to be outside the purview of the Court". For reference: "Gerrymandering in U.S. politics [is] the practice of drawing the boundaries of electoral districts in a way that gives one political party an unfair advantage over its rivals". (5) For

^I Title IX of the Education Amendments of 1972 states "No person in the United States shall, on the basis of sex, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any education program or activity receiving Federal financial assistance." (29)

^{II} "Substantive due process is the principle that the Fifth and Fourteenth Amendments protect fundamental rights from government interference. Specifically, the Fifth and Fourteenth Amendments prohibit the government from depriving any person of life, liberty, or property without due process of law." (26)

the majority of states, state legislatures control the redistricting process both for their own district lines and congressional ones. (6) While both parties in the past have been known to gerrymander, in 2010 in response to the election of Barack Obama, Republicans pivoted their strategy and pulled off a bureaucratic coup through an initiative dubbed “Project REDMAP” (short for “Redistricting Majority Project”). The Boston branch of National Public Radio (NPR) described it well in an investigative piece they did in 2016. “...states redraw their electoral maps every 10 years according to new Census data. REDMAP targeted states where just a few statehouse seats could shift the balance to Republican control in the crucial census year of 2010...That plan worked spectacularly. It’s why today [2016]



“The Gerry-mander” drawn by Elkanah Tisdale for the Boston Gazette, 1812. (53)

Republicans have a majority in nearly two-thirds of the country’s state legislative chambers. And it’s why in 2012 Democratic statehouse candidates won 51 percent of the vote in Pennsylvania, which voted for Barack Obama in the presidential election, yet those candidates ended up with only 28 percent of the seats in the legislature.” (7) Because gerrymandering lets “politicians choose their voters instead of letting voters choose their politicians”, (5) this incredibly effective gambit Republicans made in 2010 has been self-reinforcing and caused a repeat knock-on effect in 2020. For reference, in the most recent round of redistricting Republicans oversaw the process in 18 states while democrats only oversaw it in 7 with the rest being done either by the courts or independent groups. (8) Republicans have since gone on to relentlessly target trans people at the state level. “The number of anti-trans bills considered across the U.S. has broken records for four consecutive years. In 2023, the total number of bills considered surged more than three times the previous record.”^{III} (15) Notable standouts in 2024 include Oklahoma with 60 anti-trans bills being considered and Missouri with 44. (15). Both states were part of the previously mentioned 18 where Republicans oversaw redistricting. Another state where Republicans oversaw redistricting was Utah. (8)

Utah over the last few years has made national headlines as its state legislature has repeatedly and successfully sought to dismantle protections for trans people. Examples of this include *S.B.16 Transgender Medical Treatments and Procedures Amendments* (9) which banned gender affirming care for minors in the state and (10) *H.B. 257 Sex-based*

^{III} It should be noted for sake of fairness that national bills are included in the data set. For example, of the 600 in 2023, 37 were national bills and of the 523 so far in 2024, 44 are national. (15) This does affect the overall percentages but not the trend of the data.

Designations for Privacy, Anti-bullying, and Women's Opportunities (11) which “bar[s] transgender people from using bathrooms in schools and government buildings that correspond with their gender identities”. (12) Most recently and relevant to this article, *H.B. 316 Inmate Assignment Amendments* which “prohibits, with limited exceptions, the Department of Corrections or a county jail from assigning inmates of the opposite biological sex in the same housing area” (13) has passed the Utah House and Senate and made it to the governor’s desk where it is presently waiting to be signed into law. It must be said however this one is a bit of a special case and not fully like the others as it “was considered with an amendment that would allow transgender people to transfer to housing that corresponds with their gender identity” (14) which is good. A condition of transfer, however, would be genital inspections (14) which is decidedly less good.

Justice for Jane Doe

In 2021 a woman who happened to be trans entered the prison system in Utah. (16) We will refer to her as “Jane Doe”. Jane had already been suffering from gender dysphoria before she entered prison and “[h]er medical condition became increasingly worse while in custody, surrounded only by men, and lacking control over her daily life and health care”. (16) To help alleviate the distress and dysphoria she was feeling, Jane requested that she be able to purchase female clothing and personal items from the commissary. This was rejected. Jane asked that the pat down procedures she had to receive as an inmate be modified so as not to make her feel unnecessarily uncomfortable. This was rejected. Jane asked where she was housed to be re-evaluated to align with her gender identity. This was outright rejected, and no formal evaluation took place. (17) Jane asked to receive hormone replacement therapy (HRT) to alleviate the pain she felt from the incongruence between her body and her identity, but the Utah Department of Corrections required her to get approved for HRT by a committee which was an unnecessary procedural hoop that people suffering from other conditions did not need to jump through to receive treatment while incarcerated. The committee, according to Department of Justice Disability Rights Chief, Rebecca Bond, “included some members with a clear bias against transgender people.” (18) The committee which was created to determine if someone should receive medical care was made up of medical and oddly enough, non-medical staff (18) and when Jane finally got approved for HRT, her prison assigned doctor “tried to talk her out of pursuing the hormone therapy that she had been seeking for 15 months”. (16) The doctor in question did not ensure her HRT was safe nor effective. (16) 22 months after being taken into custody and after continuous suffering, humiliation and ineffectual treatment, Jane did a dangerous “DIY” orchiectomy and removed her own testicles.^{IV} Jane’s identity, current whereabouts, and condition are not publicly available. (16)

^{IV} “An orchiectomy, or bilateral orchiectomy, is a procedure that surgically removes the testes. Orchiectomies are typically sought by trans people who were presumed male at birth (PMAB), including women and non-binary people to stop the production of testosterone and sperm, or to affirm their gender. Having an orchiectomy also removes the need to take an anti-androgen” (19)

At some point during her mistreatment while the Utah Department of Corrections was ignoring her complaints and appeals, Jane filed a complaint with the Department of Justice, which as opposed to the UDOC, is a federal agency. Because gender dysphoria is classified as a disability under the Americans with Disabilities Act (a topic which we will discuss more thoroughly later in the article), the Department of Justice Civil Rights Division was able to open an investigation under Title II of the aforementioned act. Title II of the ADA “authorizes the United States to investigate complaints, make findings of fact and conclusions of law, and attempt to secure voluntary compliance where violations are found.” (20) According to the official findings which were released on March 12th, 2024, “The Department’s investigation of UDOC’s compliance with Title II included interviews with Complainant, and with UDOC’s Medical Director, ADA Coordinator, and other UDOC staff and UDOC contractors. The Department also requested and reviewed records and policies produced by UDOC.” (21) [a PDF link to the official findings will be included at the end of this article]. Ultimately the Department of Justice concluded that Jane’s rights had been violated in 3 ways:

- *Denying her equal access to healthcare services, 28 C.F.R. § 35.130(a)^v*
- *Imposing unnecessary eligibility criteria for assessment and treatment for gender dysphoria that it does not require for other conditions, 28 C.F.R. § 35.130(b)(8)^{vi}*
- *Failing to reasonably modify policies, practices, or procedures where necessary to avoid discriminating against Complainant, 28 C.F.R. § 35.130(b)(7)^{vii}. (21)*

In a prepared statement to the press, Assistant US Attorney General for the Civil Rights Division, Kristen Clarke said, “All people with disabilities including those who are incarcerated are protected by the ADA and are entitled to reasonable modifications and equal access to medical care, and that basic right extends to those with gender dysphoria.” (16). The reply from the UDOC came likewise in the form of a prepared statement via its executive director, Brian Redd. “We have been working to address this complex issue, and were blindsided by today’s public announcement from the Department of Justice. We have also taken steps on our own, and as a state, to address the needs of inmates while maintaining the highest safety standards. We fundamentally disagree with the DOJ on key issues, and are disappointed with their approach.” (16). Well, disappointed or not, the

^v 28 C.F.R. § 35.130(a): “No qualified individual with a disability shall, on the basis of disability, be excluded from participation in or be denied the benefits of the services, programs, or activities of a public entity, or be subjected to discrimination by any public entity.” (22)

^{vi} 28 C.F.R. § 35.130(b)(8): “A public entity shall not impose or apply eligibility criteria that screen out or tend to screen out an individual with a disability or any class of individuals with disabilities from fully and equally enjoying any service, program, or activity, unless such criteria can be shown to be necessary for the provision of the service, program, or activity being offered.” (22)

^{vii} 28 C.F.R. § 35.130(b)(7): “i. A public entity shall make reasonable modifications in policies, practices, or procedures when the modifications are necessary to avoid discrimination on the basis of disability, unless the public entity can demonstrate that making the modifications would fundamentally alter the nature of the service, program, or activity.” (22) [ii not included as it is not directly applicable]

UDOC has received some helpful instructions from the DOJ to ensure that it really is addressing the needs of its transgender inmates. These include:

- 1 *Adopt, revise, and implement relevant policies, practices, and procedures to ensure UDOC provides individuals with gender dysphoria an equal opportunity to participate in and benefit from UDOC services, programs, and activities. This includes providing healthcare services for gender dysphoria consistent with UDOC's treatment of other medical conditions.*
- 2 *Reasonably modify UDOC policies, practices, and procedures when necessary to ensure that individuals with gender dysphoria have equal access to all UDOC services, programs, and activities including commissary, pat and visual searches, housing, and required and optional programming.*
- 3 *Train UDOC employees on the requirements of Title II^{VIII} of the ADA.*
- 4 *Designate employees to coordinate UDOC's overall efforts to comply with Title II and this Agreement and to coordinate each UDOC facility's ADA compliance efforts, including investigating and resolving ADA complaints and grievances with respect to gender dysphoria.*
- 5 *Provide the United States with access to facilities and files, and written status reports delineating all steps taken to comply with these requirements, including the dates on which each step was taken, and, where applicable, information sufficient to demonstrate compliance.*
- 6 *Pay compensatory damages to Complainant and provide otherwise appropriate relief.* (21)

The TLDR of that list is Utah Department of Corrections needs to start treating its trans inmates better instead of making their lives harder. This includes among other things a faster and more reliable means of getting HRT, giving access to clothing and personal products (cosmetics, makeup etc) via the commissary that align with the inmates' gender identities, and paying Jane adequate compensation for the suffering inflicted it on her. Should the UDOC not be willing to implement said changes, the DOJ has indicated its willingness to sue to ensure compliance. (16)

The Colorado Class Action

If you were asked to name transphobic states in the US, you'd be forgiven for not immediately thinking of Colorado. After all, its voted Democrat in the last 4 presidential elections including 2020 where it gave Joe Biden a 13.5% majority. (23) Both chambers of the state legislature are controlled by the Democrats and the state's current governor, Jared Polis, is a Democrat. (24) The US prison system, however, has problems and the

^{VIII} Title II of the ADA requires state/local governments to give people with disabilities an equal opportunity to benefit from all of their programs, services, and activities. (35)

Colorado Department of Corrections (CDOC) is no exception. For women who happen to be trans especially, Colorado prisons have historically been a place of violence and trauma that fall outside of the public eye and consciousness.

In 2018, after fighting for the rights of 19-year-old Lindsay Saunders-Velez against the CDOC in a particularly heinous discrimination case and realizing what had happened to Velez wasn't an outlier but likely part of a horrifying trend (37), civil rights attorney Paula Greisen approached Taliyah Murphy, a transwoman serving a 12-year sentence at the Buena Vista correctional facility. (28) The following December, Greisen, alongside her colleague Jessica Freeman and attorneys from the Transgender Law Center filed a class action lawsuit against the Colorado Department of Corrections and various Colorado officials including the governor, listing Taliyah Murphy alongside 6 other incarcerated transwomen as plaintiffs on behalf of all the approximately 160 other transwomen who were currently serving sentences in the CDOC. (30) This case would come to be called *Raven v. Polis*. (48) The first amended class action complaint (a link to which will be included at the end of this article) alleged the CDOC subjected transwomen in its facilities to imminent risk of mental and physical harm in addition to actively discriminating against them by denying them access to rehabilitation programs to facilitate their transition back to normal life after their release. Additionally, allegations of being denied appropriate housing, cross gender searches (including strip searches), being actively prevented from being able to do HRT alongside other kinds of gender affirming care and being discriminated against on the basis of the symptoms of gender dysphoria constituting a disability (30) were made just like would be later alleged in the recently concluded investigation by the DOJ in Utah.

A lot of the argument around the allegations of the CDOC putting transwomen at imminent risk of mental and physical harm was centered around sexual violence and PREA^{IX} claims. In the complaint, according to Bureau of Justice Statistics (BJS), “an estimated 35% of transgender people held in prisons such as those in Colorado reported experiencing one or more incidents of sexual victimization in the past 12 months or since admission.” (30). PREA, also known as the “Prison Rape Elimination Act” was passed to create a means through which victims of sexual violence in prison could seek justice alongside safer conditions as to not subject them to cruel and unusual punishment thereby seeking to safeguard their 8th amendment rights^X. (31) As you might've guessed, PREA wasn't enforced at the CDOC like it should've been. Some but not all of the allegations listed in the initial filing included:

^{IX} The “Prison Rape Elimination Act” of 2003, also known as PREA “establishes a zero-tolerance standard against sexual abuse in adult prisons and other confinement centers. PREA requires agencies to comply with national standards to eliminate sexual abuse, recognizes that transgender people face elevated risks of being victimized in prisons, mandates that state correctional facilities provide proper training to correctional staff, and requires subject agencies to establish methods to deter and detect sexual violence in prison, to identify and treat such victims, and to report incidents of such violence to the Bureau of Justice Statistics” (30)

^X The 8th Amendment to the United States Constitution states “Excessive bail shall not be required, nor excessive fines imposed, nor cruel and unusual punishments inflicted.” (32)

TRIGGER WARNING: The following list contains graphic descriptions of sexual violence. While incredibly upsetting I've included it to illustrate the seriousness of the injustice experienced by the women brave enough to testify and the stakes of the lawsuit. If you would like to avoid the details of the specific incidents, skip down to where the text picks up after the following list.

- 1 An incident occurred at Sterling Correctional Facility involving a transwoman being followed and sexually harassed by a prison guard who fancied her. After the transwoman filed a complaint and nothing happened the guard felt emboldened and proceeded to repeatedly rape her. The transwoman in question repeatedly reported these incidents to the guard's superior who eventually assigned an investigator and a SANE^{XI} exam was performed following one such incident. DNA evidence was retrieved but later "disappeared". The prison assigned investigator told the transwoman he would follow up with her and she never heard from him again. (30)
- 2 A transwoman at Arkansas Valley Correctional Facility in Ordway, Colorado was raped by a prison guard who threatened to file a false report alleging she had attacked him if she didn't perform oral sex on him. Afterwards he informed her that no one would believe her if she reported it. She filed a PREA report despite this but ultimately did not complete the complaint due to fear of retaliation. (30)
- 3 A transwoman at Buena Vista Correctional Facility was repeatedly raped by a fellow inmate and was forcibly tattooed with his name to mark her as his property. He told her he would kill her if she "snitched" on him. (30)
- 4 A different transwoman at Buena Vista Correctional Facility upon being raped in the prison kitchen attempted to report the incident but was discouraged by CDOC staff who told her that reporting her sexual assault would just make her situation worse. The victim's family upon being told of what transpired attempted to report the incident to the CDOC but their pleas were left unanswered. (30)

While these are only a small fraction of the incidents of sexual violence at the CDOC, you get the point. The *Raven v. Polis* complaint alleged that specific discriminatory policies and procedures at the CDOC allowed these situations and others like them to transpire. Specifically, it points out the CDOC's refusal to recognize the transwomen in its custody as women and by the same logic refusing to house them separately from men while simultaneously being aware of a high amount of sexual violence taking place. (30)

Another piece of data in the suit that the public deserve to know about is when "Applying the national statistics of transgender women in custody who are subjected to sexual assault, Defendants have not documented at least 50% of the rapes suffered by these women." (30) With the information provided it is not a logical leap to infer there was potentially a concerted effort to bury evidence and/or there was rampant apathy or prejudice amongst

^{XI} "A Sexual Assault Nurse Examiner (SANE) is a Registered Nurse who has received special training so that s/he can provide comprehensive care to sexual assault victims. In addition s/he is able to conduct a forensic exam and may provide expert testimony if a case goes to trial." (33)

the people who were entrusted by the government to ensure the equal rights under the constitution of the inmates they had custody over.

Finally, after years of litigation, this month (March, 2024), “[t]he class-action lawsuit reached a settlement with the state that included a \$2.1 million payout and a consent decree that would mandate the prison system make changes to its policies when it comes to the care and housing of transgender women.” (28) In the consent decree the CDOC has agreed to (a link to which will be included at the end of this article), among other things:

- 1 “[T]he creation of the state's first-ever voluntary transgender unit, at Sterling Correctional Facility. It will house 100 transgender women and will build a pathway to get them into the general population at the women's units.” (28, 34)
- 2 The creation of an “integration unit at Denver Women's Correctional Facility. It will have about 40 beds. Transgender women will go there to adjust to living in a women's prison. The goal of the new housing corridors is to create a safe space for transgender women, all while preparing them to join the general population at a women's facility.” (28,34)
- 3 An agreement that the “CDOC shall comply with security and care requirements of the Prison Rape Elimination Act (“PREA”) and any applicable laws. CDOC will not treat transgender women who file PREA complaints less favorably than cisgender women who file similar PREA complaints” along with measures being put in place to ensure proper implementation. (34)
- 4 gender-affirming care and procedures will be made available (28)

A couple things should be pointed out regarding the consent decree. For the sake of transparency, the consent decree is at the time of writing this article (March, 2024) not yet finalized- but according to Paula Greisen, one of the aforementioned attorneys for the transwomen, “There are some formalities left but we have every indication that these are just dotting some I’s and crossing some T’s. I’m very confident that we will start to move ahead next week. They [the CDOC] understand it’s in their best interest to start moving forward as soon as we are able to on these matters. Policies are being changed as we speak, and the wheels have begun turning.” (49) Now regarding the decree’s contents- the CDOC is going to have to make a bigger effort than it has prior to comply with PREA (thank god). If you, dear reader, choose to read the decree you’ll see the mention and therefore implied continued existence of a “Gender Dysphoria Committee”. Admittedly there is only 1 mention of it in the entire document, namely that the Chair of the Gender Dysphoria Committee will be a member of the newly established “Placement Review Committee” which will oversee the placement of transwomen into the 2 newly established housing facilities. (34) When we compare this document however with the findings report published by the DOJ about the UDOC in the previous section of this article, the Gender Dysphoria Committee at the UDOC was the very soulless, bureaucratic institution that the Feds had fingered as principally responsible for the discrimination that was occurring towards Jane Doe and other transwomen incarcerated in the Utah prison system. In fact, even in the *Raven v. Polis* complaint, it states:

the “Gender Dysphoria Committee” (“GDC”) which centralizes all those decisions in the hands of persons who are not qualified to provide treatment to those with gender dysphoria. Committee members typically have never examined or even seen the class members whose course of treatment they are deciding. This committee routinely denies medically necessary accommodations to class members, such as placement in appropriate and safe facilities. This committee has never granted a class members’ request for necessary surgery, and in fact refuses to provide class members with medical and mental health evaluations by qualified personnel to determine if these accommodations are medically necessary. (30)

That, like the GDC at the UDOC is pretty bad... So why was it left in? Many a person may be tempted to think the sole reason the GDC appears to have survived was because a consent decree (the type of resolution that occurred in this case) by definition “is a court-enforced settlement, agreed to by all parties and approved by a court.” (36) Meaning that its survival could have been a condition to the CDOC ultimately caving to arguably more pressing demands such as it taking steps to actually ensure PREA is being complied with and that the victims of the abuse in the CDOC’s facilities be given just compensation for their suffering. The facts of the matter however, are complicated. Greisen informed me that the GDC, if it does continue to exist, has been completely transformed into a committee with rules that follow the generally accepted standards of care of transwomen set by the medical community (WPATH^{XII}). (37, 49) The consent decree stipulates the presence of an independent medical consultant and the hiring of a gender care specialist, not to mention part of the process being a referral to a third-party qualified transgender care provider. (30, 37) Greisen also pointed out bureaucratic institutions like prisons literally exist to put people in boxes, therefore by their nature such institutions will always create tools, policies, and procedures to do likewise. If the committee was removed it would just eventually be replaced with something that effectively serves the same purpose just under a new name. The way forward established by the consent decree instead rewires the existing system in such a way as to leave it not entirely under the CDOC’s control, able to actually implement change, and with parameters explicitly designed to help people. (37) “We wanted to show there was a way to fix it instead of just showing that it was broken.” (37)

Greisen stressed that the Gender Dysphoria Committee in Colorado was made with good intentions but ultimately fell victim to a bureaucracy with a military-like approach to incarceration. For example, Doctor Lish, the former head of psychiatry and former chair of the GDC according to Greisen “tried to do good things but there was a lot that was outside of his control.” (49) He like most of the doctors in those sorts of positions were contract personnel. “They are not lifelong bureaucrats and ultimately have very little say.” Even though he was the literal chair of the committee for it, “He didn’t get to write the policies

^{XII} “The World Professional Association for Transgender Health (WPATH) is the leading professional association for surgeons, doctors, medical researchers and others who specialize in the medical treatment of people with gender dysphoria. Based on decades of clinical experience, WPATH has promulgated medical standards of care for treating patients with gender dysphoria, the Standards of Care for the Health of Transsexual, Transgender, and Gender-Nonconforming People.” (30)

on transgender care, he was presented with them after they were finalized” (49) Within a few days of Doctor Lish giving his deposition he no longer worked at the Colorado Department of Corrections. How his employment with them came to end is not known. (49)

While there is still a lot to be done, thanks to this class action, its plaintiffs and attorneys, transwomen in Colorado are one step closer to being equal under the law. For the transwomen currently incarcerated in the state this trial was momentous and the reception to its conclusion has been overwhelmingly positive. Greisen stated “There are between 350 and 400 class members. We’ve talked to about half on the phone and overall, everyone is ecstatic and overjoyed.” (49)

Dysphoria Blues, Disability Samba

Repeatedly in this article we’ve discussed gender dysphoria being a disability as if it’s a given. In fact, in both the DOJ’s findings report on the UDOC and the class action complaint against the CDOC, gender dysphoria is either referred to as a disability outright (21) or “symptoms of gender Dysphoria” are referred to as “causing a disability” (30). I think this particular phrasing warrants an explanation.

To start, in 1990 Congress passed the Americans with Disabilities Act, also known as the “ADA”. “The purpose of the law is to make sure that people with disabilities have the same rights and opportunities as everyone else.” (38) Notably though, the ADA was passed with some explicitly named exceptions to what constitutes a disability, namely “transvestism, transsexualism, pedophilia, exhibitionism, voyeurism, gender identity disorders not resulting from physical impairments, or other sexual behavior disorders”. (39) Of course, leave it to Bush-senior-era politicians to lump being trans in together with pedophiles and people who get off to having sex in public but like it or not that’s what they did and that’s the law that congress left legal theorists to work with.

Fast forward to 2018 to Fairfax County, Virginia. The Trump presidency is in full swing, the Supreme Court has a 5 to 4 conservative majority, the Democrat base is realizing that Ginsburg probably should’ve retired years ago, and COVID-19 isn’t so much as a fever dream in the public’s consciousness. It’s in this backdrop that Kesha Williams got sentenced to prison. Kesha was a woman who happened to be trans. Her home state of Maryland recognized her as a woman. She’d been on HRT for 15 years and her driver’s license said female. However, none of this stopped Virginia from treating her like a man and putting her in a men’s prison where she was harassed, suffered medical delays and was insistently misgendered. Upon her release, she took the state of Virginia to court saying that her rights under the ADA had been violated. Her case was dismissed with the judge saying that her gender dysphoria did not constitute a disability under the aforementioned exceptions clause of the ADA, whereupon she appealed to the 4th Circuit. (40)

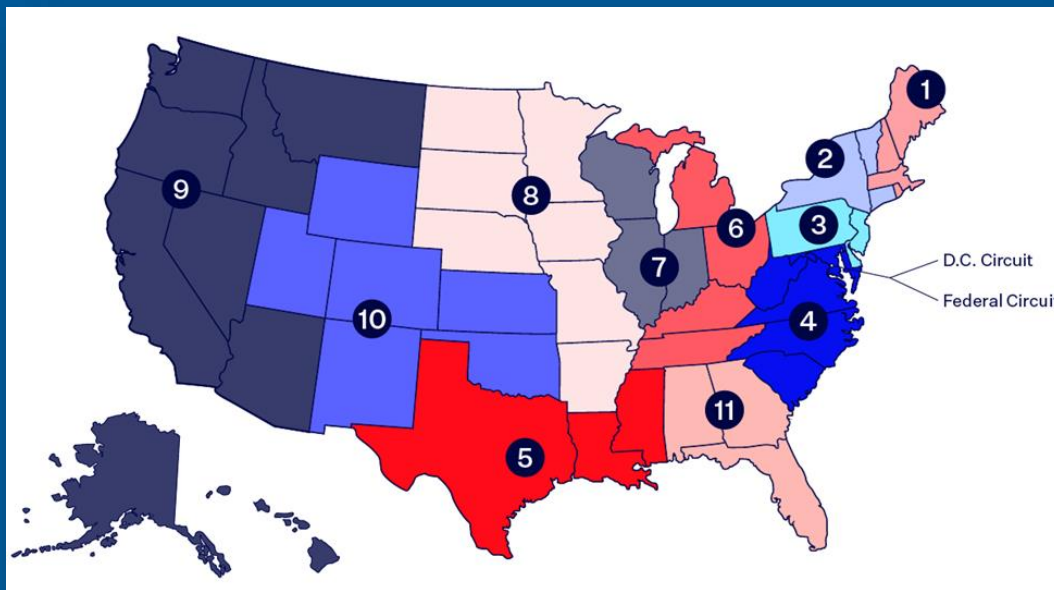
“There are 13 appellate courts that sit below the U.S. Supreme Court, and they are called the U.S. Courts of Appeals. The 94 federal judicial districts are organized into 12 regional circuits, each of which has a court of appeals. The appellate court’s task is to determine

whether or not the law was applied correctly in the trial court.” (41) The TLDR of circuit courts is that they interpret the law for multiple states, a circuit court’s decisions are to be considered law in all the states that it serves, and the only court higher than a Circuit Court of Appeals is the Supreme Court.

In a landmark decision and reversal of the district court’s prior decision, the 4th Circuit ruled in William’s Favor.

In support of reversal, the Fourth Circuit began by acknowledging that the ADA does not define “gender identity disorders.” To determine whether “gender identity disorders” includes gender dysphoria, the Fourth Circuit relied in part on the Diagnostic and Statistical Manual of Mental Disorders (5th ed. 2013), which, the court noted, “defines ‘gender dysphoria’ as the ‘clinically significant distress’ felt by [individuals] who experience an incongruence between their gender identity and their assigned sex.” The Fourth Circuit reasoned that gender dysphoria was a diagnosable condition whose definition was much narrower than, and separate from, the definition of “gender identity disorder.” The Fourth Circuit also noted that “even if ‘gender dysphoria’ and ‘gender identity disorder’ were not categorically distinct ... [Williams’s] gender dysphoria nevertheless [fell] within the ADA’s safe harbor for ‘gender identity disorders ... resulting from physical impairments.’” (Emphasis in original.) Thus, the Fourth Circuit held that Williams could potentially establish that her gender dysphoria “resulted from a physical impairment” and therefore fell outside the ADA’s exclusions. (40)

This ruling, called *Williams v. Kincaid* (a link to which will be included at the end of this article), was instrumental in establishing a legal bulwark against transphobic discriminatory policies because it established gender dysphoria as a recognized disability under the ADA. Again, the ruling was appealed but “[i]n 2023, the United States Supreme Court declined to review the Fourth Circuit’s decision, letting the lower court’s ruling stand, though not weighing in on the issue substantively.” (42) Just because the Supreme Court chose not to hear the first gender dysphoria ADA case doesn’t mean it won’t choose to hear another perhaps more opportune one in the future, meaning this area of the law is not set in stone, merely the current standard and technically only “law” in the states of the 4th circuit- North Carolina, South Carolina, Virginia, West Virginia, and Maryland. (43) According to the University of Baltimore Law Review, “Although the Fourth Circuit’s reasoning in *Williams* has yet to penetrate circuit boundaries up to the appellate court level, it appears to have gained momentum in only a few short months. Including the Fourth Circuit, five federal circuits have now indicated support for the *Williams* holding.” (44) The 10th Circuit, which includes Utah and Colorado, has also indicated support for *Williams v. Kincaid* with *United States v. Griffith* which was decided in April of 2023. (44, 45)



Geographic Boundaries of the U.S. Courts of Appeals (54)

In the words of Ben Shapiro, a well-known right-wing pundit, “[t]ransgender people are unfortunately suffering from a significant mental illness that is deeply harmful.” (46) Just a cursory look through conservative media and online spaces will reveal that a large proportion of the conservative base likely agree with his sentiments. It is perfectly reasonable that a trans girl would read “gender dysphoria is a disability”, get offended and immediately insist it isn’t and that anyone who says otherwise is a bigot. Now of course, and this goes without saying- there is nothing wrong with being transgender. At first glance, though they are distinct, it isn’t terribly difficult to draw parallels between the most important part of the Williams holding and the arguments that conservatives like to make to justify their deranged obsession with eradicating transness from public life. The similarity between them is deliciously ironic because the concept that “gender dysphoria is a disability” has an undeniable practicality and even proven lethality to dismantling the very kinds of transphobic policies and procedures that someone like Ben Shapiro lauds on Fox News. Without it the DOJ would have never held Utah’s department of corrections to account and the class action in Colorado may have floundered; so next time transphobes in power try to make us face the music, don’t panic- we know the dance.

The Big Picture Spaghetti

Alright, so we’ve talked about the Supreme Court, the corrupting of our state legislative institutions, anti-trans bills, prison reform in Utah and Colorado, and the ADA. That’s an absolute mess of different ideas... but what does it all mean? Well, grab your metaphorical fork and spoon because it’s time to twirl ourselves a bite of big picture spaghetti.

Trans rights for the foreseeable future cannot be expected to come from any state legislature in a state that is currently spewing transphobic legislation. *Rucho v. Common*

Cause and Project REDMAP have made conservative legislatures effectively super conservative and resistant to any meaningful change. “States are firming up.” (49) Pushing trans positive legislation in these states will likely not succeed. Granted, that doesn’t mean people shouldn’t try but, in my opinion, real change in the parts of this country most in need of it will come from the state, federal and circuit courts. Excluding the 5th Circuit^{xiii}, the courts are going to be the way forward to dismantling anti-trans policies and for creating a bulwark against future anti-trans legislation.

Just because a state is liberal doesn’t mean all its institutions are. The average Colorado voter would have probably been horrified if they knew the extent of what was going on in their state’s prison system. Claims of discrimination should be taken seriously and investigated, no matter what part of the country they come from.

Referring to gender dysphoria as a disability while unsavory in terms of optics inside the trans community is a practical and winning strategy for securing lasting legal protections for the greater community. Using that kind of legal argument is not a concession to transphobes nor is it an admission of there somehow being something wrong with being trans.

The wins for incarcerated trans people in Utah and in other states that have had similar cases not discussed in this article like in Illinois with *Monroe v Bowman* (51) and Georgia with *Jane Doe v Georgia Department of Corrections* (50) are incredible... but precarious. In my personal opinion it is more likely than not that the Supreme Court will seek to at least weaken if not outright totally dismantle the current GD/ADA meta within the next few years before any serious risk is posed to the court losing its conservative super majority. If that does happen however, it is not the end of the battle and there are other legal avenues available including the Rehabilitation Act of 1973^{xiv} and various state laws for equal protections like what *Raven v. Polis* used to skirt the potentially brittle *Williams v. Kincaid* holding. (49)

Negotiating mutually agreed settlements from a position of strength to ensure trans rights and to prevent appeals to higher, more transphobic judicial bodies is a viable strategy. Sure, the victory in Colorado wasn’t “total” per se but it is less likely to falter than the one in Utah. Freeman, Greisen and the attorneys from the Transgender Law Center made the deliberate and clever decision to seek a consent decree to avoid the vagaries of the Supreme Court(49) and demonstrated that rewiring institutions to prevent them from being as easily able to discriminate in the future can also be a solution instead of being forced to play ‘dismantle whack-a-mole’ each time they do discriminate.

^{xiii} “the 5th Circuit has received notoriety for being the most conservative federal appeals court in the country, its sweeping and destructive democracy-related decisions suggest that it has become more of a right-wing activist court” (47)

^{xiv} “The Rehabilitation Act of 1973, as Amended (Rehab Act) prohibits discrimination on the basis of disability in programs conducted by federal agencies, in programs receiving federal financial assistance, in federal employment and in the employment practices of federal contractors.” (52)

The existing system is broken and has disposed itself to fundamentally disadvantage trans people and beyond that it is gaining inertia, intent on crushing us underfoot. Our battle is an existential one. There is going to be years of darkness before the dawn and if we want to survive the long night the steps the trans rights movement takes need to be coordinated, strategic, and reflective of current circumstance and nature of our opposition. △

Meta-Commentary

There was a lot to talk about here and I feel like I only really got to scratch the surface of the legal side of the trans rights movement. Depending on how well this article is received maybe I'll do more of them in the future as a series kind of like the ongoing "International Trans Spotlight" one with the interviews that I'm taking a break from this month. Below I've included the core documents relating to this article and the events it discusses. Sources and other supplemental reading material if you are interested in learning more about this topic can also be found below. I'd like to thank Paula Greisen for being kind enough to take some time out of her busy schedule to speak with me for this project and want to make clear that the opinions I express in this article are mine alone and should not be considered to be reflective of Blue House collectively or Paula Greisen's. -LL

Core Documents

Letter of Findings on UDOC by DOJ Civil Rights Division

https://www.justice.gov/d9/2024-03/letter_of_findings-utah_department_of_corrections.pdf

Raven v. Polis Class Action Complaint

<https://drive.google.com/file/d/1rgvpuv9-1W1aAHqinsE9hFEPsknK3Rxs/view>

Raven v. Polis Proposed Consent Decree

https://drive.google.com/file/d/1IO_pc6lv91FAg2OuJC2gaf3Ric_kAnBP/view

Williams v. Kincaid Judicial Opinion

<https://casetext.com/case/williams-v-kincaid-5>

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- 18 <https://abcnews.go.com/US/wireStory/utah-prison-discriminated-transgender-woman-department-justice-finds-108064660>
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Supplemental Reading

Monroe v. Meeks Amended Preliminary Injunction

<https://clearinghouse.net/doc/104943/>

United States Statement of interest: *Doe v. Georgia Department of Corrections*

https://www.justice.gov/d9/2024-01/statement_of_interest-doe_v_georgia_department_of_corrections_0.pdf

Monroe v. Meeks Memorandum and Order

<https://casetext.com/case/monroe-v-meeks-23>

Heart/Break

by Cuddly (@cuddlyarbiter)

The word love is oft used in the english language

It's a term thrown about in many different situations, with its exact meaning changing according to the circumstances of delivery.

Thus no wonder that the word is used in any number of ways that's not fully appropriate. Saying "I love you" should mean something.

However, through its constant use by simpletons for the express purpose to evoke a particular carnal response, it's no wonder that to many people the utterance of the phrase doesn't carry the weight that it should.

In layman's terms I'm saying the word "Love" is used by people just looking for sex, which is a genuine disservice to the term.

In my own view "love" is a word that's a tightly packed message, one with many meanings and representative of a plethora of emotions both good and bad, as well as the acceptance of the realities of life that very much define the reach of those emotions.

The reach of love if you will.

When I say "I love you" it means I adore you.

It means that you're beautiful, cute, sexy, that the curve of your face fills me with bliss, that the depths of your eyes reveal to me how rich and complex of a person you are and how lucky I am to know you.

It means I'm happy to be in the same room as you, that having you near is something I value in and of itself.

It's feeling your warmth at night, hearing your breath as we fall asleep, seeing your face as I wake, watching you get ready in the morning, knowing how you look when you're not at your best.

It isn't just about the good things though, as to just focus on the positive is fantasy.

Love is more than the honeymoon.

The bad comes with the good, and being there for the difficult parts is what defines the boundaries of love more than anything else.

Being there when you're sad or sick, when you drink too much and have a horrible morning after.

It's being there when you have a cold, or you suffer terrible allergies and drip all manner of fluids, it's being there when you have a fight with your friend, when there's a death in the family, when anything goes wrong.

I want to be there for those parts too, to help you through all of life's problems. Even when we fight and we don't agree and can't stand to speak with one another. When we mismatch or have off days, it's then more than ever I want to talk to you. When I want to communicate and understand you, because you mean the world to me even when I'm angry, and especially when I don't know why you're upset.

Love is about communication, it's about compromise, it's about doing things for someone else even if it's not your first choice.

For you I'll do chores I despise, I'll try new things I wouldn't otherwise, I'll sacrifice things that matter to me for your sake.

With true love everything is a two way street.

All the ups and the downs, we share them together.

All the disagreements, we talk through them.

All the problems we cause each other, we compromise.

We do all these things because it makes the other happy, because it makes us happy, it sustains us and it defines us as a couple.

Give and take.

Because true happiness is what happens when you make someone else... Happy

That is what love is to me, and I mean it when I say. "I love you." ♡





Saigo Takamori:

The Last Samurai

by Daya (@dayasan)

Commonly called 'the last samurai', he is one of the most influential people in Japanese history and one of its most complex characters. Despite this, if one were to check they would find his Wikipedia article to be sorely lacking in detail for entire parts of his life. I hope this article can provide a good summary for anyone interested in the life of Saigo Takamori.

Indeed, a knowledge of Japanese history is undoubtedly going to require a knowledge of the events of the mid-19th century, and arguably the most important person during this time is Saigo. However, some background is required. Saigo was born in, and spent most of his life within, the Satsuma domain. This consisted of much of the South-Western island of Japan, Kyushu, and centered upon the coastal city of Kagoshima. The domain was run by a hereditary clan, the Shimazu. The ruling clans within Japan rarely had any strong allegiance to those in power at the time nor other clans. The Shimazu were no different. However,

they were in a unique position, being on the far end of Japan meant they were farther from Imperial scrutiny, essentially allowing them to function as an autonomous kingdom for a large part of history, even having Okinawa as a vassal state.

The Shimazu were considered a strong clan, with fanatically loyal samurai, able to extract concessions out Japan's rulers that were not given to other clans. For example following the Battle of Sekigahara^{xv} (1600), despite being a primary participant of the losing side, they were not forced out of their lands (as the Mori^{xvi} & Chosokabe clans had been, with much or all of their domain being taken from them) Additionally getting an exemption to the policy called Sankin-Kotai, which forced the clan lord to travel to Edo (Tokyo) yearly, at their own expense, distancing them from their lands (the Shimazu only going half as often). They were also allowed more than

one castle per domain, another exception. They thus sub-divided their territory into more manageable areas each with its own castle, again resembling more of an independent state than a part of Japan. They used their strength, when it suited them, to display immense loyalty to those in power, such as brutally crushing Christianity (as exemplified by the 26 Martyrs of Japan in 1597^{xvii}) something the rulers of Japan were often eager to push.

Lastly, it is worth pointing out that Shimazu domain contained the port city of Nagasaki, Nagasaki being the only place in Japan to trade with the west for 100's of years, all trade



^{xv} The Battle of Sekigahara which took place in 1600 was a major battle where the existing rulers of Japan, Toyotomi clan, and their allies fought the Tokugawa clan and its allies. Whilst some small battles followed this, the conclusion of the Battle of Sekigahara is generally considered to be the start of Tokugawa rule over Japan.

^{xvi} The Mori clan was another strong Japanese clan whose domain stretched from the Kanmon Straits (just opposite northern Kyushu) North-East to Izumo and Matsue (tip of the knee of Honshu). Following the Battle of Sekigahara the Mori domain was carved up and the Mori clan lost their eastern provinces including their capital, the port of Hiroshima and were subsequently forced to relocate it. The loss of such large land area, the capital, and much of its army combined with the accompanying loss of prestige stung Mori honor and is something they would one day seek to avenge.

^{xvii} The 26 Martyrs were Catholics who were tortured and crucified in Nagasaki.

strictly forced into a small island called Dejima. This stranglehold over western trade gave the Shimazu great influence both culturally and militarily. Photography, many sports such as snooker and badminton, and goods such as chocolate, cabbage, tomatoes, coffee and beer, all entered Japan via Nagasaki. Additionally, firearms first entered Japan via the Satsuma domain which was also the site of the first domestic firearm production^{xviii}. It goes without saying then, the Shimazu clan were frequently heavily involved in the most important historical moments within Japan. This goes for arguably *the* most important moment, too, the Meiji Restoration (and the subsequent Boshin War). This is where Saigo comes in.

Saigo Takamori was born in 1828, the son of a Samurai along with 6 siblings, one of whom went on to become an Admiral. Early in life Saigo was an administrative bureaucrat, being involved in transportation projects and rice inspections. Being close with Shimazu Nariakira, the Daimyo (Lord) of Shimazu domain, Saigo accompanied him in the mid 1850's to Edo (Tokyo). Saigo thus spent much time in the company of various politically invested parties, especially Imperialist reformists visiting Tokyo from all over Japan (they had the goal of ridding Japan of the Tokugawa and restoring Imperial rule). However, in 1858, Nariakira died and around the same time, brutal suppression of the Imperial reformists was occurring. Saigo was exiled to an island south of Kagoshima by the new Satsuma daimyo, after being repeatedly critical of him. Coming back into the fold in 1864, Saigo Takamori's life was about to change, this otherwise middle ranking bureaucrat was about to shake Japanese history. Becoming commander of the Satsuma army despite possessing no experience in battle, he repelled anti-Tokugawa forces from attacking Kyoto (the forces of the Mori clan, Choshu domain)

Within just 2 years of that battle, the Satsuma and Choshu domains had entered into a specific alliance, triggered by extremist anti-Tokugawa factions seizing control of the Choshu domain. Their goal was to overthrow the Tokugawa clan, who had run Japan for over 250 years (with the Emperor being little more than a symbolic and religious figurehead). This overthrow was something the Mori clan especially savoured, as it was the Tokugawa that the Mori and Shimazu fought against and lost to at the Battle of Sekigahara in 1600, which led to their lands being heavily reduced. The goal of elevating the Emperor to be the total leader of Japan was driven by the Shimazu and Mori belief that the only way to regain honour and respect after the humiliating unequal trade treaties and the enforced end to isolationism by the West, was wholesale change, both in leadership and also through rapid westernisation (the Shimazu always keenly embraced new technology).

In 1866, the Tokugawa launched a military expedition against the Choshu domain to punish them for their repeated treasonous statements and outspoken intentions against the Tokugawa. However the Tokugawa lost, which led to the Choshu domain and their new allies, the Shimazu, seeing an opportunity. Soon after, the head of the Tokugawa died and

^{xviii} In 1543 a Chinese ship with some Portuguese adventurers on board happened to anchor near one of the southern islands of Kyushu called Tanegashima due to a storm. The lord of the island, a vassal lord of the Shimazu, purchased 2 firearms from the Portuguese. These were the first firearms in Japan. He then set about creating more, starting the first firearm production in Japan. This association between the Shimazu and firearms continued and they would be the first in the nation to use them on the battlefield.

was replaced with a weak, reluctant leader. The following year, Emperor Komei also died, with his son Emperor Meiji, ascending to the throne. With a change in both Imperial and Tokugawa leadership, there was a sense among the highest levels that tensions could be reduced, however the Satsuma and Choshu alliance decided now was the time to strike, creating an order in the name of the emperor to 'slaughter the traitor Tokugawa Yoshinobu' who instead resigned his post thereby ending the Tokugawa shogunate. This decision was made to ensure that some measure of power for the Tokugawa clan as a whole would be retained within the new Japanese government.

Shimazu and Choshu hardliners did not see this as a solution, seeing the Tokugawa as a continual threat as long as they existed. The hardliners within the Satsuma/Choshu army led by Saigo Takamori, seized the imperial palace in Kyoto, forcing Emperor Meiji to declare full Imperial rule which was granted. Much of the existing imperial assembly were lukewarm about this and favoured some form of collaboration with the Tokugawa but Saigo Takamori instead threatened the entire assembly into abolishing the Tokugawa entirely and seizing their lands.

Tokugawa power was centered within Edo (Tokyo). Edo Castle soon suffered various arson attacks, blamed on Satsuma samurai who also attacked a government office. The Tokugawa retaliated against these attacks and in a move also intended to be a direct response to the Imperial edicts against them, attacked the official Satsuma residence in Edo and executed the officials inside. They also began preparations to attack Kyoto to force out Saigo Takamori and his army, believing, quite rightly, that the Imperial Restoration was not hugely desired by the Emperor and instead had been more or less forced upon him by the Satsuma and Choshu domains. This triggered the start of the Boshin War. The first battle of the Boshin War took place just south of Kyoto at Fushimi where the Imperial forces led by Saigo Takamori defeated a Tokugawa army three times larger. The Tokugawa forces were pushed further and further north, eventually to their political center, Edo. Saigo Takamori's forces surrounded the city, however instead of crushing the city with overwhelming force he instead entered Edo with a small group of followers, seeking to negotiate a full surrender without further bloodshed. In this he succeeded, obtaining an unconditional surrender from the Tokugawa forces in their largest military stronghold and simultaneously seizing Tokugawa Yoshinobu, who by this time had already fully submitted to the Imperial Court and was awaiting his fate (which turned out was just enforced retirement to Shizuoka).



The rest of the Boshin War against the remnants of the Tokugawa forces was a series of Imperial victories, forcing their opponents even further northwards, where they were faced defeats at Utsunomiya, Nagaoka (near Niigata), Aizuwakamatsu and Sendai. Eventually the remnants were hemmed into the French-style star fort in Hakodate, called the Goryokaku, whereupon they were finally defeated and the war ended. Following this, Saigo Takamori returned to his bureaucratic roots in this new postwar Japan, overhauling the han-system of hereditary clan-ruled domains and making them into prefectures, which remain in place today. He also established a national conscript army and led the Japanese government during the early 1870's whilst much of the leading politicians were on tours of the West (to legitimise Imperial rule and overhaul the unequal treaties still in place over Japanese trade with the West).

As ever with Saigo Takamori, what could have been a quiet life as a bureaucratic minister was not to be. Upset with elements of the modernization, Saigo opposed a national rail network and wanted the funds to instead be spent on overhauling the military of Japan.

Following Korea's refusal^{XIX} to recognize the new Japanese emperor, Saigo offered to travel to Korea and insult the Koreans to such a degree they would kill him, the death of such an important minister thereby giving the Japanese cause for a full invasion. When his idea to punish Korea was refused by the Japanese government, Saigo Takamori resigned and returned to his hometown of Kagoshima, now capital of the new Kagoshima prefecture.

Even now for Saigo a quiet retirement was not to be. He was fated to be front and center of Japanese history yet again. The military reforms following the Meiji Restoration, which had partly been led by Saigo Takamori himself by his developing of a conscript army, had now led to much of the entire samurai class becoming unemployed. The huge societal changes also caused general unease for many due to some aspects of westernization such as changes to the Japanese language, culture and dress being too much for this very traditional and military region. Many of the Satsuma area officials and ex-samurai had by now moved back to Kagoshima, causing an abundance of unhappy, unemployed samurai to now be concentrated in a region far from Japanese centralized rule.

Saigo Takamori opened private academies across the new prefecture of Kagoshima where he provided academic classes paired with weapons training, military tactics, and artillery schools. This was something which, to the new Imperial government, increasingly looked like a threat. Unhappy samurai, many of whom saw action within the Boshin War, soon found themselves in elevated positions within the Kagoshima local government or in leadership roles of various academies filled with educated samurai now trained in modern military tactics. By 1876, Kagoshima prefecture was, as was Shimazu domain before it, essentially its own country, with Saigo Takamori leading it.

The Imperial government soon sent a group of police officials to investigate what was going on. The officials were captured and under torture admitted being sent to assassinate Saigo Takamori. The samurai decided themselves that they needed to start a rebellion to protect Saigo, who at this point was in semi-retirement. An Imperial warship sailed to Kagoshima to remove weapons from the Kagoshima arsenal (fearful of Saigo's military academies) however upon hearing this, the military students seized the weapons and staged similar raids on other weapons depots and naval yards. The Imperial government decided that it needed to send forces to Kagoshima to stop the revolt before it could potentially trigger nationwide rebellion. Saigo himself, horrified by the situation, saw no choice but to, very reluctantly, lead forces against the Imperial government. The goal was to march north and east to Tokyo, to attempt to negotiate multiple points which included the unemployment the samurai faced, the elimination of their rice payments, the (unknown to Saigo, false) assassination attempt against him, the increasing westernisation and the general prioritising of rapid progress ahead of the nation's traditional commitments to its people.

Whilst it did not seem so at the beginning, this was the start of the Satsuma Rebellion, also called the Seinan War where a reluctant Saigo Takamori found himself fighting against the

^{XIX} Korea was always of interest to Japan. Throughout history both nations repeatedly meddled in the other's affairs. Japan even invaded Korea in the late 16th century and would go on to infamously do so again in the early 20th century.

very same government he only 9 years earlier fought to put in place. He led his forces north to Kumamoto on the west coast of Kyushu to seize the castle there. Kumamoto Castle was one of the strongest castles in Japan, but with an army of Kyushu conscripts plus many of its officers being from Kagoshima, Saigo felt it possible to take. Its capture was a necessity for a few reasons first and foremost its being right in the way of their northward march. Other fortifications also lay between his Army and the north on the East coast and the center of Kagoshima was mountainous, plus a statement victory could potentially draw even further support to the samurai cause. Saigo's forces surrounded Kumamoto castle and began a siege, his numbers growing in strength daily due to former samurai taking up arms in his name.



It took over a month for Imperial reinforcements to land by sea in 2 locations north and south of the castle. The siege ultimately failed due to a breakthrough victory by Imperial forces near Tabarazuka. This one battle caused more casualties and wounded than the whole of the Boshin War and the rebel forces were forced south to Hitoyoshi, roughly halfway between Kagoshima and Kumamoto. Both sides were lacking in morale and equipment at this point, so Saigo decided to march the 70-80 miles to the east coast to Miyazaki, leaving some of the troops behind in the hilly interior to slow down the imperial army who were following behind. However, with too few troops, little heavy equipment, no naval forces, and no impending national rebellion, it was likely Saigo at this point knew that failure to take Kumamoto Castle meant the rebellion was already doomed.

Forced southwest to Miyakonojo by the following Imperial troops, the rebels were again forced to move along, this time north along the coast to Nobeoka. Further imperial reinforcements landed by sea at Saiki and Oita, trapping Saigo's forces. They made a stand

at Mt Enodake just north-west of Nobeoka but were grossly outnumbered and had by now lost almost all of their best firearms and any heavy weaponry they had once possessed. Many were killed or committed seppuku and the remainder fled to Saigo's hometown of Kagoshima, including Saigo and between 400 and 500 of his men. They set up on an elevated area on the west side of a city called Shiroyama. This was to prove the last stand for Saigo Takamori, his forces and the entire rebellion.

Imperial forces swiftly created extensive fortifications and ditches around Shiroyama, then proceeded to relentlessly attack the rebel positions using both land artillery and also calling upon the firepower of the imperial warships in Kagoshima harbour. Saigo refused surrender, and massive wave attacks by imperial forces reduced the rebel forces to just a few dozen men including Saigo who was gravely wounded. What happened next is debated, the rebels insisted that Saigo committed seppuku, the Imperial forces claiming he died of a bullet wound. The remaining handful of rebels positions were seized by the imperial positions and the defenders quickly met their end.

The rebellion it could be argued, achieved one of Saigo's objectives. The Imperial government paid off the former samurai to keep them from rebelling again. However, this came at great cost. Japan was forced off the gold standard and national debt tripled, leading to state-owned enterprises being rapidly sold off to the highest bidder which only just saved the country from near bankruptcy.

Despite what happened, the Imperial side held no grudge, within 12 years of the rebellion, Saigo was entirely pardoned, and soon after 2 statues of him (one in Ueno Park and one near Shiroyama) were erected. Never forgotten in his home prefecture, his portrait and statues of him abound throughout the city of Kagoshima. His birthplace, deathplace, and the cave he was in during the final battle are popular tourist destinations within Kagoshima, with leaflets at tourist offices getting people to go on a 'Saigo Takamori pilgrimage.' His life recently came into the spotlight again, as the focus of the NHK produced Segodon TV series (lengthy well financed historical drama series are a yearly tradition for the NHK).

Saigo Takamori is definitely one the most complex characters in Japanese history. Originally a bureaucrat, then an army general protecting the Tokugawa and soon after a commander leading Imperial forces to victory against them. After that he was a man who was instrumental in the development of post-Meiji Japan and finally a martyr leading a rebellion against the same government he was so instrumental into putting into place and developing. Even with Saigo's life being complicated and fraught with sometimes unusual choices that were seemingly at odds with his previous ones, his belief in honour, tradition and loyalty show him to be a model leader, and for this he is still commemorated today as a hero- especially within Kagoshima. ♡

Image Sources by order of appearance

Portrait of Saigo Takamori <https://www.ndl.go.jp/portrait/e/datas/85/>

Map of Japan's main islands <https://rb.gy/uhta8k>

Map of the Boshin War <https://rb.gy/k5lv4k>

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Group Picture

Spring 2024

Compiled by Poliwhirl (@poliwhirl61)



A seasonal tradition for Blue House is the Group Photo. As many of us live very spread out, trying to capture our memories together is impossible. Instead, towards the beginning of each season; Spring, Summer, Fall, and Winter, we arrange a faux "group photo" where anyone can submit a profile picture or avatar of themselves to be arranged together. Aside from the moderation staff, participation in the Group Photo is completely voluntary. Each season, if someone wants to be included, they have to opt-in. In each Group Photo, I try to make it fit a seasonal theme. Gardens and cherry blossoms are often a winning theme for Spring. Although this is fundamentally a collage, it does represent a significant time investment. Not just finding or generating a suitable background image, but cropping and editing everyone's submitted photo, and arranging 50-70 layers together into something that people would look forward to. This season, for the 2024 Spring Group Photo, we had 14 staff members and 55 non-staff members included in our little "get together at the lake house." ♡

Understanding Vocal Transition

The Science of Speech Production and Perception

by Pomegranate (@pomegranate.princess)

What is Vocal Transition, and Why is it Challenging?

Vocal transition, or the act of changing the way one's voice is gendered, may seem less approachable for many trans people when compared with other forms of transition. With some forms of transition, such as hormonal transition, the questions of what techniques or practices an individual can engage in to be successful and how to determine whether or not an approach is yielding the desired results have relatively clear cut answers. With regard to the particular example of hormone replacement therapy for feminization, some practices one might engage in are taking estradiol orally or sublingually, taking it via injection, using hormone patches, or attempting to change hormone levels by some other means.

Regardless of the chosen method, clear and specific instructions for using it are generally provided by a doctor, pharmacist, or other healthcare professional and the prescribed task is generally easy to perform. In order to identify whether or not the feminizing HRT regimen is working, blood hormone levels can be tracked with regular lab work, the body can be inspected for the desired physical changes, and the magnitude of those changes can be evaluated and described in a variety of ways without much difficulty. Blood hormone levels can be described in terms of concentration and compared with a set of target values, breast size can be evaluated using a tape measure and compared to size charts, and the presence or absence of various skin changes such as softening of the skin or a reduction in acne can be noted and described qualitatively. The combination of straight-forward to understand and easy-to-carry-out instructions and readily apparent metrics for evaluating progress and determining whether or not to consider adjusting the treatment plan makes HRT for feminization a relatively approachable form of transition.

On the other hand, vocal transition can be seen as intimidating for transitioners of all genders because it lacks those things. Whether one desires to masculinize^{xx} or feminize

^{xx} While individuals who wish to masculinize their voices as well as therapies targeted at doing so do exist and are offered, it is much more common for people to want to feminize their voices. Some of this may be due to the way in which the vocal apparatus is affected during testosterone-dominant puberty versus estrogen-dominant puberty as well as asymmetries in the workings of gender perception of speech when it

their voice, the issues of what one should do in order to have the greatest chances of safely achieving their desired results and what to look for in order to determine whether or not the approach one is using is proving to be effective are harder to pin down. Many different groups of people including speech therapists and speech pathologists with a wide range of qualifications and levels of experience working with the trans community, vocal surgeons who perform several different kinds of vocal surgeries each with different satisfaction rates, singing coaches, youtubers, and individual members of the trans community who have experimented with their own approaches have proposed various methods for changing the way the voice sounds. Whether or not these approaches are evidence-based or backed up with some form of scientifically-grounded rationale varies. As a result, the multitude of approaches, rather than providing transitioners with a plethora of validated options as with hormone replacement therapy, serve more to muddy the waters and make choosing an effective treatment plan for vocal transition a daunting task that requires lots of research.

Regardless of method, in order to evaluate whether or not an approach is effective at achieving its goal, there must be some metrics by which approaches can be evaluated and compared. With respect to vocal transition, identifying such a set of metrics requires answering the question of what makes a voice sound masculine or feminine, which despite the simplicity of the query is a complex and lengthy undertaking, one to which this article is largely dedicated. Once such metrics are identified, the question of which methods are best for changing them so as to align with the gender with which one identifies can be addressed in a coherent and directed manner. While answers to both questions are integral to equipping trans people with effective tools for vocally transitioning, this article is concerned primarily with the former question regarding the identification of features and metrics pertaining to the gender perception of vocal signals.

There are also many myths and misconceptions about the voice and vocal transition that can cause transitioners to pursue unhelpful or even detrimental methods of attempting to change the voice. One of the most common of these myths is the idea that voices are gendered masculine or feminine based almost entirely on pitch, also known as fundamental frequency, with women having higher pitched voices and men having lower pitched voices. While this pattern may appear to hold for the majority of cases, upon closer inspection, the truth is far more complicated. Pitch, resonance, intonation, word choice, and many other aspects of speech influence the way that speech is gendered (Latinus and Taylor, 2011). Moreover, each factor may influence how speech is gendered to varying degrees based on the language being spoken, the cultural backgrounds of the speaker and the listener, the age of the speaker, and many other factors that are difficult to account for (Brown, 2015).

comes to gendering a voice as masculine versus feminine, but regardless of the cause, there are many more publications and resources dedicated to the topic of vocal feminization than masculinization. This has an effect on how vocal transition is discussed and studied as well as the quality of studies and the availability of data relevant to masculinization in literature. As such, examples and sources discussed in this article may focus more on vocal feminization. Regardless, information gleaned from these sources, particularly with respect to information about the basic operation of the vocal apparatus and its role in imparting gendered features to vocal signals, is often relevant to people wishing to masculinize their voice as well. When necessary, the scope of applicability associated with statements made in this article will be clarified so that the reader can decide whether or not the information is relevant to them.

Worse still, many of these factors limit the degree to which studies performed in different locations, at different times, or within different cultural contexts can be usefully compared. In spite of this, the public at large as well as researchers who study transgender care and publish papers about vocal transition in a professional context continue to place disproportionate emphasis on the role of pitch in vocal perception.

An example of this comes from a 2019 review of literature on the subject of the effectiveness of vocal feminization therapy and surgery published by researchers at the University of Vermont's College of Nursing and Health Sciences. The publication in question began by evaluating 82 papers relevant to the topic and after applying a set of inclusion and exclusion criteria to determine which works to use in their review, 12 were chosen. One criterion for what these 12 papers needed to contain reads as follows: "Objective measurement of fundamental frequency pre/post therapy," with the rationale for the criterion being, "Perception of voice is impacted by fundamental frequency. Although other factors contribute to the femininity of one's voice (e.g. intonation, resonance, quality), fundamental frequency is essential in achieving a feminine voice". Amusingly, the rationale for another criterion stating that papers included in the review must have a "Self-perception measurement" reads as follows: "Oftentimes, individuals who have increased their fundamental frequency to within the typical cisgender female voice range will still be perceived as masculine by others and themselves. As such, a measure of self-perception is crucial to determining successful VT (Voice feminization Therapy)/voice modification surgery" (Leon-Gambetta et al., 2019). Taken together, these two sets of statements both acknowledge that pitch can play a role in the way a voice is gendered and also that a pitch within the typical female range may not by itself be sufficient for obtaining a voice that is generally perceived as feminine. Furthermore, given the existence of men with voices that are routinely gendered masculine despite being of a higher pitch than the voices of many women whose speech is likewise gendered properly and the existence of women who have feminine-perceived voices that are lower than those of many men whose voices are perceived as masculine (Kovačić, 2009; Latinus and Taylor, 2011), it appears that not only is a pitch in the normal female range not sufficient for being perceived as feminine, it may not even be necessary in all cases. As such, it's clear that factors other than pitch must be significant in affecting how vocal productions are gendered.

What this something else might be is touched on in a separate paper discussing various methods of vocal feminization currently in use. The paper, titled *Vocal Feminization for Transgender Women: Current Strategies and Patient Perspectives* published in 2020 in the International Journal of General Medicine opens with the following: "Voice feminization for transgender women is a highly complicated comprehensive transition process. Voice feminization has been thought to be equal to pitch elevation. Thus, many surgical procedures have only focused on pitch raising for voice feminization. However, voice feminization should not only consider voice pitch but also consider gender differences in physical, neurophysiological, and acoustical characteristics of voice" (Kim, 2020). The paper mentions some of these important non-pitch characteristics, most notably the sizes and volumes of various parts of the vocal apparatus, but it includes very little detail on the subject and no specific discussion of approaches for modifying these characteristics.

Ultimately, the topic of the voice is extensive and complex and can be discussed from a variety of perspectives, and any single piece of writing on the subject will necessarily leave out a large amount of important information. The scope of this article will be limited to providing a conceptual overview of the voice from a technical perspective as well as frameworks and tools for thinking about and evaluating vocal productions with the goal of exploring how vocal transition works. The primary focus will be on addressing the two challenges above by explaining what aspects of a voice cause it to be gendered a particular way and how those aspects arise from the anatomy and physiology of speech production. While the differences between how the vocal apparatus is used when producing masculine vocalizations versus feminine vocalizations will be discussed and described, the topic of exercises, drills, and methods for affecting changes to the voice, while important, is beyond the scope of this article, rather the goal is simply to develop an accurate and grounded understanding of a poorly understood and complicated topic so that readers can be empowered to pursue more effective means of achieving their goals and not waste time or energy pursuing ineffective ones, or worse, detrimental ones.

To begin with, it's helpful to discuss what the voice is and how it can be measured and analyzed. This will be done by considering the voice through the lens of *signal processing*: a branch of engineering and mathematics focused on how signals and the information they contain arise from the systems that produce them as well as how they are changed by the various systems they interact with and how systems go about deriving information from signals they receive. With respect to vocal signals, the system that produces them is generally the human vocal apparatus and the system that receives and perceives them is generally the human ear and brain, although the information that is discussed can apply to artificial systems that process such signals as well. The following section is dedicated to cultivating an understanding of what a signal is for the purposes of informing further discussion.

Three Perspectives on Signals: Mathematical, Physical, Sensational

Broadly speaking, signals can be thought of in three domains: the physical, the mathematical, and the sensational/phenomenological/perceptual (all three terms will be used interchangeably throughout this article). The physical representation is the way the set of information termed 'the signal' arises from the physical nature of the universe wherein the signal is comprised of some configuration of matter and energy distributed over space and time. For example, sound signals are pressure waves propagating over a material medium, such as air or water, light signals are propagating fluctuations in the electromagnetic field within a given frequency band, and gravitational wave signals are fluctuations in spacetime which can be detected via observing the change in position of a light beam caused by the distortion of space over a large distance.

The physical form of a signal can also be changed into another form via a process known as transduction. This is the case when a microphone is used to convert pressure waves into

mechanical oscillations in a diaphragm, which get converted to fluctuations in the magnetic field via the motion of a magnet attached to the diaphragm, which then get transduced into electrical signals by a coil surrounding the magnet that serves to convert the changes in the magnetic field into changes in voltage across the coil. At every level, one may choose to think of each representation (*e.g.* change in pressure at the microphone over time, the displacement of the diaphragm over time, voltage across the coil over time) as different representations of the same sound signal, albeit in forms other than a pressure wave.

Physical signals and their information content can be altered unintentionally or intentionally as they travel through the universe and interact with other physical entities, such as in the example of a sound signal being recorded by a microphone and going through the series of transductions described above. While many of the alterations that can happen to a signal are undesirable and may introduce noise to the signal, systems and processes which act directly on a physical representation of a signal can be used to perform useful and predictable processing of it. An example of this is the choice of holding an opera performance in a large auditorium with specially designed architecture that imbues the space with desirable acoustic properties. The changes to the sound signals produced by the performers that result from the sound interacting with the physical system that is the building is a form of signal processing.

The mathematical representation of a signal is how a signal is described using numbers, functions, graphs, operations, sets, and in so many words, the tools and conventions of mathematics. The representation of a sound as a series of indexed values corresponding to the amplitude of the signal at a given time is an example of a mathematical representation of a signal. A graph of a stock price in a given currency over time is another mathematical representation of a signal. Mathematical representations are the most easily understood and manipulated forms of a signal as they can be explicitly and unambiguously described and can be studied and modified quickly and easily by performing mathematical operations on them, usually with a digital computer processor. It's much simpler to add and modify a reverb effect to an audio signal by manipulating its mathematical representation using audio editing software than it is to find a large echoey space in which to produce and record sound (and even then the spaces that are accessible will limit the kinds of reverb that can be achieved).

The mathematical realization of a signal, while convenient to work with, often only has an obscure, indirect, or complicated relationship to the information one may wish to glean from it, particularly if the information is of an abstract nature. A digital image represented as a series of numbers indicating the colors of a set of pixels arranged in a grid might be an image of a dog, but attempting to understand that fact from observation of the numbers alone without the benefit of human visual processing is difficult. Deriving abstract meaning from mathematical representations is a challenge at the core of many problems in the fields of audio and visual signal processing, including the problem of gender identification.

Finally, the phenomenological representation is the response that signals of various forms elicit in beings capable of experience. If one looks at a red delicious apple, one might have the *experience* of seeing the color red. Similarly, if one were to look up at the sky on a clear

day, one might have the *experience* of seeing blue. Likewise, there are experiences associated with hearing different sounds or being exposed to various scents. It's important to note that the experience of a signal is one and the same as the phenomenological representation of that signal, or in other words, the experience of a signal is how the signal is represented in the mind^{XXI}.

Experience is perhaps the most complex aspect of a signal to account for as there is often no sure-fire way to guarantee that a signal intended to convey a particular experience actually succeeds in doing so. A red apple may reliably reflect light with a wavelength of approximately 650nm (a physical representation), but if it bounces onto the retina of someone with red-green color blindness, does that person see (*i.e.* perceive/experience) red? Or to put it another way, if the goal of sending the 650nm light signal is for the person receiving it to experience seeing the color red, does the apple accomplish this? One can assert that such an individual would see red, but that their experience of seeing red would include the experience of being uncertain as to whether or not what they are seeing is green. Therefore it could be said that they process and experience red light in a way different from how someone without red-green color blindness does. Whether or not this difference in processing and experience is significant is highly contextual. If such an individual is tasked with separating blue marbles from a bucket containing both blue and red marbles, their processing and experience of the color red would likely be sufficient for the task, but if the blue marbles are replaced with green marbles, their processing and experience would likely not be sufficient.

Aside from physical/medical conditions, cultural background, life experience, and history with art and media may all contribute to how a signal is experienced as well. If the goal of showing a person the color red is to evoke ideas of fierceness, strength, and power, perhaps a Western European audience, accustomed to seeing red in such a way by the associated traditions of art and culture common to many such societies, might receive the intended message from the signal. On the other hand, people from different cultures with other stories and ideas associated with the color red might see it differently. For example, people who have grown up with a Chinese cultural background may see it as a lucky color and associate it with wealth, good fortune, and prosperity (The Meaning Of Different Colors In Chinese Culture, 2021).

In a world where things as fundamental as the experience of human emotion and even symptoms of mental illnesses like depression differ between people of varying cultural backgrounds (Phifer, 2022), the role of past and present subjective experience in the

^{XXI} The classical distinction between the mind and brain may be summarized succinctly through the sentence: "The mind is what the brain does." The brain stores and processes physical representations of a signal, but the mind is the aspect of the system in which the meanings of these representations, these symbols, are converted into phenomenology and experience, which depending on one's framework, may be broken down further into more 'atomic' experiences, sometimes referred to as qualia. While a broader discussion of phenomenology is beyond the scope of this report, the idea that practical everyday experiences, such as the experience of stepping outside and feeling the sun on your skin, or listening to a song, can be thought of as composed of more basic experiences is a useful one to keep in mind, as it carries implications for how one might go about designing systems intended to affect perception and experience.

interpretation of a signal, especially with respect to abstract notions such as style, gender, mood, or tone can be significant and must be appropriately understood to the best of one's ability to do so when approaching relevant problems.

The following example serves to illustrate the significance of physical, mathematical, and phenomenological representations of signals and the implications this has for practical applications. Begin by consider a 10 second audio signal stored on a computer as a series of 80000 16-bit numbers obtained by sampling a person speaking aloud at a sampling rate of 8kHz. While it's easy enough to understand that playing the series of samples in an audio player application will result in a production that is highly reminiscent of the original speech signal emerging from the computer's speakers (changing the signal from a mathematical representation encoded as an electrical/physical representation on a hard drive to a physical representation encoded as pressure waves propagating through the air), is this sufficient to obtain whatever information the signal may be meant to convey? Perhaps the 10 second clip is of a person saying, "I need to get groceries before 5pm". In order to understand what this means, one must be able to understand the language and accent being spoken, which itself consists of multiple cognitive tasks (Brent, 1999), how 12-hour time works, and indicators that may be present in the tone of voice and overall manner of speech. Additionally, information about the context in which the audio was recorded may change what the signal means. If the signal was recorded by an actor rehearsing lines for a play then it's meaning is different than if it was made as a reminder or part of a to-do list.

This example demonstrates that in order to obtain information that may be *encoded* in a signal, one must have the means to *process* the signal in such a way as to be able to *extract* the encoded *features* and assign them meaning. Without such a means of processing the signal, the way the audio is perceived and the meaning that is derived from that perception may not be useful. For example, without understanding the language of the speaker in the clip, the audio may be perceived as gibberish when processed by the brain and it may not even be possible for the listener to parse when one word ends and another begins, much less come away with any semantic information (Kooijman, 2007). Even though none of this information is explicitly conveyed by the mathematical representation on the hard drive similar to how a list of numbers corresponding to pixel colors doesn't explicitly convey 'dog', the hard drive clearly contains enough information for someone with the proper means of processing it to glean further insight. Therefore, in a real sense, the mathematical representation also stores this more abstract information provided that the stored signal is played back by an entity capable of processing it in an appropriate fashion. Keeping these three perspectives of signals (the physical, the mathematical, and the phenomenological) in mind while proceeding is crucial as it allows one to gain a better understanding of how physical differences in signals correspond to differences in how they're perceived. In order to see these three domains in action, it is helpful to look at the act of human speech from a signal processing perspective, which is to say as a signal moving through a pipeline/cascade of systems that alter its nature. Such a system is depicted in figure 1 below.

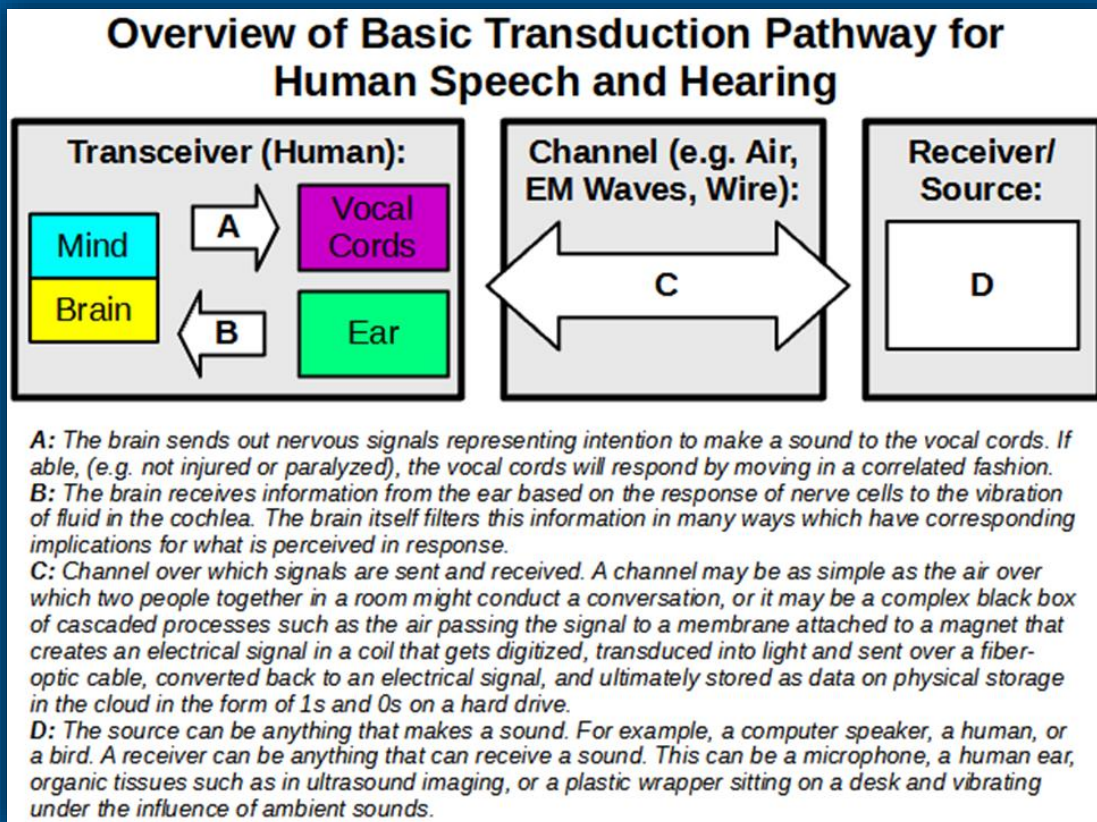


Figure 1: Simplified signal pipeline for human speech and hearing with respect to voiced phonemes

Consider the process that begins with speech production and ends with hearing and perception. All signals have a source. These sources are often physical and their physical nature constrains the types and traits of the signals that the sources can produce. This is why a ukulele sounds different from a guitar: their forms lead to different constraints on the signals that they make. In human speech, the direct source of the sound signal^{xxii} is the human vocal cords, which vary in form (e.g. length, mass, resting tension) with such variations having implications for the resulting sound. The vocal cords are set into motion when speaker intention, represented physically in the form of neural signals, propagates along a series of nerves and causes adjustments in muscle tension that bring the vocal cords together causing them to vibrate when air is forced through them from below (Zhang, 2016). This mechanism, whereby the vocal cords themselves are not directly moved back and forth by the muscles as one might wave one's hand from side to side but rather set aflutter by the stream of air flowing through them, is similar to the mechanism by which a

^{xxii} It is important to distinguish the vocal cords as being the direct source of the sound signal (i.e. the pressure waves in the air) because it is not the only signal involved in the speech process! The neural state that motivates the vocal cords to produce the sound signal is an example of another signal that is present within the system, and indeed the sound signal can be analyzed as a filtered version of this neural signal. Within such a model, the neural signal could rightly be referred to as the source. Filtration as a formal concept is introduced in the next section, although many examples of it have already been discussed.

kazoo generates its sound. The conversion of the signal from intention within the brain to vibrations within the vocal cords is represented by the arrow labeled 'A' in figure 1.

From there the oscillations travel through the air within the vocal tract. As the sound waves propagate, they are partially reflected and partially absorbed when they encounter the surrounding tissues. When the sound waves reach the lips, they radiate outwards into the surrounding atmosphere and the amplitude of the signal begins to diminish with higher frequencies diminishing faster (Laine, 1982). This is why sounds are quieter when heard from further away. The series of all channels over which the signal propagates on its way to the receiver is represented by the arrow labeled 'C' in figure 1.

Finally, the signal arrives at the receiver, labeled 'D' in figure 1, at which point the signal is processed by the receiver in some way. If the receiver is a computer microphone, this processing may look like transduction to an electrical signal followed by processing with analog circuitry and then conversion into a digital signal. If the receiver is a human, this processing may look like human hearing and perception.

Human hearing can be analyzed in a similar fashion to reception via computer microphone. Consider 'D' in figure 1 to be a human speaking a sentence aloud to another human in an otherwise empty room. This signal would be produced by the vocal apparatus in the manner already discussed above, propagate through the channel represented by 'C', and eventually reach the receiver on the other side of the channel, which in this case is a human ear. The ear, much like a microphone, transduces the signal from a pressure wave representation to a new type of signal, in this case an electrochemical representation which manifests in the brain, a process represented by the arrow labeled 'B' in figure 1. The brain contains a complex and on-the-whole poorly understood assemblage of neurons that perform a set of computations on the signal, thereby processing it in some fashion and changing its own electrochemical state as it does so. It should be noted that this electrochemical state within the brain is one and the same as the current physical representation of the signal at this point along the processing pipeline. These changes in physical brain state result in changes within the mind/ongoing experience of the perceiver, which is to say that a person's experience is based on the physical state of their brain and what the individual experiences changes as their brain state does. This is the interface between the physical and the phenomenological. The roles of the various components of a human receiver of sound signals are outlined in figure 2 below.

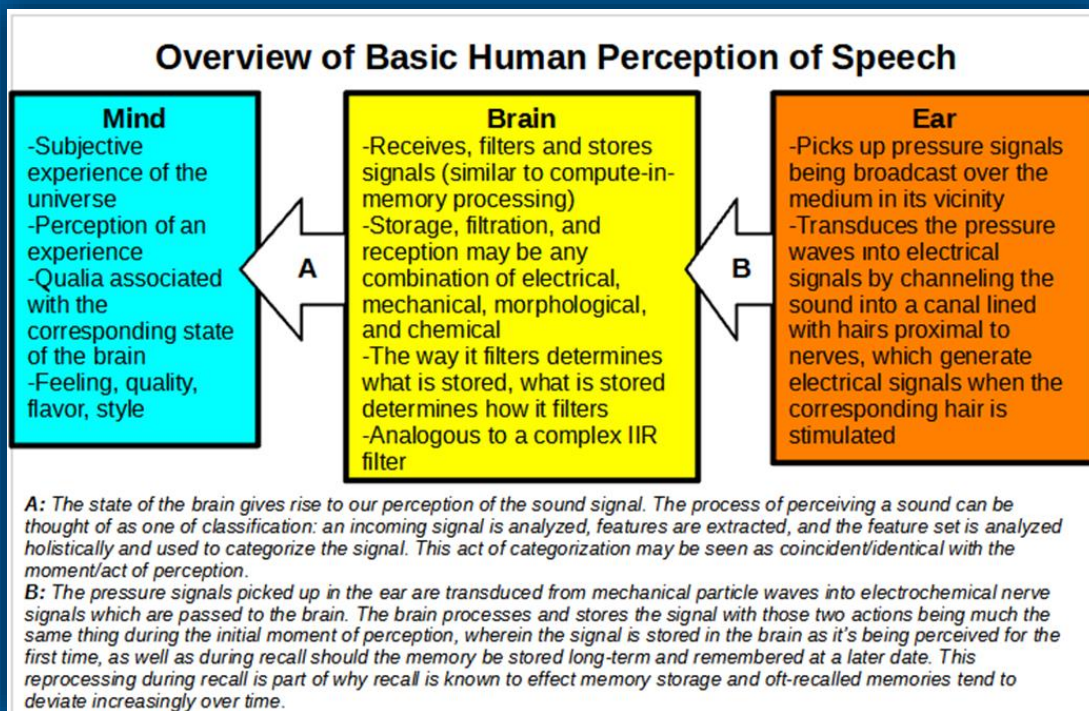


Figure 2: Simplified process of human auditory perception.

Having addressed the conceptual foundations of signals and perception and having explained how they relate to human speech and hearing, the nature of vocal signals as mathematical and physical objects will be explored in greater detail. The motivation of doing so is to provide a greater understanding of the relationship between signals and their features and how they can be described in useful and specific ways conducive to comparison and study, as is required for such features to serve as useful metrics by which to gauge the nature of a voice.

Descriptions of Signals: Waveforms, Spectra, and Spectrograms

This paper has two primary goals. The first goal is to cultivate a deeper understanding of vocal signals and the particular aspects of such signals that result in them being gendered/perceived in a certain way. The second goal is to understand the processes taking place in the physical world that result in the gendered qualities of a vocal signal in order to explore how those processes can be adjusted so as to create different signals with differently gendered qualities. In order to accomplish either of these goals, it is necessary to understand various tools for describing vocal signals and their traits. This section will introduce multiple such tools in the form of several ways of representing the contents of a vocal signal and what each type of representation is useful for showing.

Sounds are some of the most important and common signals encountered in daily life. When presented visually, such as in audio editing programs, sounds are often shown as an amplitude graphed over a dimension of time. When stored in digital systems, sounds typically take the form of a series of indexed samples wherein each sample has a value representing the amplitude at a time corresponding to the sample index. Amplitude signals or other time-varying signals plotted with the signal value on one axis and the time on the other axis are called *waveforms* or *time domain representations*. With respect to audio processing, time domain representations are most useful for showing where the energy of a signal is concentrated in time, but they don't always do a good job of conveying information about other qualities of a signal. This is illustrated by the waveform in figure 3 below. While the waveform makes it clear where the sound is loud and where it is soft, it's more or less impossible to determine the phonetic contents of the waveform, or if the contents are even phonetic in nature, simply by examining the graph.

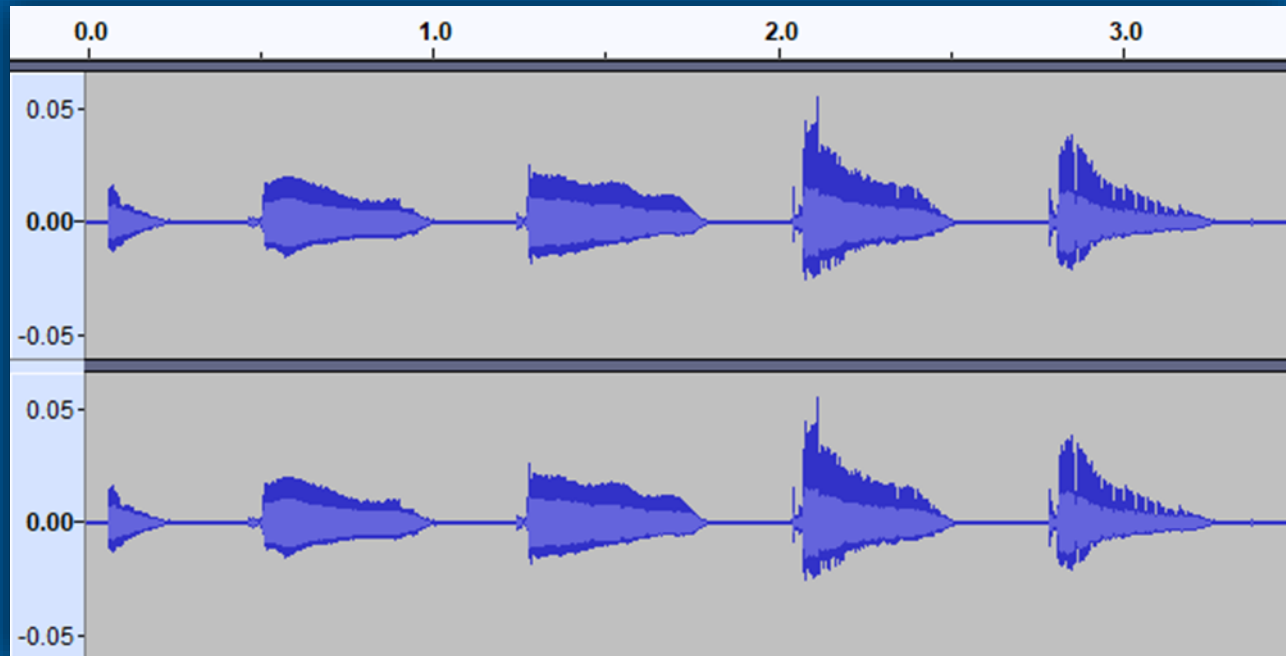


Figure 3: Waveform of the author making a series of vowel sounds. While it's apparent when in the recording a sound is being made, the nature of the sound is far less apparent.

By contrast *frequency domain representations* or *spectra*, an alternative to time domain representations, do a good job of showing what a signal consists of at a particular time but don't provide any information about the behavior of the signal at different times. Instead, the unit along the x axis is Hertz or another unit of frequency and the unit along the y axis is amplitude. Consider the set of graphs in figure 4 below. The first graph consists of three sine waves of increasing frequency back to back and each graph below is a frequency domain representation of the information in the first graph over a given slice of the signal, known as the *window*. Note how neither graph shows all three of the frequency components

present in the signal nor the order in which these frequency components appear. Instead, it only shows which frequencies are present during the particular time window over which the analyses are performed and what their relative amplitudes are/how much each component contributes to the overall signal within the window. Since the 20Hz sine wave is only present for half the amount of time in each window as the component it appears with, it appears with half the amplitude. Given the obvious nature of the time domain signal in figure 4, it may not seem that there is much of a need for the frequency domain representations, however consider a more complicated waveform, such as the one in figure 5.

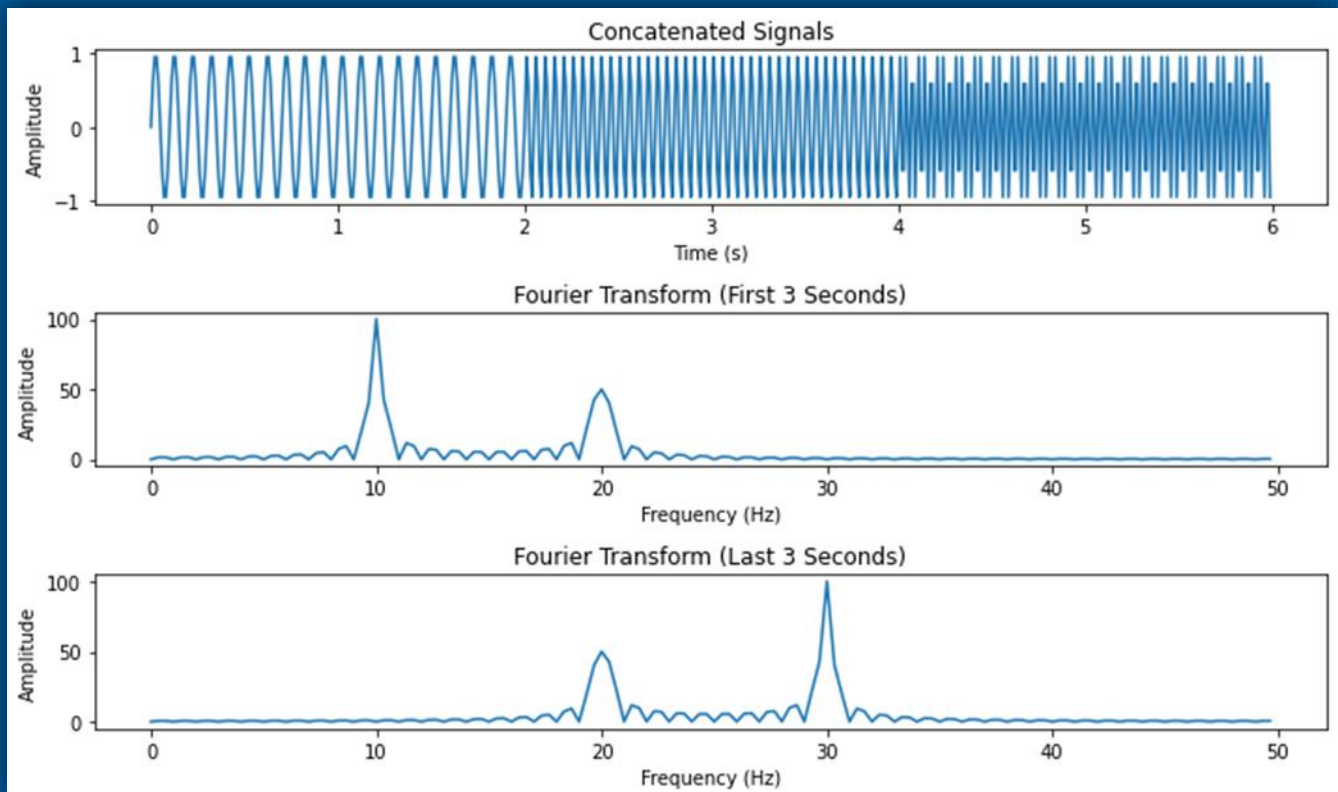


Figure 4: From top to bottom: A waveform consisting of a 10Hz, 20Hz, and 30Hz sine wave back-to-back, a frequency domain representation of the first three seconds of the signal showing the presence of a 10Hz and 20Hz component, a frequency domain representation of the last three seconds of the signal showing a 20Hz and 30Hz component. All graphs were generated by the author.

The waveform and frequency domain representation in figure 5 below correspond to 0.5 seconds of an E major chord, which consists of notes that are approximately 330Hz, 415Hz, and 494Hz being played simultaneously (Yousician, 2024). If one were to look only at the waveform, discerning the component frequencies of the signal would be incredibly difficult. However, by looking at the spectrum determining the component frequencies is easy. Indeed, spikes are readily observable around the 330Hz, 415Hz, and 494Hz marks as

expected, thereby making it obvious from the spectrum that the signal is an E major chord even if this information isn't clearly conveyed by the waveform.

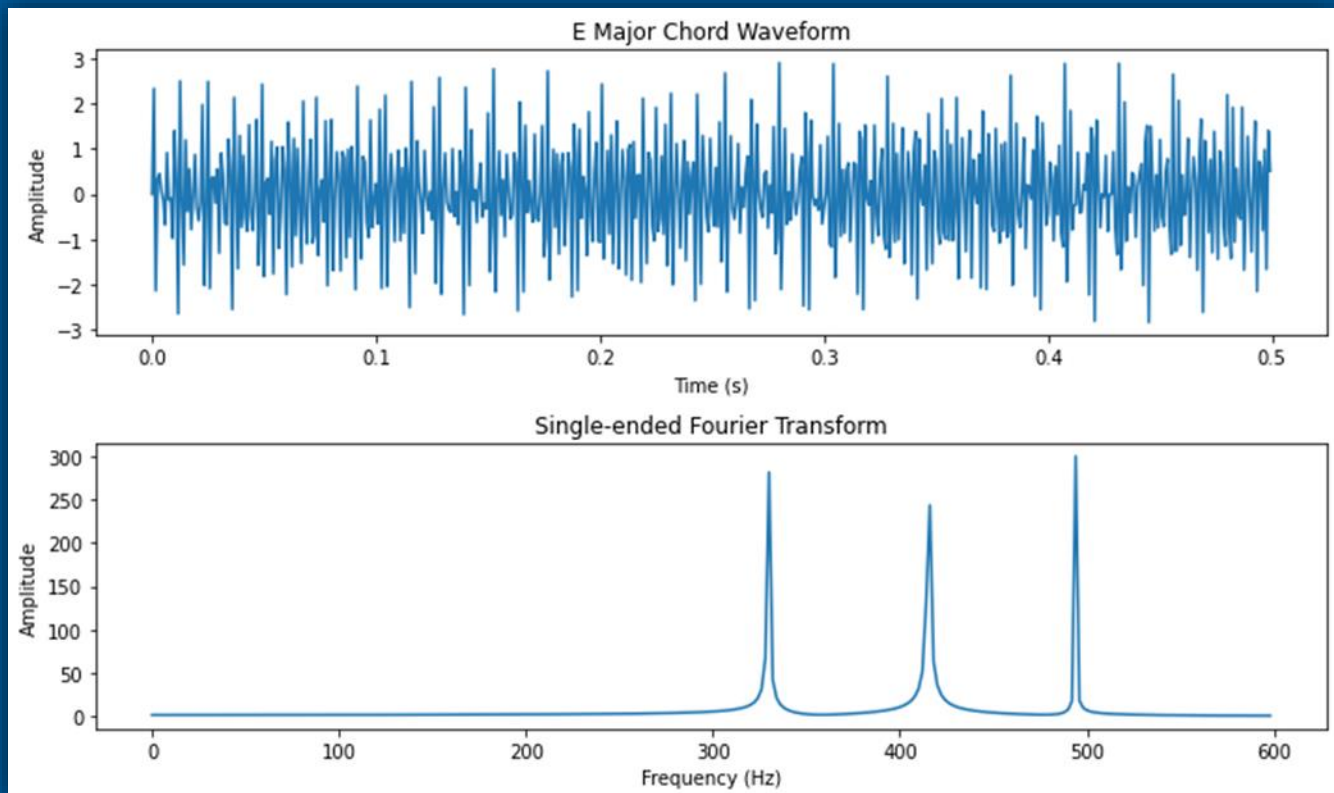


Figure 5: From top to bottom: A waveform representing an E major chord consisting of pure sine waves at the appropriate note frequencies. The frequency domain representation of the waveform clearly showing three spikes corresponding to the frequencies of the components present in the chord. All graphs were generated by the author.

It's important to note that despite the fact that frequency domain representations contain no explicit reference to time whatsoever, they still represent the same signal as their corresponding time domain representations, and subject to certain conditions, the time domain representation of a signal can be reconstructed exactly from its corresponding spectrum. While this concept of representing the signal without reference to time might seem baffling, the meaning is rather straight-forward. Periodic signals, which is to say signals that repeat with a particular frequency, look the same from one repetition to another, so knowing what frequencies make up the signal one is dealing with and what time each frequency component starts at (*i.e.* the *phase*^{XXIII} associated with that particular

^{XXIII} While spectra are often shown with only the frequency and magnitude information provided, such as in Figure 5, in order to completely reconstruct a time-domain signal (waveform) from its spectrum, additional information, namely the phase associated with each frequency is required. This information is often combined with the magnitude information in the form of a single value known as a complex amplitude wherein the phase information is contained in the argument of the complex exponential associated with the complex amplitude. Another way of conveying this information is via a separate graph or function with phase angle expressed along the y axis and frequency expressed along the x axis. Combined with the information in the

frequency) constitutes complete information about the signal over time without needing to directly reference time itself.

Given that waveforms are good at capturing how a signal behaves over time, albeit with a certain lack of clarity as to its frequency content, and given that spectra are good at representing the frequency contents of signals over a given window but are inherently unable to capture the behaviors of a signal during more than one window at a time, it would be nice to have a type of representation that combines the best of both worlds and allows one to see the ways in which the frequency content of a signal changes over time. This is the idea behind the *spectrogram*, which is a form of time-frequency representation of a signal. One can think of it as a set of spectra taken at different times laid out sequentially along the x-axis or time axis of the spectrogram with frequency being indicated along the y axis. In order to show the amplitude of each frequency component, color or shade is used thereby creating a heat map. An example of a spectrogram is provided in figure 6 below.

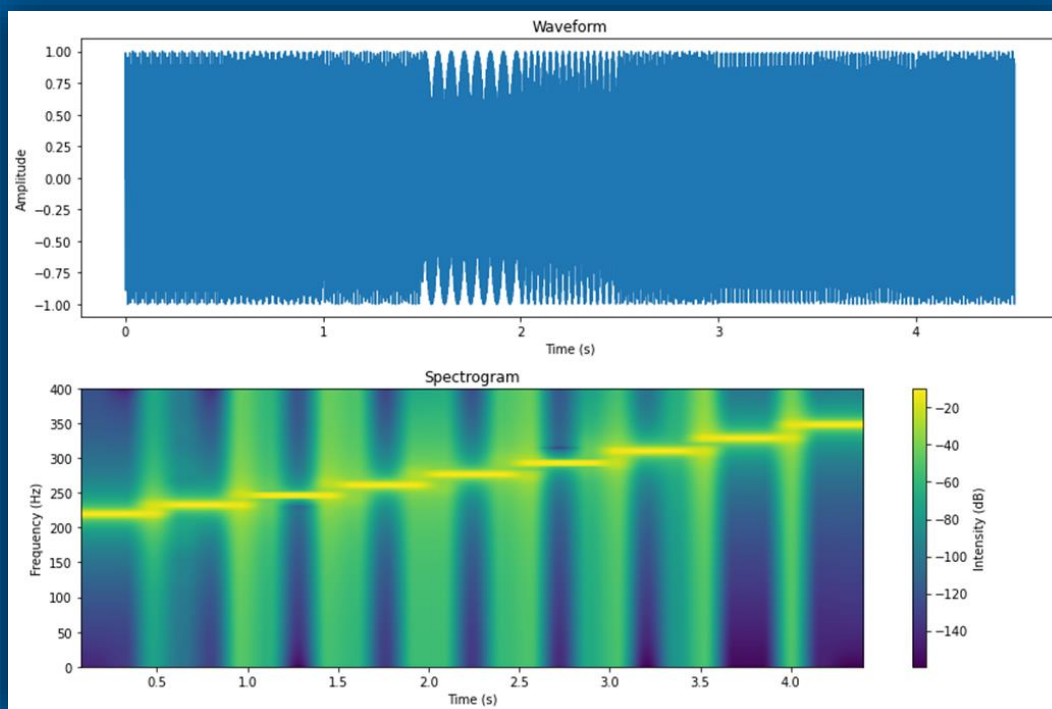


Figure 6: From top to bottom: A waveform consisting of several notes of ascending frequency played back to back. A spectrogram corresponding to the waveform clearly showing the predominant frequency at a given time. As the signal changes from one frequency to another and the window of analysis moves over the discontinuities and transition regions, error is introduced. Despite what the green regions appear to indicate, the only frequencies actually present in the time domain signal are the ones indicated by the yellow lines in the spectrogram. Similar errors are present in the spectra of signals at a given time, hence why the spikes in previous figures have width and shape rather than being vertical lines confined to a single location along the x axis. All graphs were generated by the author.

magnitude graph, there is then enough data to reconstruct the time-domain waveform. While all of this is mentioned so as to explain that the two representations above don't convey precisely the same information, the mathematical particulars of expressing and processing signals are beyond the scope of this article.

The spectrogram makes it quite clear how the frequency content of a signal changes over time. In this case, the signal is a set of notes each of which lasts for 0.5 seconds being played in order of ascending frequency forming a stair step pattern in the spectrogram. Another way to represent sounds that is quite similar to a spectrogram is musical staff notation. A similar representation of ascending notes indicated with musical staff notation is presented in figure 7 below. The same stair step pattern is easy to observe and rather than the duration of each note being indicated by the extent of a colored region across the x axis, duration is indicated by the shape of the note on the staff.

The usefulness of these representations in understanding vocal signals will become apparent in the following sections as they make use of such descriptions to illustrate how speech sounds are formed and imbued with their particular features. Furthermore, they can be used to analyze speech signals and determine what features are present within them such that it's often possible to determine what

phoneme is being uttered during a particular segment of speech simply by looking at an appropriate representation of the signal. These representations form the basis of how speech can be quantified, measured, and compared, hence they are important for understanding metrics related to speech which may be useful indicators of gender.

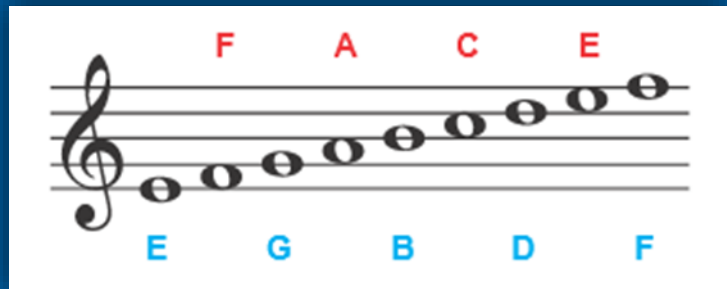


Figure 7: Musical staff with the note (frequency) indicated via vertical position and the time/order in which the notes are to be played indicated by horizontal position.

From Vocal Cords to Vocal Chords: Source-Filter Models of Vocalization

As has already been mentioned, the vocal cords are frequently referred to as the source of the voice, both in technical literature wherein the vocal cords are seen as a single, albeit important, aspect of the machinery that produces the voice, but also in lay terms wherein all vocal action is often thought of as originating from the vocal cords. In reality, there are other ways of creating speech sounds that do not originate from the vibration of the vocal cords. While many basic speech sounds (known as phonemes) utilize the vocal cords in their production, some classes of phonemes, such as *fricatives* (Ali et al., 2001), do not utilize the vocal cords. For fricatives, the sound is produced by turbulence in the air within the vocal tract resulting in a white-noise-like signal throughout a certain frequency range/slice of the spectrum^{xxiv}.

^{xxiv} In order to see what particular vowels and formants look like during speech on a spectrogram and how to distinguish them from each other, look at:

<https://home.cc.umanitoba.ca/~krussll/phonetics/acoustic/spectrogram-sounds.html>

The juxtaposition of the /sh/ and /zh/ sounds is revealing in that, despite the difference in source for these two phonemes, there is undeniable similarity in the way they are produced and perceived, which must be due to other qualities that the two sounds share. Since the vocal tract is in roughly the same shape for each of those phonemes owing to them each having a similar point of articulation, it stands to reason that this is the source of the similarity in perception, and by extension that the position of the vocal tract and more specifically the points of articulation have a significant role in how an utterance is perceived. This does not discount any role that the features of the excitation signal may play in affecting the perception of an utterance, as both components are important. The idea that the combination of these two things, the excitation signal and the shape of the vocal tract, is primarily responsible for the nature of the sound produced is what motivates the *source-filter model of speech* (Tokuda, 2021). The source-filter model of speech is illustrated in figure 9 below (Munoz et al., 2013)

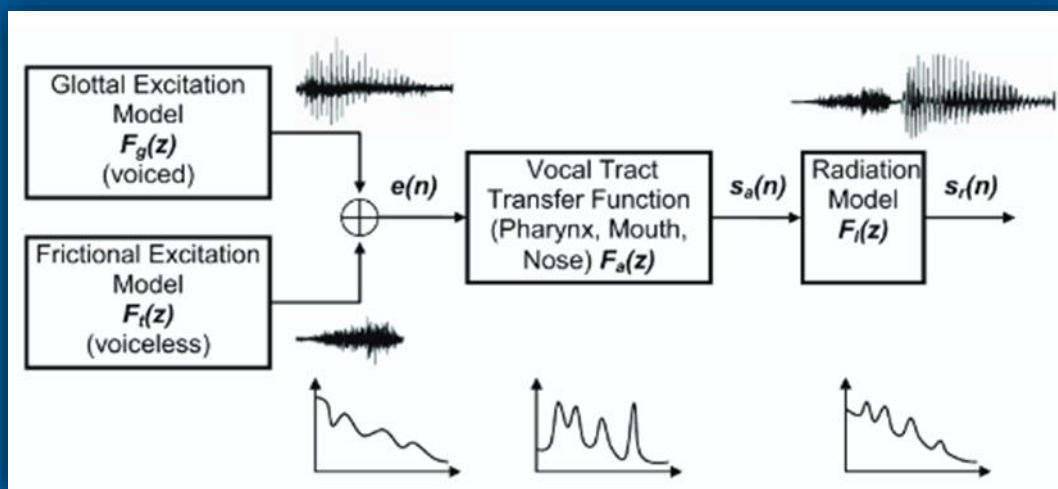


Figure 9: Source-filter model of speech showing, from left to right, the excitation that provides the energy for the speech, the effect of the vocal tract/articulators on the spectral content of that excitation, and the effects of radiation (the propagation/dissipation of sound as it travels further from the lips) on the spectral content of the signal.

This model illustrates how a speech signal is imbued with its particular qualities by the anatomy and physiology underpinning the human voice. The *excitation/source* waveform and corresponding spectrum, depicted on the left of figure 9, may be either glottal (originating from the movement of the vocal folds) or fricative (originating from the white-noise-like signal produced by turbulent air). The *vocal tract transfer function* and its associated spectrum, as seen in the middle of figure 9, is responsible for how the vocal tract alters the signal produced by the source. This transfer function is primarily what is meant by ‘filter’ in ‘source-filter model’ it is also what is meant by ‘resonance’ when discussing the voice. In signal processing, a *filter* is a system that a signal passes through that changes the nature of the signal, and the *transfer function* is a mathematical description of these changes, hence the vocal tract filters the excitation and the effect that this filtration has on the signal

is described by the vocal tract transfer function. Returning to the example of recording sound waves with a microphone, a mathematical expression relating the amplitude of the sound at the microphone at a particular time to the voltage across the microphone at a particular time would also be a form of transfer function. Similarly, to the right of the vocal tract transfer function in figure 9 is the radiation model which is a mathematical model of the effects that the outward radiation and dissipation of sound have on the quality of that sound. The radiation model is also a form of filter and the effects of radiation can be illustrated via a transfer function as well. For a fuller understanding of this process, it is helpful to examine one sound in particular and note how the features that lead to that sound being the sound that it is emerge from the machinations of the source-filter model.

Consider the production of the phoneme /i/, which is a long ‘ee’ sound as found in the words ‘leap’ and ‘keep’. Several graphs relating to the production of this phoneme are shown in figure 10 below. The phoneme /i/ is a voiced sound, meaning that the excitation comes from vocal fold vibrations. The signal produced by these vibrations has the spectrum depicted in graph A in figure 10. Note how this signal is made up of multiple frequency components, each of which is a multiple of the *fundamental frequency*, which in this case is 500Hz. The fundamental frequency is also commonly referred to as the *pitch*. It’s also worth noting that the time-domain representation of the glottal excitation function will repeat itself at the fundamental frequency even though there are other frequency components present because those other components, being multiples of the fundamental frequency (otherwise known as *harmonics*) also repeat themselves on a 500Hz cycle. Since they are higher in frequency, they simply end up repeating a greater number of times in a given period than the 500Hz component itself. Every 0.002 seconds, the period of repetition corresponding to a 500Hz frequency, a 1000Hz component will go through two complete periods and end up back where it started, a 1500Hz signal will go through three complete periods, and a 500Hz signal will go through one, but every 0.002 seconds, each signal will return to the same position it started in, therefore the whole signal can be said to repeat with a period of 0.002 seconds or a fundamental frequency of 500Hz. 500Hz is also called the *first harmonic*, and each multiple of 500Hz is referred to as a correspondingly numbered harmonic (e.g. 1000Hz is the second harmonic since $1000\text{Hz} = 2 \times 500\text{Hz}$ and 1500Hz is the third harmonic since $1500\text{Hz} = 3 \times 500\text{Hz}$). Were a spectrum of the excitation signal associated with an unvoiced fricative phoneme being examined, rather than being sectioned into harmonics, it would more closely resemble an even and continuous spread of frequencies.

Graph B in figure 10 depicts the vocal tract transfer function. The vocal tract transfer function is a representation of how passing through the vocal tract will effect the spectrum of a sound. The vocal tract transfer function does not actually represent a sound itself in the same way as the glottal excitation signal does, but rather how much it will *attenuate* or reduce the magnitude of each frequency component passing through it. The higher the magnitude of the frequency of the transfer function, the less the energy of a corresponding frequency component passing through it will be reduced. The vocal tract transfer function above exhibits three peaks in its spectrum labeled F1, F2, and F3, and these peaks represent the frequencies that will have their energy reduced the least when passing

through the filter. This makes these frequencies more prominent in the signal that emerges from the speaker's mouth. Each of these peaks is known as a *formant* and the presence of these formants, as well as the overall shape of the transfer function, emerge as a direct consequence of the shape of the vocal tract as it's making the sound. As a result, the formants and vocal tract transfer function contain information about the shape of the vocal tract and therefore the sound that the vocal tract is being used to produce. In this case, the F1 value being low (typically this formant ranges from 200Hz to 1300Hz) and the F2 value being high (a typical range is 1100Hz to 2900Hz) (Hillenbrand, 1995) combined with the fact that the sound is voiced, as can be deduced from the harmonic nature of the excitation function, provide sufficient information to determine with high confidence that the phoneme being produced is /i/. In general, the first two formants determine what vowel sound is being said.

Finally, graph C in figure 10 depicts the result of the excitation described in graph A being effected by the vocal tract transfer function described in graph B. The harmonics of the excitation spectrum which are closest to the peaks of the vocal tract transfer function (marked on graph C with circled 'X's) are of larger magnitude than the harmonics that are more distant from those peaks. This is especially notable by observing the low magnitude of the 1000Hz and 1500Hz frequency components, which align with the trough in the vocal tract transfer function. Another important observation is the harmonic nature of graph C itself. Since the excitation is harmonic and the vocal tract only serves to *passively filter* the excitation (meaning that it adjusts the relative magnitudes of its spectral components but does not add new components that are not present), the output will also be harmonic with the same fundamental frequency as the excitation. One of the implications of this is that formants that are between harmonics, such as is the case for the 'X's in graph C, will be harder to detect by analyzing the output spectrum. This means that voices with a higher pitch in which the harmonics are further away from each other, such as those of children, can pose challenges for formant detection algorithms.

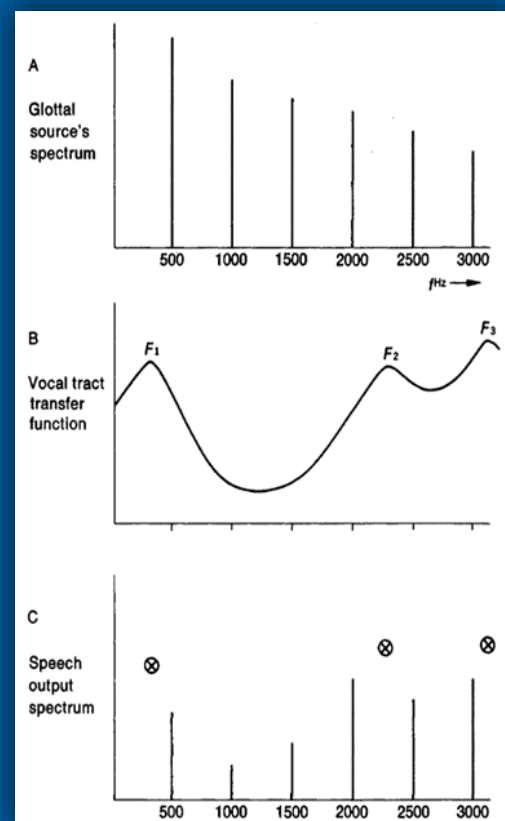


Figure 10: Figure depicting simplified graphs of several important functions involved in the production of the sound /i/: A) the spectrum of the glottal source function, B) the vocal tract transfer function, C) the combined output of the source function and vocal tract transfer function resulting from the former being filtered by the latter. Source: (Lieberman, 1988)

While this example illustrates the relationship between all of these components in a graphical way, it's worth asking the question of how one might acquire the glottal excitation signal or the vocal tract transfer function when all that is accessible (non-invasively and with a standard microphone setup) is the overall output signal. The answer is that there are many mathematical techniques and approaches for doing so and that the best approach is highly context-dependent. An aspect of the context that when varied may necessitate a change in algorithm or approach might be as large as the language being analyzed or as small as which phoneme is being spoken.

For example, techniques that may be successful at extracting the vocal tract transfer function or glottal excitation function of an English vowel may not work for a French vowel since French has nasal vowels and English doesn't. Nasal vowels are phonemes that are produced by allowing sound to travel through both the oral cavity and nasal cavity on their way out of the vocal tract, which allows for destructive interference to occur between waves emerging from the nasal branch and waves emerging from the oral branch. Accounting for this effect requires a significantly different approach to the analysis than for non-nasal vowels.

Having explained the fundamentals of signal processing with a particular emphasis on vocal signals, it is now possible to examine some features associated with vocal signals in greater detail as well as how these features relate to the way a voice is gendered.

Gender Perception of the Voice: The Feature Presentation

The word, '*feature*' when applied to a signal refers to a mathematical property of that signal. Fundamental frequency, F1, F2, and all other formant frequencies are examples of signal features that apply to voiced phonemes. The act of taking a signal and processing it so as to determine the values of specific features is known as *feature extraction*. Feature extraction in an engineering context typically means designing a system to perform mathematical operations on a signal and return a set of values representative of the features being extracted. In the context of speech and hearing, *perception* can be viewed as feature extraction being performed by the human brain along with the subsequent *categorization* of the signal in accordance with the extracted features. In plainer terms, the brain identifies *something about a signal* and uses this information to determine *what type of signal* it's listening to. This process happens unconsciously whenever the brain receives information from a sensory organ.

Much research has been done investigating what features of a vocal signal the brain uses in order to categorize the signal as being associated with a particular gender. While there is disagreement in the literature as to which features are involved, the degree to which certain features contribute to how a vocal signal is gendered, and even the contexts in which particular features are relevant to making a gender determination, there is generally agreement that, for English speakers, in most cases, pitch and *resonance* (defined as the locations of the formants within the vocal tract transfer function) are the most important features (Brown, 2015). The pitch and resonance associated with the production of vowel

phonemes is particularly critical for how speech is gendered since a large proportion of the time an individual spends speaking is spent pronouncing vowels, and a similarly large percentage of the energy within a vocal signal is similarly found within the vowels (Acoustic Aspects of Consonants – Phonetics and Phonology, n.d.).

It's important to note that features that are utilized for gender perception by people speaking a particular language or dialect or people who have particular culture expectations regarding gender presentation may not be the same as the features used for gender perception by a different group of people or they may not be used to the same degree (Brown, 2015). As such, the following discussion will pertain specifically to English speakers although the information may be applicable to various groups of non-English speakers as well. Regardless, having an understanding of the various features contained in speech and how they relate to gender perception will be a useful starting point for anyone who wishes to research how gender perception of speech works in their specific context.

As is generally assumed to be the case, a higher pitch tends to correspond to a vocal signal being gendered female and a lower pitch tends to correspond to a vocal signal being gendered as male. While the typical female and male pitch ranges vary from one group to another, this trend seems to hold rather broadly. That said, there is usually significant overlap between the low end of the female pitch range and the high end of the male pitch range associated with a particular group (Kovačić, 2009) meaning that in order to gender signals falling within this range, additional information aside from pitch is needed. This is illustrated by the graph in figure 11 below. Prepubescent children, who overwhelmingly have higher pitches than either grown men or grown women (Hillenbrand, 1995), are a notable exception to this trend, as the pitch of their voices does not matter in making a gender determination (Perry, 2001). As such, cues other than pitch are necessary to gender their speech.

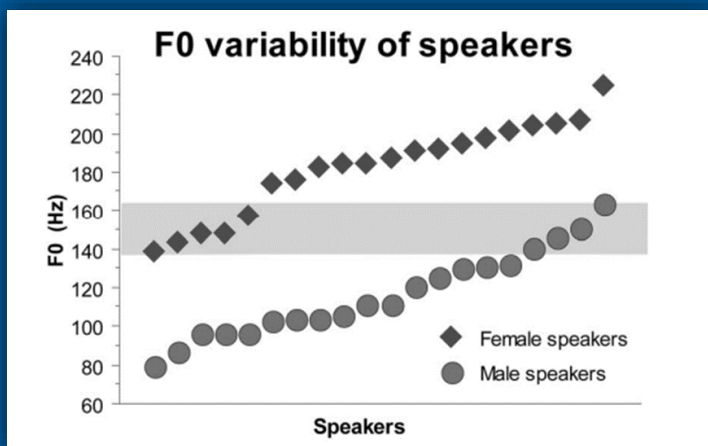


Figure 11: Graph of pitch values for the voices of 20 male and 20 female Czech radio broadcasters used in the Kovačić 2009 study on gender perception in children with cochlear implants. The gray region in the center indicates the range of pitches for which there is overlap between the set of male speakers and set of female speakers. It is also worth noting that there are male speakers whose pitches are higher than some female speakers and vice-versa.

Looking at the above data, it appears the question of what features of a vocal signal lead to it being perceived a certain way has an answer. While pitch and resonance are indeed the primary gender cues encoded in speech, this has different implications for vocal masculinization than vocal feminization. This has become apparent through various studies that making use of synthetic mixed vocal cues that generated by combining the pitch values typical for one gender with the resonance values typical of another to create a new vocal production. One such study which asked listeners to gender mixed vocal cues found that combining a masculine pitch with a feminine resonance resulted in productions that were disproportionately gendered male and that combining a feminine pitch with masculine resonance also resulted in productions that were disproportionately gendered male (Coleman, 1976). The results are summarized in the graph in figure 13 below.

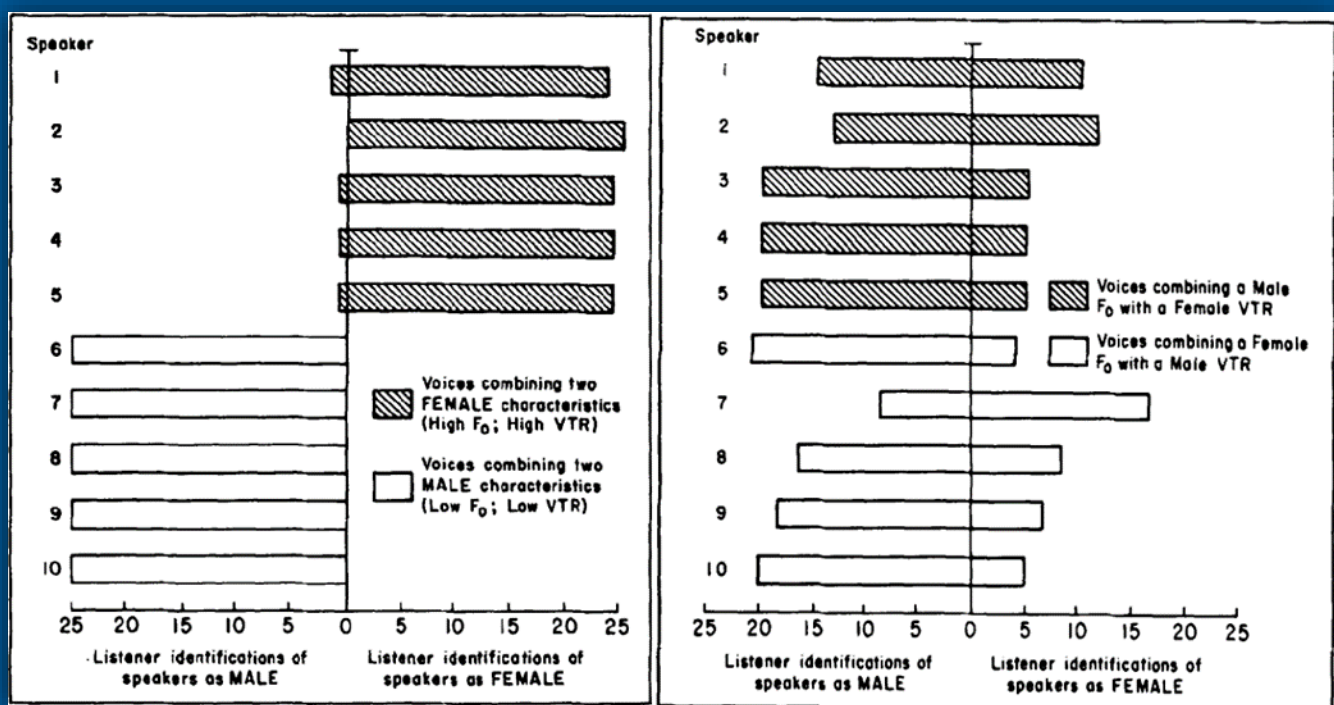


Figure 13: Two graphs taken from the Coleman 1976 study. The graph on the left shows how listeners perceived signals containing a female f_0 and female resonances and signals containing a male f_0 paired with male resonances. The graph on the right shows how listeners perceived signals containing a mismatched f_0 and resonances.

While the unmixed cues were predictably gendered properly the overwhelming majority of the time, it's worth noting that the only misidentified vocal cues were female cues that were identified as male. Interestingly, all of the mixed cues, with the exception of one, were gendered as male the majority of the time (Coleman, 1976). This would seem to indicate that an individual wishing to masculinize their voice can be gendered as male the majority of the time by simply changing either their resonance or their pitch while an individual wishing to feminize their voice will need to change both in order to be gendered as female the majority of the time. Later studies continued to note similar asymmetries to varying degrees both when using samples of isolated vowels as well as full sentences to generate

stimuli (Brown, 2015; Assmann, Nearey, and Dembling, 2006). Regardless, changing both pitch and resonance is far more effective for changing the perceived gender of a signal than changing either variable alone, which in many cases, is ineffective at changing gender perception (Hillenbrand, 2009).

Another thing worth noting is that not all forms of vocal production involve pitch. As has already been stated, fricatives are unvoiced phonemes that rely on turbulence generated at a point of articulation to create a sound free from pitch or harmonics. Whispered speech is similarly unvoiced and free from harmonics meaning that resonance plays a role in whispered vocal signals but not pitch. The resonance cues in whispered speech have also been determined to be sufficient for such speech to be gendered properly despite the absence of pitch information (Schwartz and Rine, 1968). Consequently, pitch adjustments alone will do little to assist in changing the perception of whispered speech, which can be properly gendered despite having no pitch information.

Finally, it's worth reiterating that while pitch and resonance are the primary cues used to determine gender in speech, they are not the only significant cues (Assmann, Nearey, and Dembling, 2006). It's also not entirely clear in which contexts additional cues may be most relevant in making a gender determination. This is further confounded by the fact that fundamental frequency and resonance covary with one another such that an increase in vocal pitch is typically paired by a corresponding increase in resonance frequencies (Assmann, Nearey, and Dembling, 2006). Ideas for features that may be correlated with gender perception in speech are still being put forward and examined by scientists in the field and research is ongoing.

The Physiology Behind the Phonemes: How the Voice Works

Regardless of what features a signal has and what they signify in terms of perception, signals still come from something, which is to say there is a system from which they originate. This system is also responsible for the properties and feature of said signal. While the source-filter model explains how the properties of a vocal signal develop as the signal moves through the vocal tract, it doesn't explain why these changes occur based on the anatomy and physiology of the vocal tract, it simply describes the changes mathematically. While this may be enough for some applications, such as automated identification of speech sounds, its insufficient to offer insight into how the vocal apparatus can be reconfigured or differently utilized so as to generate signals with different properties. Elucidating the link between the sound signal and the anatomy and physiology that generates it will be the goal of this section.

As has previously been mentioned, in the case of voiced phonemes, the vocal cords can be considered to be the direct source of the excitation signal that is fed into the vocal tract transfer function, otherwise frication can be said to be the source of excitation. While the action of the vocal cords is relatively easy to understand, they vibrate back and forth at different frequencies and the higher the frequency at which they vibrate the higher the pitch

of the excitation and therefore the voice, it's worth exploring why some sets of vocal cords tend to vibrate faster than others.

Generally speaking, women tend to have higher pitched voices than men. This is largely a result of differences in how the vocal cords develop during puberty. Men who go through a testosterone-dominant puberty will have their vocal cords become longer and heavier meaning that more energy is required to move them back and forth (Hawkins, Hacking, and Hughes, 1998). As a result, a given amount of energy will move the vocal cords back and forth fewer times as opposed to if they were shorter and less massive. This means that larger vocal cords correspond to a lower fundamental frequency. Women who go through an estrogen-dominant puberty will not have their vocal cords changed in such a way and any lengthening of the vocal cords or increase in mass will be proportional to overall changes in body size during adolescence, thereby accounting for observed differences in the pitches of women and children (May & Williams, 1989).

Despite this, it's possible for women to speak with a lower pitch and for men to speak with a higher pitch by altering the tension of the vocal cords and the amount of energy put into generating a vocal production. Higher energy and higher tension correspond to a higher frequency regardless of the size of the vocal cords and vice-versa. Many vocal surgeries work by trying to adjust the mass and tension of the vocal cords via a variety of means. Laser ablation to remove mass and lighten the vocal cords is one such method resulting in a higher pitch. Suturing a short segment of the vocal cords shut to reduce the effective length of the vocal cords and increase their tension is another method of increasing pitch (Kim, 2020). Since short vocal cords need to travel a shorter distance in order to complete a cycle and tense vocal cords exhibit a higher restoring force causing them to return to their original position more rapidly, suturing also results in a higher pitch (Herbst, 2016).

Changes during puberty affect resonance as well. In order to understand how, it's necessary to first explore how resonance emerges from the vocal apparatus. The vocal tract can be thought of as a series of resonators each of which makes a contribution to the overall resonance/vocal tract transfer function of the vocal apparatus. If one resonator exhibits a peak at 300Hz and another resonator exhibits a peak at 2400Hz, the combination of the two resonators will have peaks at both 300Hz and 2400Hz meaning that components around these frequencies present in the excitation signal will be attenuated the least and therefore present in higher magnitudes in the resulting vocal production.

The frequency of each resonator is primarily a function of its size. This is similar to how the frequencies of pan pipes are inversely proportional to the sizes of the pipes with smaller pipes producing higher frequencies and longer pipes producing lower frequencies. This is because smaller pipes allow for waves with smaller wavelengths, and therefore higher frequencies, to constructively interfere with each other rather than destructively interfere when bouncing around inside the pipe. The opposite is true for longer pipes. When blowing over the top of a pan pipe, turbulence consisting of a relatively even spread of frequencies, similar to the excitation signal associated with a fricative, is fed into the pipe. The resonant frequency of the pipe determines which of the frequencies in the excitation signal is

attenuated the least and therefore ends up being the most prominent^{xxvii} (Tokuda, 2021; The Ling Space, 2015).

While the geometry of the vocal tract isn't as straight-forward as the geometry of pan pipes, the general trend of smaller volumes and shorter lengths corresponding to higher resonant frequencies holds. The sizes of two such regions are particularly important. The first is the distance from the top of the larynx to the opening of the oral cavity, a region known as the oropharynx. The longer this distance is and the larger the volume of the oropharynx the lower the resonant frequency associated with the region. During testosterone-dominant puberty, in addition to the enlargement of the vocal cords, the larynx also descends relative to the oral cavity thereby increasing the length and volume of the oropharynx resulting in a lower resonant frequency. The size of this region is responsible for the value of the F1 formant (The Vocal Tract, n.d.; Brown, 2015).

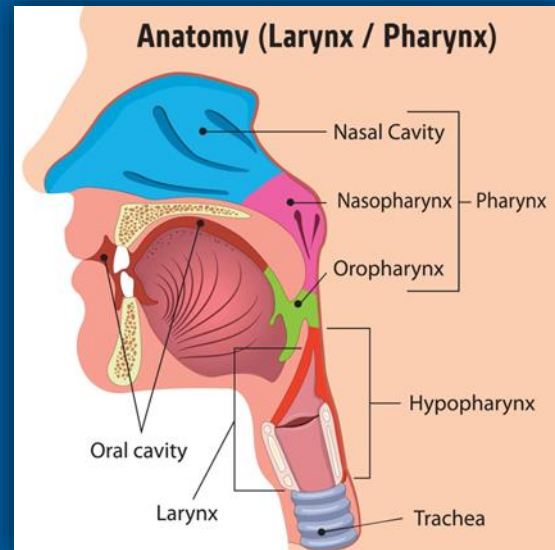


Figure 14: Simplified diagram of the vocal tract showing the relative positions of the larynx, oropharynx, and oral cavity. Image taken from: <https://jamieloufman.com/what-is-lpr-what-is-the-pharynx/>

The second region of importance is the distance between the front of the tongue and the end of the lips. As with the size of the oropharynx, the size of the space from the tip of the tongue to the outside of the lips is also impacted by testosterone-dominant puberty. This is because the size of the head relative to the body increases during testosterone dominant puberty thereby scaling up the size of this resonator along with it. The size of this region is responsible for the F2 formant (The Vocal Tract, n.d.; Brown, 2015).

The sizes of each of these regions can also be controlled via voluntary motions of the vocal tract in such a way as to adjust the associated resonance up or down as desired. In order to decrease the size of the oropharynx, the back of the tongue can be positioned lower down in the throat thereby lowering the entrance to the oral cavity and shortening the length of the oropharynx and increasing the F1 resonant frequency. To increase the size and lower the frequency, the back of the tongue can be raised (Brown, 2015). Consequently, vowels with a high F1 and low tongue position are referred to as low vowels and vowels with a low F1 and high tongue are referred to as high vowels. In order to decrease the size of the region between the tip of the tongue and outside of the lips and increase the F2 frequency, the tongue can be pushed forward and upward and the lips can be pulled back such as when one smiles. To lower the F2 frequency and increase the size of the corresponding resonator, the lips can be puckered forward in order to form a tube that extends the

^{xxvii} The following video, created with a lay audience in mind, provides an excellent explanation of how the vocal tract results in the phenomenon of resonance and formants: <https://youtu.be/jl4zGRSYqkE>

distance from the tongue to the outside of the lips and the tip of the tongue can be pulled back towards the throat.

The degree of control one can exercise over the resonant frequencies of the vocal tract is generally sufficient to change the gender perception associated with the resonance of the voice for the vast majority of vowels, if not all of them. Looking at figure 12, it's apparent that the regions associated with many of the vowels fall towards the center of the diagram (Hillenbrand, 1995). This means that on all sides of these regions, there are masculine resonance values associated with the production of other phonemes and feminine resonance values associated with other phonemes indicating that the resonance values corresponding to the central vowels fall within the ranges of the maximum and minimum resonances typical for all genders. This suggests that any set of F1 and F2 resonance values within the regions representing central vowels should be achievable for people of all genders, including the resonance values for each central vowel associated with other genders.

Unlike with pitch, surgical options focused on changing the resonance of the vocal tract are more-or-less nonexistent, however surgeries designed to alter the larynx and vocal cords can often have the effect of adjusting the resonance as well, particularly F1, due to changes in the resting tension of the muscles responsible for positioning the larynx. A higher larynx results in a shorter oropharynx and a higher F1 resonant frequency. The degree to which changes in resonance occur following surgery are poorly documented and surgery cannot generally be relied on for changing resonance. Rather even with vocal surgery, voice training is recommended for achieving the most effective vocal transition possible (Kim, 2020).

Coda: Where to go From Here

With a greater understanding of the mechanics of the voice, the specific features that are responsible for the gender perception of vocal signals, and the ways in which these features arise from the anatomy and physiology of the voice, it may be tempting to put all of this information to use. Before doing so, it's worth discussing one more thing: when is vocal transition complete? The answer to this question, unlike the answers to many other questions addressed in this article, is simple and straight-forward: vocal transition is complete when one is satisfied with their voice.

Satisfaction, unlike resonance or pitch, is purely psychological in nature and particular to the individual. As with many other areas of transition, it's possible to endlessly obsess over the associated metrics and how they compare to the normative values associated with one's target gender. While drawing comparisons can be an important way to measure one's progress, it crosses over into self-harm when the comparisons cease to be useful or encourage one to over-train to the point of injury or engage in devaluation of the self to the detriment of one's mental health. It's important to take things slowly, temper expectations, and understand that regardless of how knowledgeable or prepared one feels, mileage may vary.

It's also important to remember that normative values for cis people are not the only values that will result in an individual being gendered in the way that they desire. Plenty of cis women have resonance and pitch values that are lower than the average female values and may even overlap with the typical masculine range and vice-versa for masculine speech productions. Much like producing a piece of art, there's no particular point an individual can arrive at where the piece suddenly becomes finished, rather a piece is finished when the artist stops working on it. There will always be more vocal training that one can engage in. There will always be more extreme values that someone can strive for. Regardless, there is no perfect voice, only many acceptable voices. Past a certain point, the challenge of vocal transition will no longer be to change one's voice but to accept one's voice. This challenge may prove to be even more difficult than the rest of vocal transition. In conclusion, it is the recommendation of the author that anyone wishing to pursue vocal transition prepare for this challenge as well. △

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