HARSCH, ISABELLE, M.M. Ayerora: Chiptune and Gender Connected. (2023)
Directed by Dr. Alejandro Rutty. 44 pp.

Ayerora is an hour-long concept album primarily composed within the medium of chiptune. The pieces of *Ayerora* use a variety of emulations of sound chips (electronic hardware that generated audio for early computers and game consoles) that define the limitations on what waveforms can be used and how many can play simultaneously in chiptune music. One piece is written for alto saxophone and chiptune digital audio playback, and another is written for chamber ensemble without any playback track. The rest of the album consists of playback-only chiptune pieces. The album tells the story of an individual named Ayerora, who discovers that her world, meant to reflect our own, is defined by the arbitrary social construction of two genders, and fights to challenge and eventually destroy that construction.

This thesis explains the album's influences: the progressive rock conceptual works of the 1960's and 1970's, the chiptune community, and my personal experiences as a transgender person, especially one involved in the gaming community. It will also explain the sound chip emulations used to write the pieces, and other processes used to achieve the album's sound. Finally, the thesis will discuss how the album conveys its central story, through themes that represent narrative concepts and a formal structure that emphasizes these themes.

Ayerora is a combination of three of the most important aspects of my own life. Two of these, music and video games, are combined in chiptune. Using chiptune to tell a story that expresses my experiences with the third important part of my life, gender identity, brings these three disparate parts of my life together as one.

AYERORA: CHIPTUNE AND GENDER CONNECTED

by

Isabelle Henry Harsch

A Thesis
Submitted to
the Faculty of The Graduate School at
The University of North Carolina at Greensboro
in Partial Fulfillment
of the Requirements for the Degree
Master of Music

Greensboro

2023

Approved by

Alejandro Rutty
Committee Chair

DEDICATION

To Dr. David Froom, for using your incredible gifts to show me mine.

APPROVAL PAGE

This thesis written by Isabelle Harsch has been approved by the following committee of the Faculty of The Graduate School at the University of North Carolina at Greensboro.

Committee Chair	Dr. Alejandro Rutty
Committee Members	Dr. Mark Engebretson
	Dr. Lorena Guillen

June 15, 2023
Date of Acceptance by Committee

June 1, 2023
Date of Final Oral Examination

ACKNOWLEDGMENTS

I would like to thank my thesis committee chair Dr. Alejandro Rutty, and my additional committee members, Dr. Mark Engebretson and Dr. Lorena Guillén, for their assistance, advice, and feedback.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

CHAPTER I: INTRODUCTION

Ayerora is a chiptune concept album about gender identity, conceptualized and composed between late 2021 and early 2023. It was influenced by conceptual progressive rock works such as Emerson, Lake, & Palmer's *Tarkus* from 1971,[1] and by numerous soundtracks and albums in the chiptune medium, especially longer chiptune works that are not video game soundtracks, such as Jake Kaufman's *FX3*[2] and *FX4*.[3] Most importantly, *Ayerora* was inspired by my own personal experiences as a transgender individual, having had to confront the expectations and constraints of gender in society head-on for many years. The album's narrative is a representation of these experiences, my own feelings toward gender identity, and my beliefs about the changes possible and necessary, in relation to gender, to make our world a better place.

Most of *Ayerora's* pieces are made within the medium of chiptune music, and nearly every track uses an emulation of a different sound chip: a piece of hardware that generates audio within a set of constraints on what types of sounds can be used and how many at once. Prior to modern mixing techniques in a digital-audio workstation, all of these pieces could theoretically be played on the console the chip originated from. There are just two pieces in the album that use elements other than chiptune: a piece for alto saxophone and chiptune playback track, and a piece for chamber ensemble.

There are a number of musical features that define my compositional style throughout the album: a symmetrical form built around a central theme, pre-written solos as climactic points, a

[1] Emerson, Lake, and Palmer, *Tarkus,* LP, Advision Studios (Fitzrovia, London), June 14, 1971.
[2] Jake Kaufman, "FX3 Remastered," Bandcamp, June 4, 2013, accessed June 5, 2023, https://virt.bandcamp.com/album/fx3-remastered.
[3] Jake Kaufman, "FX4," Bandcamp, March 1, 2012, accessed June 5, 2023, https://virt.bandcamp.com/album/fx4.

harmonic emphasis on suspended chords, and frequent, significant key modulations. These features are intended to emphasize the recurring themes, which represent specific concepts in the narrative, such as masculinity and femininity, birth and rebirth, and identity. These themes are clearly established in particular pieces so they can reappear in later pieces and create stronger narrative connections. This thesis will discuss and explain this, and all of the aforementioned facts in greater detail.

CHAPTER II: CONCEPT ALBUMS

It is generally understood that a concept album is an album based around one theme or dramatic idea, giving the album as a whole greater meaning than the sum of its parts.[4] As a concept album, *Ayerora* is preceded by numerous famous works that came to define the term.

Sgt. Pepper's Lonely Hearts Club Band, released by the Beatles in 1967, is considered to be one of the first by many,[5] despite its lack of clear thematic connection—its status comes more from its perceived quality and importance, and how it brought the idea of the album as a unified work to the public consciousness.[6] Other albums considered early examples for similar reasons include the Beach Boys' *Pet Sounds* (1966), The Who's *Tommy,* (1969), and The Beatles' *Revolver* (1969).[7] However, some argue that the concept album dates back further: In his book *Popular Music Culture: Key Concepts,* Roy Shuker claims they originated with thematic country, soul, and jazz albums of the 1950's and 60's by artists such as Ray Charles, John Coltrane.[8] Fiona Sturges of *The Independent* goes back further, listing Woody Guthrie's *Dust Bowl Ballads* (1940) and Frank Sinatra's *In the Wee Small Hours* (1955) as early narrative albums.[9] Going even further back in time, according to Martina Elicker in "Concept Albums: Song Cycles in Popular Music," concept albums can be considered the modern pop iteration of a

---

[4] Roy Shuker, "Album," in *Popular Music Culture: The Key Concepts*, 5th ed. (Abingdon, Oxon: Routledge, 2022), 10.
[5] Fiona Sturges, "The Return of Concept Album," The Independent, October 2, 2009, accessed June 6, 2023, https://www.independent.co.uk/arts-entertainment/music/features/the-return-of-concept-album-1796064.html.
[6] Martina Elicker, "Concept Albums: Song Cycles in Popular Music," in *Word and Music Studies: Essays on the Song Cycle and on Defining the Field: Proceedings of the Second International Conference on Word and Music Studies at Ann Arbor, MI, 1999*, eds. Walter Bernhart, Werner Wolf, and David L Mosley (Rodopi, 2001), 231.
[7]Carys Wyn Jones, "The Album as a Work of Art," in *The Rock Canon: Canonical Values in the Reception of Rock Albums* (Routledge, 2017), 44.
[8] Roy Shuker, "Rock Opera," in *Popular Music Culture: The Key Concepts*, 5th ed. (Abingdon, Oxon: Routledge, 2022), 303.
[9] Sturges, "Return of the Concept Album," *The Independent.*

song cycle,[10] a series of vocal pieces that sets itself apart from a general collection of songs with a source of cohesion and coherence.[11] Regardless, the term itself originated from the previously-mentioned early progressive rock albums of the 1960's.[12]

Following these beginnings, many rock artists of the late 1960's and 1970's began to experiment with projects of increasing scope and ambition, moving the format quickly towards a more classical inspiration. The Kinks' *Lola Versus Powerman & the Moneygoround, Part One* (1970), [13] David Bowie's *The Rise and Fall of Ziggy Stardust and the Spiders From Mars* (1972), Pink Floyd's *The Wall*, and Yes' *Tales From Topographic Oceans* are some notable examples. A significant number of these albums fell into the new subgenre of rock opera, a term that lays the classical inspiration bare. In the 1980's, however, the format seemingly fell out of fashion, likely due to the changing cultural emphasis on singles and the interpretive difficulties of the structure.[14]

A conceptual work that was particularly an inspiration for *Ayerora* was Emerson, Lake & Palmer's *Tarkus.*[15] Released on the group's second album in 1971, it is a single track rather than an album, but it is based around a conceptual narrative, over 20 minutes long, and divided into seven movements. The basic narrative of the piece, established on the album sleeve, is that an amalgamation of a tank and an armadillo, named Tarkus, ventures out to destroy a series of enemies that mostly seem to be animals fused with heavy weaponry. Tarkus is temporarily

[10] Elicker, "Concept Albums: Song Cycles in Popular Music," 227.
[11] Susan Youens, "Song cycle," Grove Music Online, 2001; Accessed 10 Jun. 2023. https://www-oxfordmusiconline-com.libproxy.uncg.edu/grovemusic/view/10.1093/gmo/9781561592630.001.0001/omo-9781561592630-e-0000026208.
[12] Sturges, "Return of the Concept Album," *The Independent.*
[13] Elicker, "Concept Albums: Song Cycles in Popular Music," 231.
[14] Sturges, "Return of the Concept Album."
[15] Emerson, Lake, and Palmer, *Tarkus.*

defeated by a Manticore, but soon reemerges from a river as "Aquatarkus."[16] In his book *Rocking the Classics,* Edward Macan interprets this otherwise nonsensical story as a representation of the destruction caused by war, technological development, and totalitarianism. He explains that each beast Tarkus destroys is an aspect of society lost to these forces: spirituality, individuality, tradition.[17] This political message conveyed through a series of almost mythical events is a particular source of my interest in the concept album, and was a heavy influence on *Ayerora.*

In recent years, the concept album has made a cultural comeback, perhaps due to increased access to digital distribution of music.[18] Janelle Monáe is an artist of particular note, releasing a series of concept albums: *Metropolis: The Chase Suite* in 2007, *The ArchAndroid* in 2010, *The Electric Lady* in 2013, and *Dirty Computer* in 2018. These albums center around a dystopian science fiction story, which was depicted in the film adaptation released alongside *Dirty Computer*.[19] A pair of modern concept albums that were particularly inspiring for *Ayerora* were the 2006 album *FX3* and its prequel, *FX4* (2013), written by prominent video game composer Jake Kaufman (Shovel Knight series, Shantae series). They were the first chiptune concept albums I had heard that were not tied to a video game. *FX3* labels itself as "the original chip metal concept album" due to its heavy metal-inspired composition, and *FX4* follows a similar style.[20] This comeback of concept albums has influenced the creation of *Ayerora,*

[16] Edward Macan, "Four Different Progressive Rock Pieces," in *Rocking the Classics* (Oxford University Press, 1997), 88.
[17] Macan, "Four Different Progressive Rock Pieces," 89.
[18] Sturges, "Return of the Concept Album."
[19]Aja Romano, "Janelle Monáe's Body of Work Is a Masterpiece of Modern Science Fiction," Vox, May 16, 2018, accessed June 5, 2023, https://www.vox.com/2018/5/16/17318242/janelle-monae-science-fiction-influences-afrofuturism.
[20] Jake Kaufman, "FX3 Remastered."

exposing me to the format and to its originators, and inspiring me to create my own like it has for many other modern artists.

CHAPTER III: CHIPTUNE

I composed *Ayerora* within the medium of chiptune, music created using the limitations of sound chips created for older computers, game consoles, and any other piece of technology that produced sound from a hardware chip. It is truly a medium, not a genre: chiptune encompasses a tremendous number of approaches, styles, and platforms. Though it is strongly associated with gaming—after all, their histories are forever deeply linked—chiptune has expanded far beyond the sole realm of video game music, a fact that *Ayerora* reflects. My album is not and was never intended to score a game, it is intended to stand on its own.

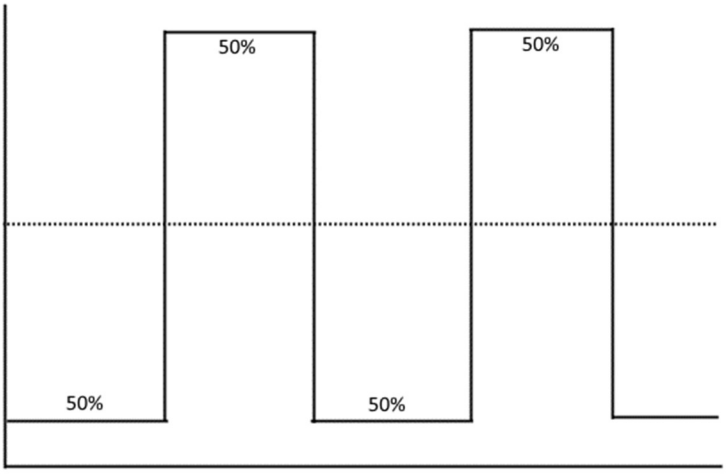
The chiptune soundtracks for early games were produced in real time, through sequences of code that instructed the sound chip, usually a programmable sound generator or PSG, to create the intended sequence of notes. As an electronic, preprogrammed work, expression could only be achieved through careful attention to detail in this coding process, attempting to create some semblance of human performance.[21] However, the music had to work around numerous hardware limitations, as these PSG's were usually heavily limited in what types of sounds could be created, and how many could occur at once. Additionally, sound effects for the game itself had to occur from these generators. Early consoles that were able to give game composers the tools to create this truly expressive and impressive music included Commodore's C64 and the Nintendo Entertainment System, or NES.[22]

The NES, originally known as the Famicom in Japan, is particularly important to *Ayerora* as emulations of the Famicom's sound chips make up the bulk of its pieces. This console's built-in hardware utilized a chip manufactured by Ricoh called the 2A03 that allowed for five

[21] Kenneth McAlpine, *Bits and Pieces: A History of Chiptunes* (New York, NY: Oxford University Press, 2019), 5.
[22] Ibid., 4.

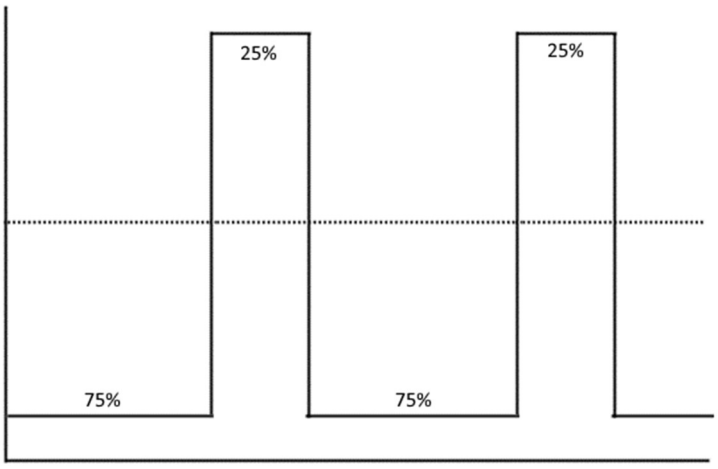
channels of sound.[23] Two of these channels could generate pulse waves, with four possible duty cycles. A pulse wave has a waveform of a rectangular pattern, alternating between "on" and "off" states. The duty cycle, represented with a percentage, refers to the ratio between these states in the waveform, creating different timbres.[24]

Figure 1: A Pulse Wave with a Duty Cycle of 50%, Also Known as a Square Wave



Note. There is an equal relationship between the "ups" and "downs."

Figure 2: A Pulse Wave with a Duty Cycle of 25%

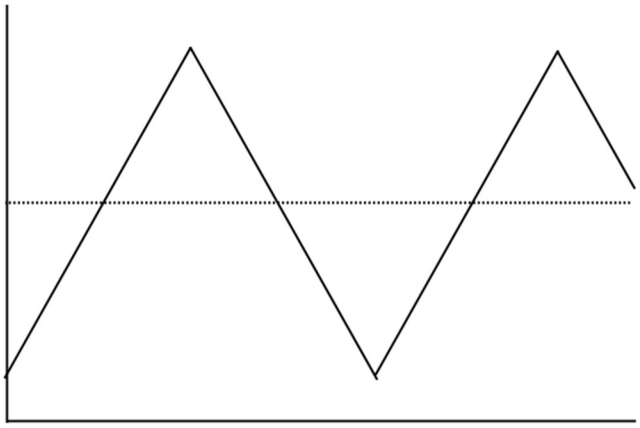


Note. The ratio between the "ups" and "downs" has changed.

[23] Ibid., 109.
[24] Karen Collins, *Game Sound: An Introduction to the History, Theory, and Practice of Video Game Music and Sound Design,* (Cambridge, MA: MIT Press, 2008), 17.

The Ricoh 2A03 could create pulse waves with ratios of 12.5%, 25%, 50%, and 75%–though 25% and 75% waves are indistinguishable from one another due to containing the same ratio.[25] Its third channel could only create triangle waves, which have another unique timbre similar to a sine wave, with a somewhat fuller sound.[26] Its softer sound compared to a square wave made it the common instrument for basslines on NES soundtracks.

Figure 3: A triangle wave



Additionally, the 2A03 had a channel that could create white noise—essentially the same sound as TV static—but at sixteen different pitches, which was usually used to create percussion and sound effects.[27] Finally, its fifth channel could play back short, low-quality samples, which were typically used for additional percussion or sound effects, and the occasional voice line.[28] Thus, these five channels created all of the music for almost every NES game. However, the Famicom in Japan also supported the use of additional sound chips included within the external game cartridges, outside of the console's built-in hardware. This allowed for additional sound channels to be added on top of the Ricoh 2A03, creating the possibility for more complex

[25] McAlpine, *Bits and Pieces,* 110.
[26] Collins, *Game Sound,* 18.
[27] Ibid.
[28] McAlpine, *Bits and Pieces,* 113.

music—though they were very rarely used.[29] Many of these expansion chips are emulated in *Ayerora,* as will be explained in chapter VI.

Though music created with simple PSG's like the 2A03 was the prominent way to create video game music throughout the 1980's and early 1990's.[30] However, as music created with these chips began to faze out of game consoles in favor of MIDI and CD audio, there were musicians still using those old, outdated chips. Initially, it was primarily associated with video game piracy. Games were beginning to increase the strength of anti-piracy measures, but programmers were still able to crack through these protections.[31] These individuals began to leave a sort of calling card behind in the form of custom audiovisual displays, which took up a very small amount of space but were still impressive in order to show the cracker's coding prowess. The tiny amount of space PSG music takes up was perfect for this purpose, keeping space requirements extremely small even as the complexity of these introductions was pushed to the limit.[32] These "demonstrations" became an art separate from their illegal origins, called the "demoscene." Throughout the 1990's, chiptune was able to break from its demoscene origins, thanks to the increased communication capabilities of the Internet. From here, chiptune as its own form of composition was fully born.[33]

Programmers began developing tools specifically designed for creating chiptune on consoles. The Nintendo Game Boy was a particular focus early on, and is still the most popular

[29] Contributors, "List of Games with Expansion Audio," NESdev Wiki, last modified January 15, 2023, accessed June 5, 2023, https://www.nesdev.org/wiki/List_of_games_with_expansion_audio#NEC_%C2%B5PD7755C_(Jaleco).
[30] Belinda Smith, "How 8-Bit Music, or Chiptune, Moved from Illicit Origins to Mainstream Popularity." ABC News, August 9, 2019, accessed June 5, 2023, https://www.abc.net.au/news/science/2019-08-10/chiptunes-8bit-music-of-video-games-reimagined/11383632.
[31] McAlpine, *Bits and Pieces,* 7.
[32] Israel Márquez, "Playing New Music with Old Games: The Chiptune Subculture." *Game*, no. 3 (2014): 69.
[33] Ibid.

console for chiptune to this day, thanks to its portability and ease of use.[34] It was for this handheld console that some of the first chiptune music programs were created—*Nanoloop* created by Oliver Wittchow in 1998, and *Little Sound DJ (LSDJ)* by Johan Kotlinski in 2000 (which is still the most popular way to create Game Boy music, and is used in *Ayerora's* third track).[35] Previously, chiptune had to be created through complicated coding procedures, so these applications helped to make the medium much more accessible. These aforementioned tools created the music natively on the console, but programs that ran on computers and simply emulated those consoles' hardware began to crop up as well. In 1998, Michael Iwaniec created *Nerdtracker ii* on MS-DOS, which emulated the sound of the previously mentioned NES with solid accuracy. In 2005, it was followed by Famitracker, which was better-looking, easier to use, and more hardware accurate.[36] Famitracker is another one of the most popular chiptune programs to this day (and was used for the majority of pieces in *Ayerora*). These emulation programs made chiptune even more accessible.

[34]Smith, "How 8-Bit Music, or Chiptune, Moved from Illicit Origins to Mainstream Popularity."
[35] Márquez, "Playing New Music with Old Games: The Chiptune Subculture," 69.
[36] McAlpine, *Bits and Pieces,* 151.

CHAPTER IV: TRANSGENDER GAMING CULTURE

Transgender identity is highly significant to the narrative of *Ayerora*, a reflection of my own identity as a transgender woman. The use of chiptune for this album about gender identity is not incidental—there is a distinct connection between the transgender community and the gaming community. This section will explore that connection, to demonstrate how *Ayerora* came to exist at the intersection of these two cultures.

The three significant features of video games that attract and benefit transgender and gender non-conforming people that will be discussed in this section are:

- Customizable avatars and other avenues of self-expression
- Online community surrounding identity
- Neurodiversity

These factors lead to many gamers being members of or involved in the transgender community, and vice versa, creating a distinctive link between the two.

Customizable Avatars

One such feature included in many games is the creation of a digital avatar, a character that the player controls throughout the game. Crucially, the player defines this character's appearance and traits, with extreme detail in certain games. These choices can include the character's skills, job, clothing, body, hair, skin tone, fantasy species, and gender.[37] When the player takes control over their avatar's body, they are primed to identify with the avatar—they see through its eyes, they are addressed by other characters as their avatar would be, and as Danielle Nielsen points out in "Identity Performance in Roleplaying Games," the avatar "take(s)

[37] Danielle Nielsen, "Identity Performance in Roleplaying Games," *Computers and Composition* 38 (2015): 49, https://doi.org/10.1016/j.compcom.2015.09.003.

on their own behaviors and responses."[38] This gives gamers, a group predominantly made up of heterosexual, cisgender men, possible exposure to the experience of an identity that is different from their own, challenging their assumptions about others—and themselves.[39] Through an avatar, in a space much safer and more secure than the offline world, they may open their eyes to the potential that they are not straight, and/or do not identify as men.

This form of self-exploration only possible in gaming becomes yet more important when a player comes to identify as transgender or gender-nonconforming, giving them further avenues for exploration and expression even when they are unable to do so in real life.[40] Games are even beginning to expand their options in order to include these gender-nonconforming players—while older games sometimes restricted certain items to a specific avatar gender, many nowadays make everything accessible to any gender, such as *Animal Crossing: New Horizons* and *Final Fantasy XIV. Cyberpunk 2077* is particularly unique for allowing the player to choose the avatar's genitals, separately from gender and expression.[41] All of these options for creating an identity within an avatar attract and resonate with transgender people, and even with individuals who may come to identity as transgender in the future.

Online Community

Another important aspect of gaming that has attracted and connected the transgender community is the online communication afforded by them. Many engage with video games

[38] Ibid., 49.
[39] Ibid., 45.
[40] Xiaohua Awa Zhu, "Choice-Based Games and Resilience Building of Gender Nonconforming Individuals: A Phenomenological Study," *Digital Transformation and Society* 1, no. 2 (2022): 205, https://doi.org/10.1108/dts-08-2022-0039.
[41] Ibid., 206.

primarily as a social activity, rather than the personal, antisocial activity.[42] As much as anonymous expression is freeing, so is connecting with others similar to oneself—especially in the absence of those connections in real life. As Adrienne Shaw writes, "…offline identities are emphasized in online worlds. Perhaps nobody *knows* you are a dog on the internet… but if you are the only dog you know and you want to find others like you, proclaiming your 'dog-ness' becomes an important part of how you present yourself online."[43] Online gaming thus can be a very effective method of finding others sharing their identities, especially for marginalized groups—including transgender and gender non-conforming people. Even games without these online features built into them can still connect LGBTQ people, through websites, forums, and more recently servers on Discord, which may market themselves as LGBTQ-accepting spaces for people who enjoy a particular game.[44]

Neurodiversity

Finally, video games also particularly appeal to neurodivergent people, a group that strongly overlaps with the transgender population. People who suffer from depression can often attempt to use gaming as a coping mechanism; many transgender people may suffer from depression due to the difficulties that come from the identity.[45] Transgender people also especially commonly experience social anxiety and anxiety disorders, which certain games have been found to be useful in improving.[46] A transgender person may be more likely to become interested in gaming due to these factors. Finally, many transgender people are also on the

[42]Adrienne Shaw, "Talking to Gaymers: Questioning Identity, Community and Media Representation," *Westminster Papers in Communication and Culture* 9, no. 1 (2012): 73, https://doi.org/10.16997/wpcc.150.
[43] Ibid.
[44] Ibid., 72.
[45] Jon Arcelus et al., "Video Gaming and Gaming Addiction in Transgender People: An Exploratory Study," *Journal of Behavioral Addictions* 6, no. 1 (2017): 26, https://doi.org/10.1556/2006.6.2017.002.
[46] Ibid., 26.

autistic spectrum,[47] and video games have been found to be a common special interest for those with autism.[48] Thus, due to the connection between transgender identity, autism, and gaming, more transgender people become involved in the gaming community.

Video games allow transgender people to experiment with their expression and identity, connect with other LGBTQ people, and to cope with their higher rates of neurodiversity. These facts create a clear connection between the transgender community and gaming. This is the connection that *Ayerora* reflects: chiptune, a medium heavily associated with video game music, represents an inherently transgender story in the album.

[47] Ibid., 22.
[48] Ibid., 26.

CHAPTER V: NARRATIVE OF *AYERORA*

Ayerora is centered around a narrative about gender identity, the transgender experience, and gender as a set of predetermined expectations in our society. This narrative is set in a world meant to reflect our own, but with a handful of fantastical elements and purely allegorical events and locations. Tonally, it was intended to resemble a myth or epic. This story is summarized as follows:

Track 1 - The Fires of Birth: In a world strongly resembling our own, deep below the earth is a forge called the Fires of Birth, where smiths endlessly work to produce identities: metaphorical gems owned by every living person that define who that person is and what they are meant to do to be their best self. However, one particular soul created here seems to be destined to change the world once they are born.

Track 2 - Identity: The identities are brought to a golden palace in the sky, which is presided over by an undefined deity, and houses the souls of infants who are soon to be born. In a ceremony, the identities are presented to these souls, including the fated identity, and then the children descend from the heavens to earth.

Track 3 - Life of Sephtos: It is that earth where a couple birth a child, named Sephtos and assigned male at birth, who unbeknownst to them owns that fated identity. Sephtos grows up and quickly finds the expectations of masculinity, which are constantly repeated and reinforced to him, constraining and distressing, but when he even dares to

question this and consider the other side, femininity, he is chastised and reprimanded for stepping out of line.

Track 4 - Prison of the Mind: He begins to see his world manifested as a dark prison, in which all people are arbitrarily divided into two gendered cells. He screams and begs for release, but no one else comes to his aid, and he despairs.

Track 5 - Dysphoria, the Blight: He experiences intense gender dysphoria, which in this world takes the form of an illness that begins to consume him.

Track 6 - Finding Euphoria: However, Sephtos realizes that the doors to the cells are open and unlocked, and he sneaks into the other cell. She immediately experiences intense gender euphoria that cures her dysphoria, and the world appears as a wide-open field in which she dances and twirls around.

Track 7 - Fight For a New Name: Unfortunately, her jubilation is interrupted when the other prisoners discover her, and subsequently they all violently pull her back into her previous cell. Sephtos is nearly consumed by dysphoria again, but knowing what happiness lies on the other side, decides to fight against the massive crowd one more time, barely surviving but succeeding. In doing so, she fulfills her purpose defined by her identity, and achieves a sort of enlightenment, gaining the new name, Ayerora.

Track 8 - Stand Before It: However, her transformation and the chaos created by it draw the ire of a terrifying mechanical creature that emerges from the shadows, seemingly to act as a prison guard. The prisoners scatter back into their cells in fear, but Ayerora stands before the monster, refusing to back down. Unfortunately, Ayerora is swallowed by the beast's bladed mouth, and appears to die.

Track 9 - Supernova: The people of the prison collectively realize the reality of the oppression they face, and all decide to stand up to the prison monster like Ayerora did, a decision the magnitude of which creates a massive explosion that destroys their entire corrupt world.

Track 10 - Ayerora: Afterward, the Fires of Birth, still intact thanks to their existence outside the destroyed world, begin to produce a new, free and pure world named after Ayerora, who contentedly watches over it from the heavens above.

This narrative, and the work as a whole, is inspired by my own experiences of coming out and living as a transgender woman, receiving pushback from my loved ones and standing strong against that and coming to find greater happiness than ever before. Being transgender makes one acutely aware of a number of realities that cisgender people often completely take for granted. *Ayerora* is also a reflection of my involvement in the gaming and chiptune communities, which are, as stated previously, highly connected with transgender culture. This connection helps to strengthen the impact of the narrative, as its subject matter is intimately tied to the medium with which it is being told. Further reinforcing this link is the fact that this was not an intentional choice, but instead a circumstantial one: I am myself a member of the trans, gaming, and chiptune communities and sought to tell a story expressing my personal experiences in a medium equally personal to me. The work's existence and circumstances of creation reinforce its own message and purpose.

CHAPTER VI: CHIPTUNE IN *AYERORA*

Sound chips were the hardware used in early games to create their audio, and they have a very particular number of channels and waveforms able to be produced by those channels. Nearly every piece in *Ayerora* uses an emulation of a different sound chip that defines the sounds and limitations possible for that piece. While consoles had built-in sound chips, it was possible for a particular game to include a unique sound chip within the cartridge, expanding the sound capabilities for the game. This was particularly common on the Famicom, the 1983 Japanese equivalent of the United States' Nintendo Entertainment System released in 1985 (the international version did not support the use of these expansion chips). There were a total of 6 expansion chips for the Famicom, and *Ayerora* uses emulations of four of them throughout its tracks, as well as a handful of other consoles' default configurations.

Table 1: The Names and Specifications of the Simulated Sound Chips Used in *Ayerora*

Sound Chip	Console of Origin	Type	Available Sounds
Ricoh 2A03	Famicom (1983)	Built-in	• Two pulse wave channels (with duty cycles of 12.5%, 25%, 50%, and 75%), • a triangle wave channel, • a white noise channel (with an alternate mode generating periodic noise), and • a 1-bit PCM channel.[49]
Konami VRC6 (1989)	Famicom	Expansion	• Two pulse wave channels (with duty cycles of 6.25%, 12.5%, 18.75%, 25%, 31.25%, 37.5%, 43.75%, and 50%), and • a sawtooth wave channel.[50]

[49] McAlpine, *Bits and Pieces,* 109-113.
[50] Contributors, "VRC6 Audio," NESdev Wiki, last modified November 20, 2018, accessed June 5, 2023, https://www.nesdev.org/wiki/VRC6_audio.

Nintendo MMC5 (1990)	Famicom	Expansion	• Two pulse wave channels identical to those found in the Ricoh 2A03, and • a PCM mode (which is not utilized in *Ayerora*).[51]
Nintendo FDS	Famicom Disk System (1986)	Expansion	• One wavetable synthesis channel capable of simple frequency modulation. [52]
Namco 163 (1988)	Famicom	Expansion	• Up to eight wavetable synthesis channels that degrade in quality the more channels are active.[53]
N/A - Game Boy sound chip	Game Boy (1989)	Built-in	• Two pulse wave channels (with duty cycles of 12.5%, 25%, and 50%), • a wavetable synthesis channel, and • a white noise channel.[54]
Yamaha YM2612	Sega Genesis/Mega Drive (1988)	Built-in	• Six frequency modulation synthesis channels, one of which includes a mode to play PCM samples.[55]
Texas Instruments SN76489	Sega Genesis/ Mega Drive (among others)	Built-in	• Three square wave channels, one of which includes a mode to generate white noise.[56]

A variety of programs and applications emulating these sound chips were used to create *Ayerora.* For the pieces using Famicom sound chip emulation, I utilized a computer program called Famitracker, created by Jonathan Liss (known online as "jsr") in 2005.[57] When development on Famitracker ceased in 2015, it was succeeded by various extension programs:

[51] Contributors, "MMC5 Audi,." NESdev Wiki, last modified April 3, 2023, accessed June 5, 2023, https://www.nesdev.org/wiki/MMC5_audio.
[52] Contributors, "FDS Audio," NESdev Wiki, last modified July 12, 2019, accessed June 5, 2023, https://www.nesdev.org/wiki/FDS_audio.
[53] Contributors, "Namco 163 Audio," NESdev Wiki, last modified April 14, 2023, accessed June 5, 2023, https://www.nesdev.org/wiki/Namco_163_audio.
[54] Contributors, "Gameboy sound hardware," Gbdevwiki, last modified November 25, 2020, accessed June 5, 2023, https://gbdev.gg8.se/wiki/articles/Gameboy_sound_hardware.
[55] SEGA, *Genesis Sound Software Manual,* February 21, 1992, 4.
[56] The Engineering Staff of TEXAS INSTRUMENTS Semiconductor Group, *SN76489 AN – Manual,* 2.
[57] Jonathan Liss, "Downloads," Famitracker.com, last modified February 4, 2015, accessed June 5, 2023, https://web.archive.org/web/20130507092257/http://famitracker.com/downloads.php.

online user HertzDevil's 0CC-Famitracker (2015-2018),[58] user nyanpasu64's j0CC-Famitracker (2018-2020),[59] and finally user Gumball 2415's Dn-Famitracker (2020-present).[60] This latest version was the specific extension I used in *Ayerora.* I primarily utilized Dn-Famitracker due to my familiarity and particular interest in the creation of Famicom chiptune.

The piece that used Game Boy emulation, *Life of Sephtos,* was made with Little Sound DJ (LSDJ), created by Johan Kotlinski in 2000. Unlike Famitracker, LSDJ is actually an application for use in a Game Boy, and it can be purchased in the form of a Game Boy cartridge for use on the handheld in real life- which means it is not an emulation at all.[61] However, as I don't personally own an original Game Boy, I utilized a computer program that emulates the Game Boy console itself, and a ROM file of LSDJ- still making my use of LSDJ an emulation.

Finally, for *Prison of the Mind,* I emulated the sound hardware of the Sega Genesis: Yamaha YM2612 and Texas Instruments SN76489. The program I used to accomplish this is called Furnace, created by online user tildearrow in 2021, which can emulate a large variety of sound chips (including Game Boy and Famicom, though I am personally more familiar and comfortable with the aforementioned applications, and thus decided to stick with them).[62]

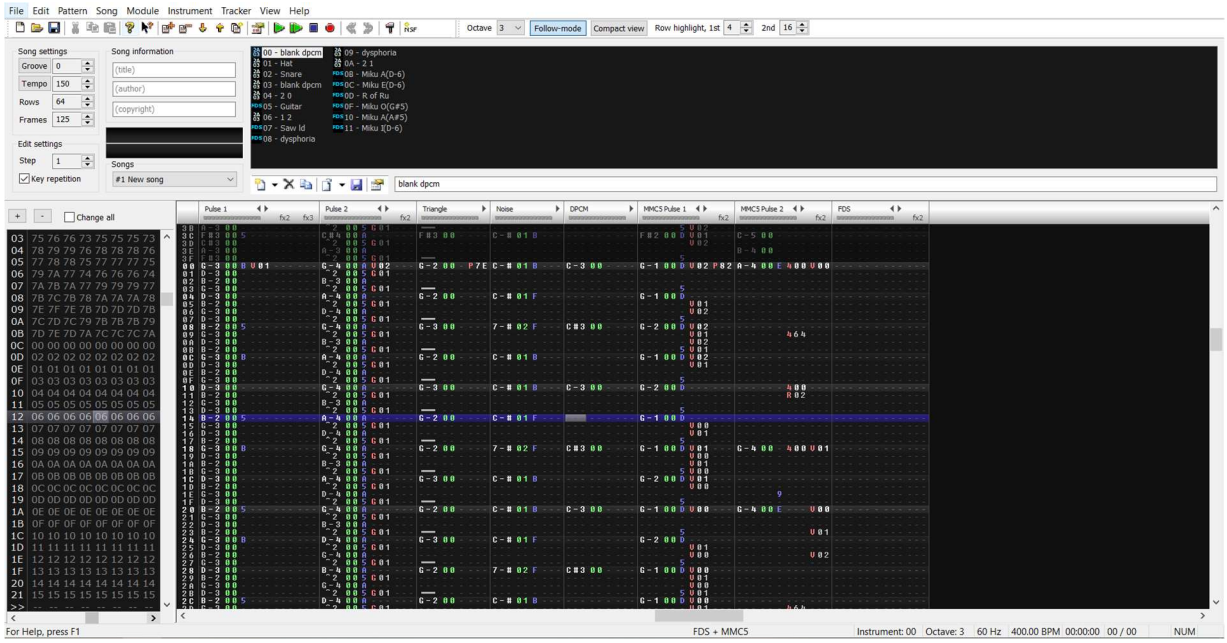
All of the programs listed above are examples of trackers, music creation programs in which the user inputs data, such as notes, volume levels, and effects, into vertically scrolling rows. Trackers exist in contrast with digital audio workstations, which are usually based around

---

[58] HertzDevil, "0CC-Famitracker Releases," GitHub, last modified May 20, 2018, accessed June 5, 2023, https://github.com/HertzDevil/0CC-FamiTracker/releases.
[59] nyanpasu64, "j0CC-Famitracker Releases," GitHub, last modified August 1, 2020, accessed June 5, 2023, https://github.com/nyanpasu64/j0CC-FamiTracker/releases.
[60] Gumball2415, "Dn-Famitracker Releases," GitHub, last modified May 2023, accessed June 5, 2023, https://github.com/Dn-Programming-Core-Management/Dn-FamiTracker/releases.
[61] McAlpine, *Bits and Pieces,* 186.
[62] tildearrow, "Furnace Releases," GitHub, last modified May 2023, accessed June 5, 2023, https://github.com/tildearrow/furnace/releases.

horizontally-scrolling piano rolls. In Famitracker and LSDJ, I made all digital instruments used from scratch, while in Furnace, I altered pre-existing instruments from Sega Genesis games due to the difficulty of generating frequency modulation synths.

Figure 4: Interface of Dn-Famitracker 0.2.1.0



I determined which sound chip emulation to use for which piece based on the strengths of each sound chip. For example, *Dysphoria the Blight* uses the Namco 163 chip emulation, because the chip's wavetable synthesis allowed for multiple unique and strange sounds to be used, to attempt to create an unsettling atmosphere. The Sega Genesis' sound parameters were used for *Prison of the Mind* to take advantage of the deeper, richer sounds FM synthesis can create- preventing the piece's low, drudging chords from becoming tiresome. Other pieces' reasoning was more logistical: *The Fires of Birth* was written first, and so I used the VRC6 because it is the Famicom expansion chip emulation I am most comfortable with. *Supernova,* the last chiptune piece of the album, uses the same chip simply to make the album's sound chip selections cyclical.

Most pieces in *Ayerora* are solely created within the confines of one or more of these real-life sound chips, but a few defy these parameters. *Finding Euphoria* uses a variety of sampled instruments that all appeared in various games on consoles that allowed for sample-based MIDI-sequenced audio. This piece thus uses no particular sound chip emulation or console's limitations on number of simultaneous channels. *Stand Before It* includes a saxophone, but the backing track uses an emulation of the Ricoh 2A03 alone. *Ayerora* (the individual piece) uses solely live performers.

Table 2: The emulated sound chip and instrumentation specifications of pieces in *Ayerora*

Track Title	Sound Chip/Instrumentation
The Fires of Birth	Ricoh 2A03, Konami VRC6
Identity	Ricoh 2A03, Konami VRC6, Nintendo MMC5
Life of Sephtos	Game Boy
Prison of the Mind	Yamaha YM2612, Texas Instruments SN76489
Dysphoria, the Blight	Ricoh 2A03, Namco 163
Finding Euphoria	Samples found in Earthbound, Mother 3, Mega Man 8, Pokemon Ruby & Sapphire, Pokemon Diamond & Pearl, and The Legend of Zelda: Ocarina of Time
Fight For a New Name	Ricoh 2A03, Nintendo MMC5, Nintendo FDS
Stand Before It	Alto saxophone, Ricoh 2A03
Supernova	Ricoh 2A03, Konami VRC6
Ayerora	Flute, B flat clarinet, bass clarinet, viola, piano, electric piano, and percussion (cajon & hi-hat)

As one of the goals of this album, and generally of chiptune as a medium, is to maintain accuracy to hardware constraints, all the applicable pieces would theoretically be playable on the console their sound chips originate from, were they to be converted into the proper format

(disregarding possible memory limitations). However, this is only true prior to the post-production work done on them in the digital audio workstation FL Studio 20. Renders of the individual channels were created and imported into the DAW, which allowed for modern mixing and mastering techniques. This allows for more detailed volume control and stereo, as well as equalization, none of which are possible with the original sound chips alone, and make the music sound unequivocally better, fuller, and more detailed. However, other common effects are avoided almost entirely. For example, automated delay effects are extremely rare in *Ayerora,* opting instead for manual delay achieved by duplicating the contents of one sound channel into another, offsetting its rhythm slightly, and dramatically lowering the volume. This keeps the tracks within the real-life limitations on polyphony present in the original chips, maintaining and only enhancing the hardware-accurate sound rather than straying further away from it. Similarly, the approach to equalization is to never alter the simple sounds too drastically, only to increase the brightness, clarity, and comfortability of them.

Other than a few minor exceptions, there is one sole track that does not follow this rule: *Dysphoria, the Blight.* In the ending section that begins around 2’35”, a number of effects are applied to its whirling, chaotic notes that are found nowhere else: reverb effects, low pass filters, and even automated delay. This singular break from what is otherwise a rule is intended to make the segment sound distinct from the rest of the album, perhaps even foreign, in order to emphasize the discomfort and despair occurring at the point in the narrative this moment is intending to convey.

CHAPTER VII: COMPOSITIONAL STYLE FEATURES OF *AYERORA*

There are a number of musical features that make up the compositional style I utilized throughout *Ayerora,* connecting together pieces of music spanning a wide variety of affects, instrumentations, and sonorities. This style includes formal structure centered around singular themes in order to increase narrative conveyance, the use of solos as climactic structural elements, the prominence of suspended chords and the suspended pentatonic scale alongside them, and frequent significant modulations of key.

Reinforcing Themes with Form

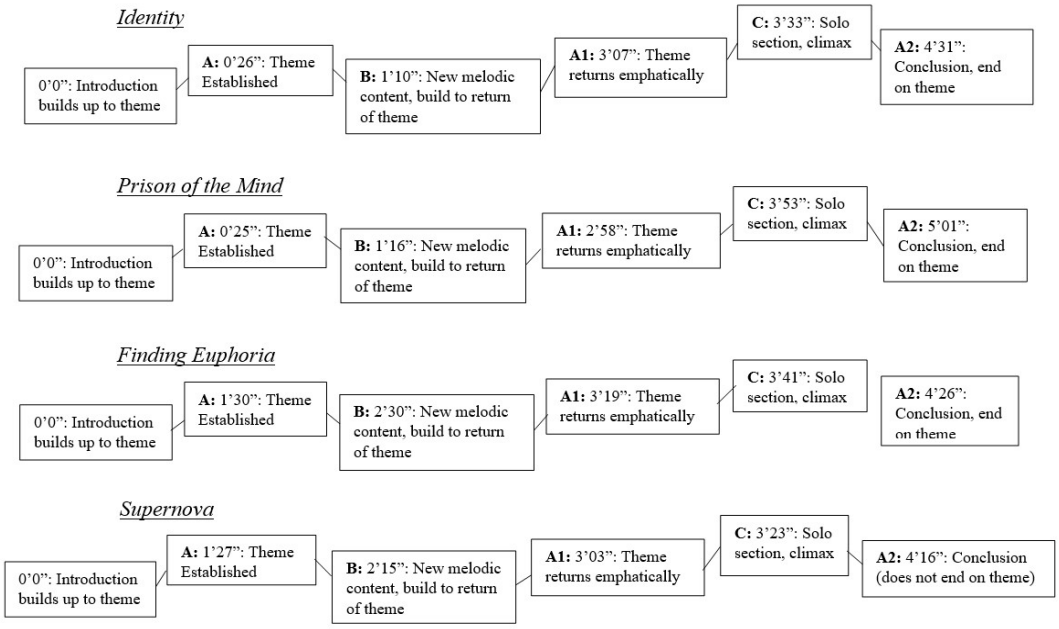
Most pieces in *Ayerora* follow a similar formal structure, centering around a single theme that usually holds narrative significance. This is generally an A-B-A1-C-A2 structure, in which:

- All of the A sections feature the central theme, or a motive derived from the theme—though the sections are otherwise not similar.
- The B section moves away from clear statements of the theme, and steadily increases the tension and energy.
- The A1 section releases the tension from the B section with a reprise of the theme with strong emphasis.
- The C section is an extended pre-written solo, serving as the climax of the piece and creating variety.
- The A2 section is a conclusion that often features the central theme once more.

Prior to the A section, there is usually an introduction that doesn't immediately reveal the central theme, establishing the piece's sound design and building up energy. The appearance of the central theme in A is the start of the process of making this theme, or a motive derived from the theme, stick with the listener, one of the primary compositional goals throughout the album.

The B section, which avoids the central theme, primarily serves to dramatically build up more intensity for an inevitable return to the central theme in A1. The return to the theme at such a point of release and high energy is intended to reinforce the importance of the central theme as well. After the solo section in C, many of the pieces conclude with one more statement of the central theme, bookending the piece with the important theme to remember. Thus, each section is designed to keep the central theme in the listener's mind. This structure is important to the style of the album, to my strategy for narrative reinforcement, and to my own personal compositional practices.

Figure 5: Formal Structure for *Identity, Prison of the Mind, Finding Euphoria, and Supernova*

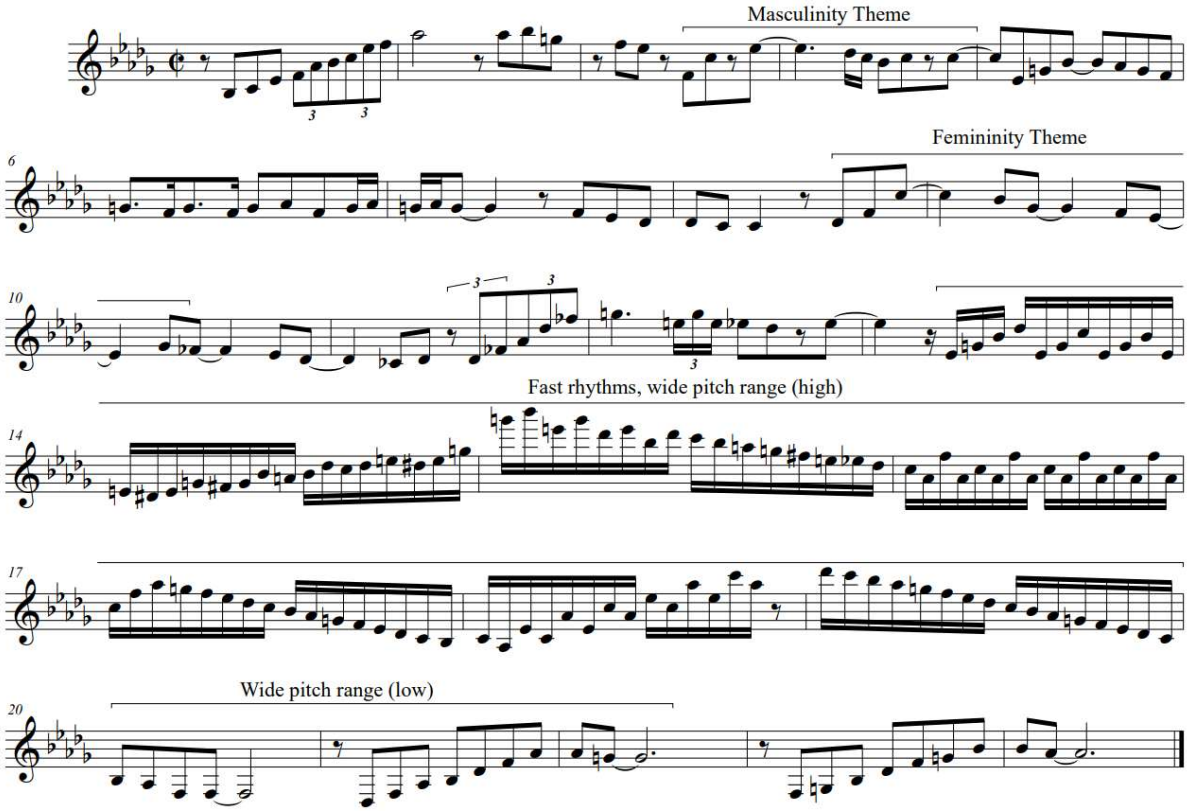


Solos as Climax

The solo sections at C are another important and prominent feature of the *Ayerora* compositional style, present in every single track except *Life of Sephtos* and *Dysphoria the Blight* (which still feature soloistic melodies). They intend to feel like improvisational solos, though as

playback tracks they are of course pre-written—save for the solo section of *Stand Before It,* the only true improvisational section. As seen in Figure 5, there is a natural momentum to the pieces created by the use of the central theme, and the solos fit perfectly into that buildup: they occur when the energy cannot grow any more, and a more expressive form of music is needed. These solos are characterized by fast rhythms, a significantly wide pitch range, and short references to themes used previously in the album. While they create variety in a formal structure otherwise heavily centered around a single central theme, they simultaneously allow for short callbacks to prior themes to easily be implemented that can convey narrative meaning. Most solos make little reference to the central theme of the piece it is included in, but many include themes central to previous pieces. As much of my musical upbringing was focused on jazz, solos are part of my musical language and some of the most enjoyable aspects of composing to me. Many of the solos throughout *Ayerora* were conceived through my own improvisation along with the chords at the piano, helping to create the improvisational feel.

Figure 6: *Prison of the Mind,* FM Channel 1, 3'54"



Note. This is the first 24 bars of the solo, to demonstrate recurring themes, rhythms, and pitch range.

Figure 7: Recurring Theme Representing Masculinity

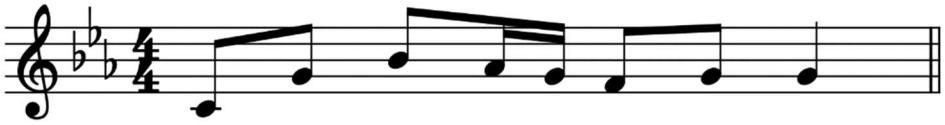
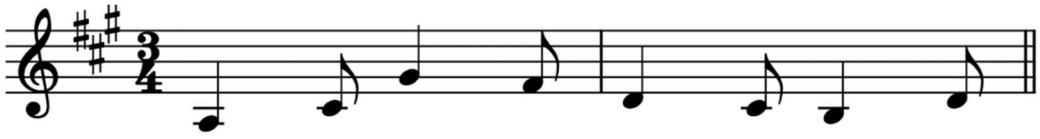


Figure 8: Recurring Theme Representing Femininity



Suspended Harmony and Pentatonic Scale

Throughout *Ayerora,* I focused on harmony based around suspended chords. Though these chords are not equally prevalent in every piece, a significant number do and most feature them, and it was a compositional goal of the album. Due to this suspended chord harmony, *Ayerora's* melodies, especially the aforementioned solos frequently utilize the suspended pentatonic scale, pictured below. It avoids a minor or major third and sixth, meaning it could imply natural minor, Dorian, or Mixolydian scales—mirroring the lack of major or minor sound in the chords.

Figure 9: Suspended Pentatonic Scale Beginning on A

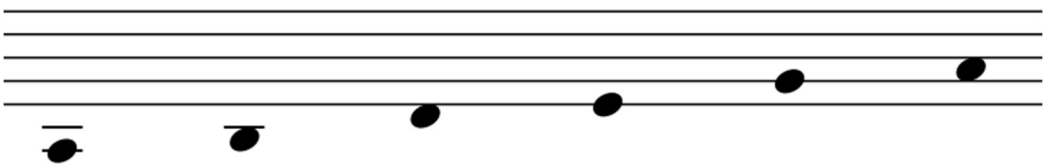
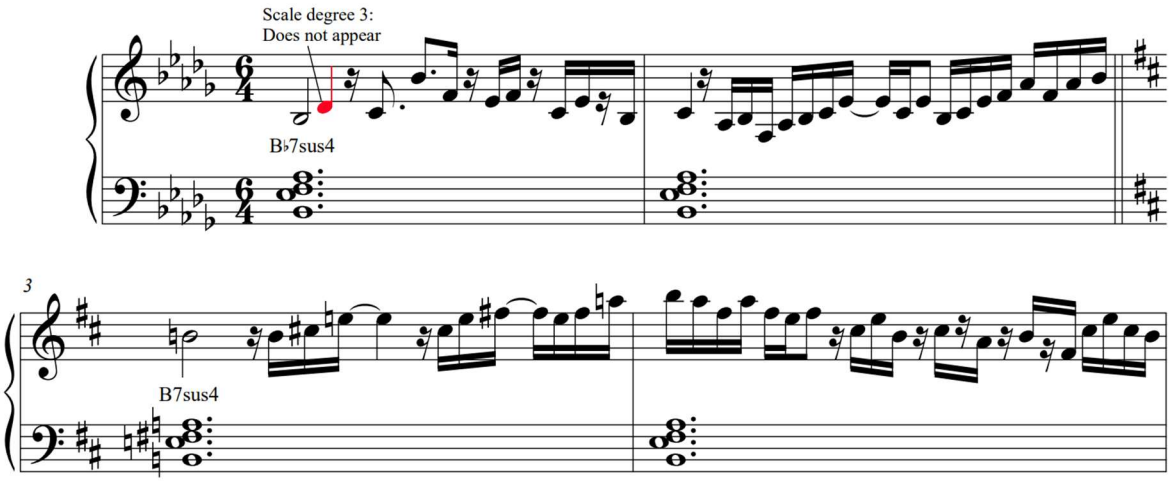


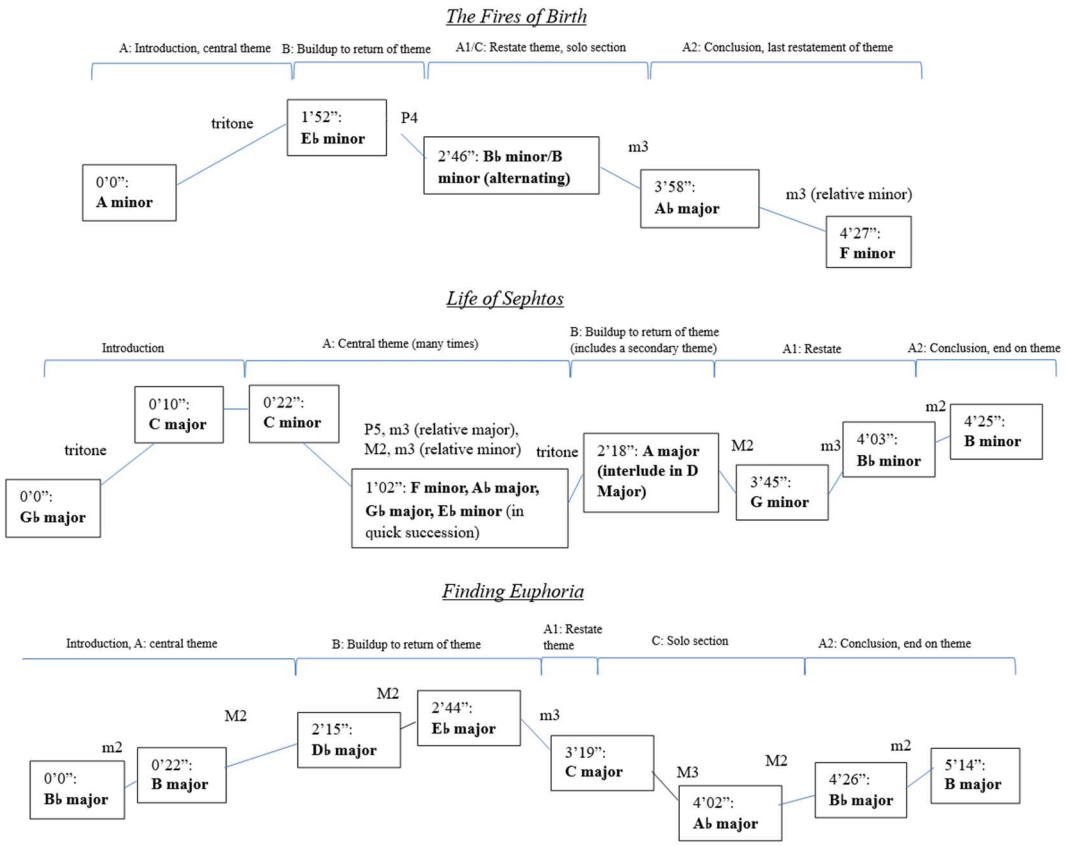
Figure 10: *The Fires of Birth,* VRC6 Pulse 1 and Simplified Harmony, 2'51"



Modulation

Finally, most pieces in *Ayerora* feature numerous modulations of key throughout, and rarely end in the key they originally began in. These modulations are rarely simple, often changing key by significant intervals.

Figure 11: Key Changes in *The Fires of Birth*, *Life of Sephtos*, and *Finding Euphoria,* Along With Formal Structure



The intended effect from these modulations is to highlight the sense of a musical, narrative journey—the changes in key highlight the turning points of the narrative being expressed. Between these modulations, the repetition and strategic placement of themes, and the steadily increasing energy culminating in the use of solos, the tracks of *Ayerora* attempt convey a sense of narrative development. They are the core theoretical music features that define the album's compositional style.

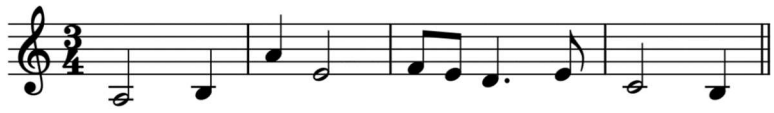
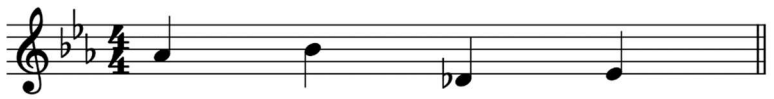
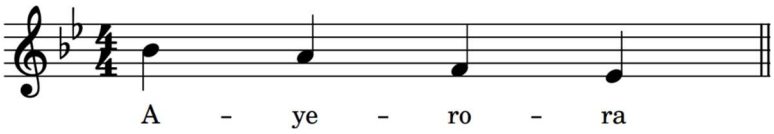
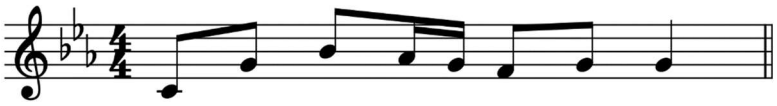
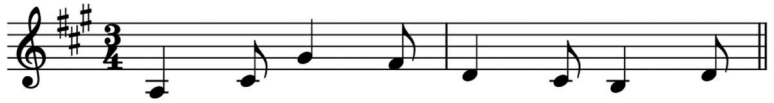
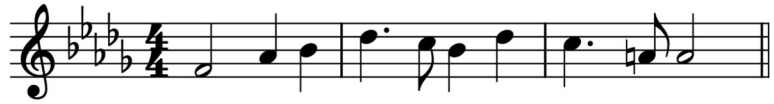
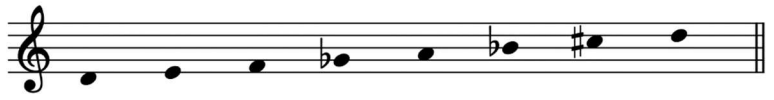
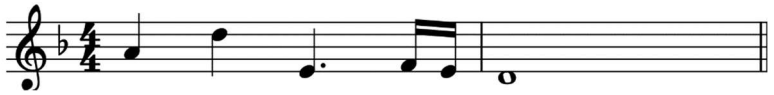
CHAPTER VIII: NARRATIVE REPRESENTATION IN *AYERORA*

Ayerora conveys the narrative it is intended to represent in several ways, which are key to understanding the purpose and meaning of the music. As music on its own cannot convey meaning directly, the primary way the story is established is through writing. I have written short poems associated with each piece that describe the events that occur within each piece. These poems appear in the videos created to be synced to the pieces, which were shown, along with myself reading each poem prior to each piece, at the album's premiere recital. Additionally, the program notes (which will serve as liner notes for the album's online release) explain each track's story in further detail.

Themes and Meaning

While the bulk of the narrative of *Ayerora* is conveyed through these text-based mediums, the music also contains features designed to convey meaning. The central device for representing *Ayerora's* narrative is the use of recurring themes. As stated previously, these themes are typically first established through consistent, strategic repetition within a single track. Each of these themes has an intended conceptual meaning that is established through association with the title and primary subject of the track it originates from. As a result, their meanings can only be fully understood with the assistance of the program notes or the poetry, but the goal is that they are as intuitive and simple as possible.

Table 3: All Meaningful Themes in *Ayerora,* the Concepts They Represent, and the Tracks They First Appear in

Theme (in key of initial appearance)	Meaning Represented	First Appearance
	Birth	1 - The Fires of Birth
	Identity	2 - Identity
	Ayerora	2 - Identity
	Masculinity	3 - Life of Sephtos
	Femininity	3 - Life of Sephtos
	Prison	4 - Prison of the Mind
	Dysphoria	5 - Dysphoria, the Blight
	Rebirth	7 - Fight For a New Name

Note: In order of appearance.

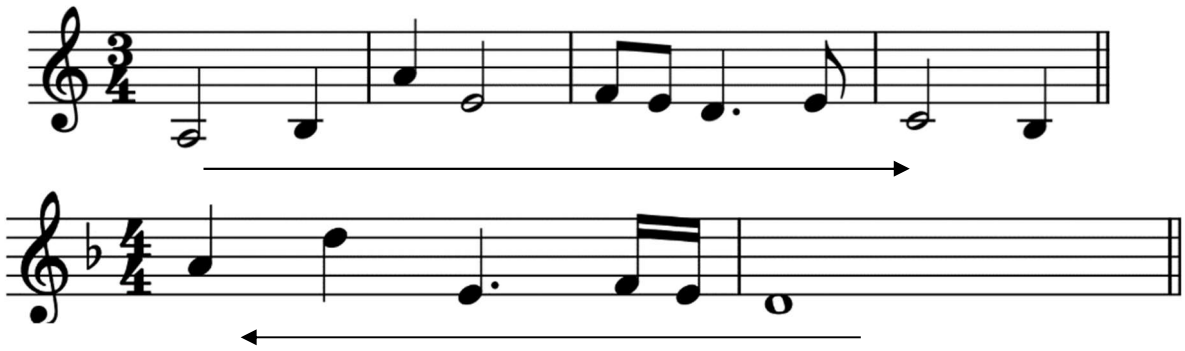
A few notes on these themes: firstly, the “lyrics” pictured in the Ayerora theme are present to demonstrate the implied syllabic connection between the notes and the name. In the

final measures of Fight For a New Name, the melody is played with waveform intended to mimic the vowel sounds of "Ayerora," to make this connection somewhat more explicit.

Next, the "theme" representing Dysphoria is not a theme at all, but rather a series of pitches creating a scale, which I refer to as the "Dysphorian mode." In a number of its appearances the scale is transposed, so it retains its meaning without the exact pitches listed.

There are a handful of connections between themes themselves, which are worth going over to demonstrate the intention behind them. In terms of pitches, the Rebirth theme is the retrograde of the Birth theme, with the addition of a small ornamentation.

Figure 12: Birth Theme and Rebirth Theme

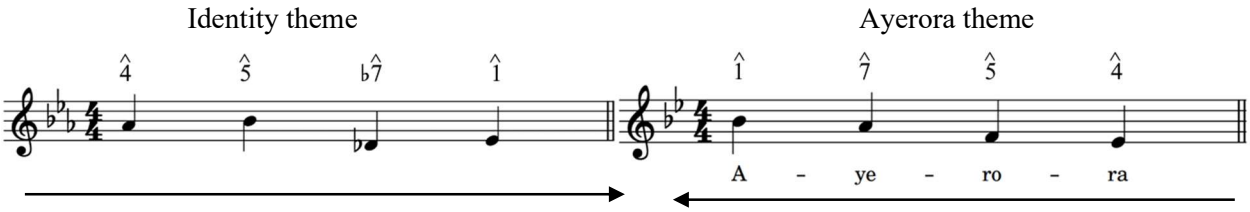


Note. Ordered respectively. Includes arrows indicating their retrograde relationship.

This connection is made clear from its first appearance in Fight for a New Name, in which the Birth theme (occurring at 2'45") is soon followed by the Rebirth theme (occurring at 3'16"). Narratively, this choice is intended to highlight the clear connection between the two concepts, and further suggest the idea that birth and rebirth are fundamentally the same process. This is reinforced by the Fires of Birth creating the reborn world in the conclusion to the album.

Another example is the four-note theme of Ayerora, which originates from the Identity theme. In the track *Identity,* the Identity theme is heavily emphasized, so when the Ayerora theme first occurs (at 1'53") it appears to solely be a variation on the prior theme:

Figure 13: Identity Theme and Ayerora Theme

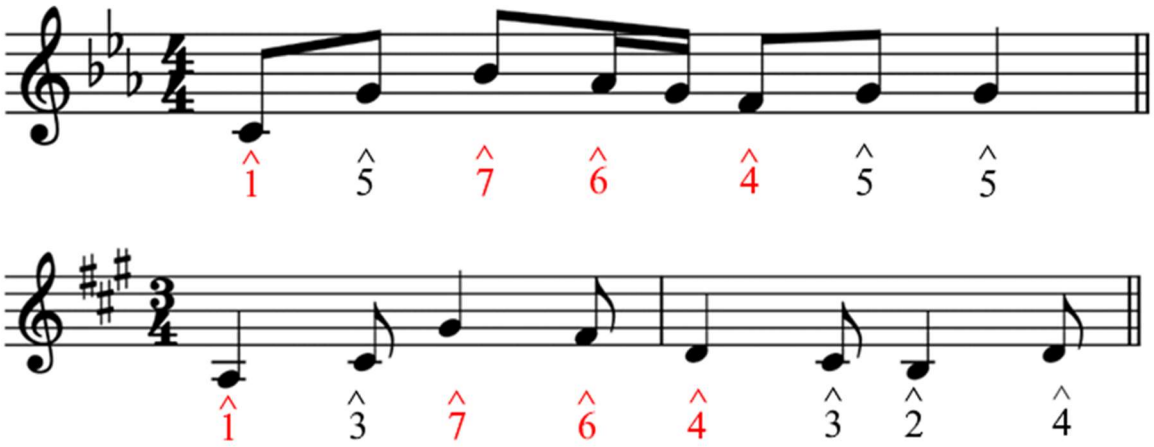


Note. Includes scale degrees and arrows indicating their relationship.

However, its subsequent appearances, the Ayerora theme appears completely separated from its originator, making their distinction clearer. This connection is present because when Sephtos transforms into Ayerora, it is a realization and recreation of her own identity, granting herself a new name and a transcendence above a system that seeks to control identities.

Finally, the themes of Masculinity and Femininity have similar initial contours:

Figure 14: Masculinity and Femininity Themes



Note. Ordered respectively. Includes scale degrees indicating relationship: numbers in red are shared between the two themes.

This reflects the idea that both concepts are gender roles, fundamentally equal, and deeper examination and explanation is required to describe the differences between them. They are often heard soon after one another in order to reinforce their connection.

Recurrence of Themes

For most themes, meaning is established in their first appearance, with the exception of the Ayerora theme which appears a few times prior. Once this has occurred, the theme reappears in subsequent tracks, subtly or prominently. It is a major structural aspect of the album's composition.

Table 4: Themes that Appear in Each Track of *Ayerora*

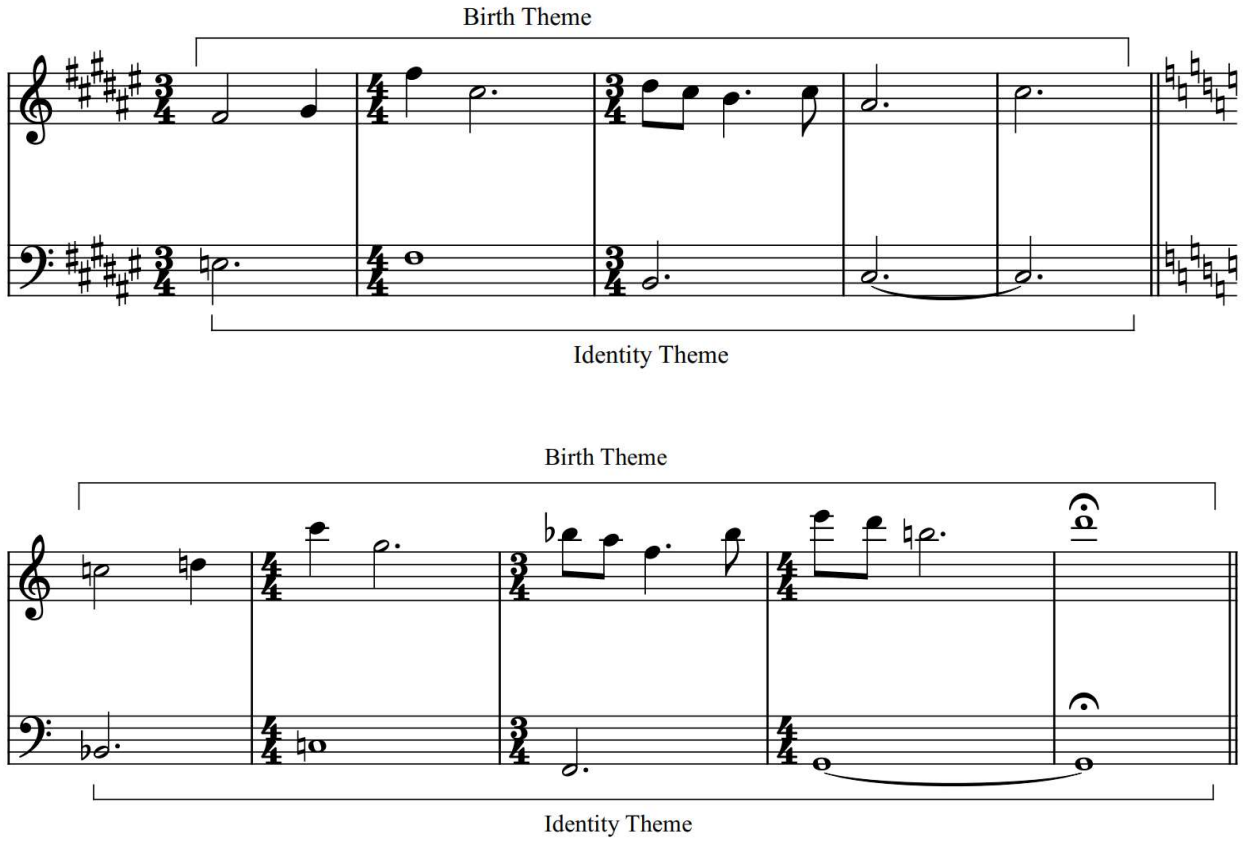
Track Title	Themes Appearing (in order of appearance)
The Fires of Birth	**Birth**
Identity	**Identity**, Ayerora
Life of Sephtos	Birth, Identity, **Masculinity, Femininity**
Prison of the Mind	**Prison,** Identity, Masculinity, Femininity
Dysphoria, the Blight	**Dysphoria,** Masculinity, Prison
Finding Euphoria	Prison, Ayerora, Femininity, Identity
Fight For a New Name	Masculinity, Dysphoria, Birth, Rebirth, Femininity, **Ayerora**
Stand Before It	Dysphoria, Prison, Identity, Masculinity, Femininity, Birth, Rebirth, Ayerora
Supernova	Rebirth, Identity
Ayerora	Birth, Rebirth, Ayerora

Note. Themes in **bold** are those first given meaning in that particular piece.

Each reappearance of a theme serves a narrative purpose, to connect the ideas being communicated with previous ones. It would be impossible to go into detail about the purpose of every single one, but here are a few examples:

Life of Sephtos is the first track to call back to previously-established themes, and it only does so in its introduction. Here, the melody is simply the Birth theme in its entirety, with a few minor alterations. Simultaneously, though less clearly, the bassline outlines the Identity theme.

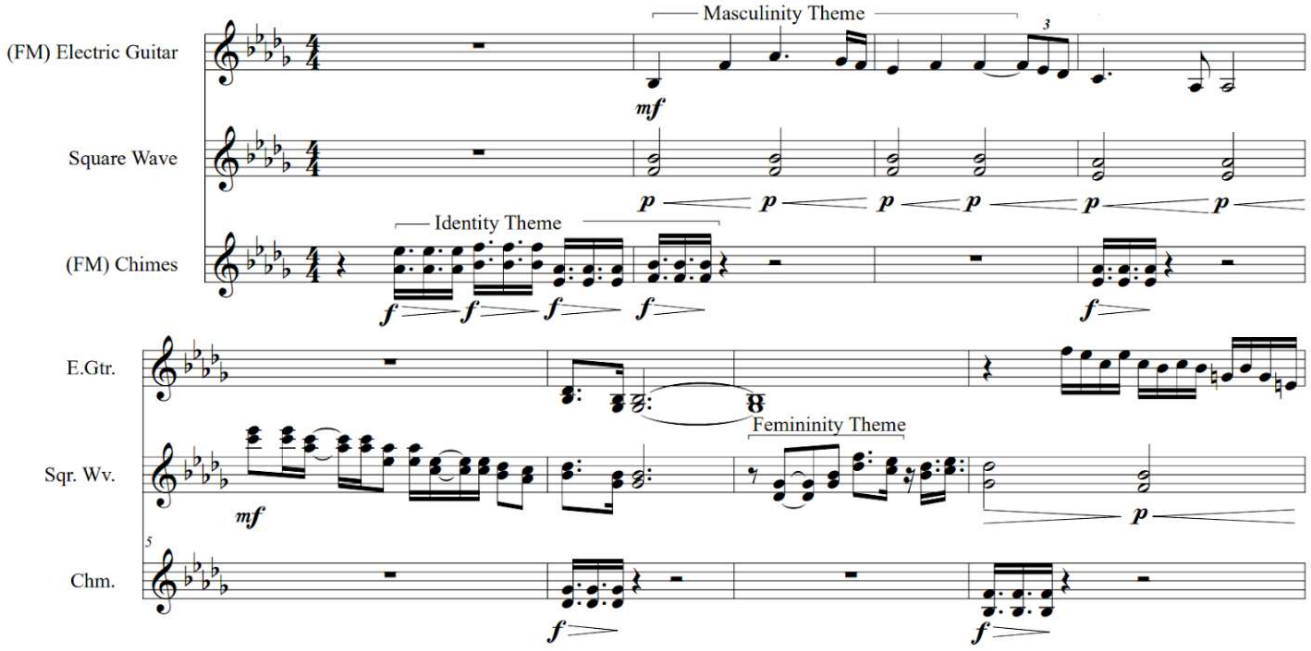
Figure 15: *Life of Sephtos,* Pulse 2 and Wavetable Channels, 0'00"



This introduction is intended to represent the birth and early life of Sephtos, before the pressures of masculinity are forced upon him. The Birth theme naturally represents Sephtos being born, recontextualized from its original meaning in *The Fires of Birth*. The Identity theme serves as the undercurrent of this melody, calling to mind Sephtos' identity which seems to be destined for radical greatness- the road to which begins now.

Next, *Prison of the Mind* features three themes all in a row following its opening section. First, the Identity theme is heard in a chime-like instrument, followed by the first measure of the Masculinity theme in a guitar-like instrument, and after a few measures, the square wave channels call back to the first measure of the Femininity theme.

Figure 16: *Prison of the Mind,* FM4 Channel (Electric Guitar), Square Channels 1 and 2 (Square Wave), and FM1 & 2 (Chimes); 1'26"-1'52"

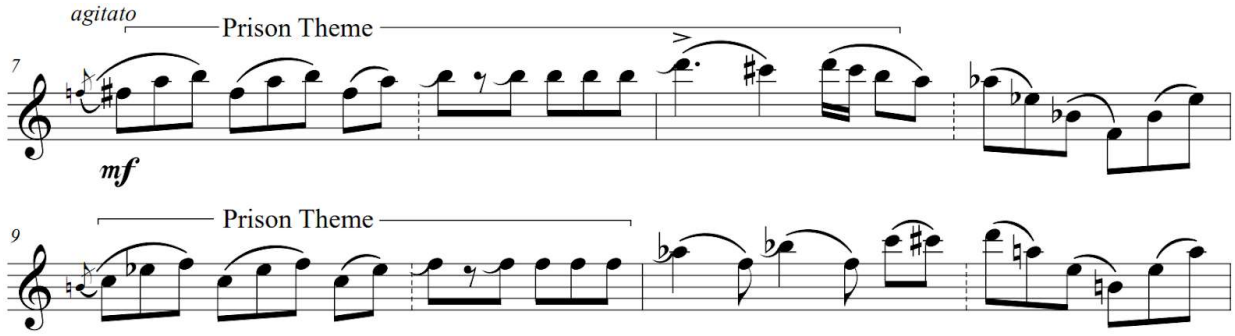


The narrative intention of this short section is to connect the prison of the mind to its purpose: to uphold the oppressive societal structure that is rigid gender roles. First, the Identity theme is heard, indicating that the prison ultimately has control over the identities of its prisoners. The chime instruments continue throughout the section to continually remind the listener that identity is the thing this prison truly controls. Then, the Masculinity and Femininity themes occur one after another, to demonstrate that the prison is divided between these two gender roles, represented by the two cells. The Masculinity theme occurs in a low, more abrasive instrument to reflect the traditionally masculine traits of a lower voice and of aggression, while the Femininity theme is played by the lighter and higher square channels to reflect a traditionally feminine higher voice and grace. With these connections, the purpose of the prison, the focus of the entire piece, is clarified in the music alone.

Stand Before It is unique in that it features every single theme at least once, though truth be told, some uses are more meaningful than others. Thankfully, this is directly proportional to how important each connection is to the piece, so the most pertinent concepts are much more prominently featured. For the sake of concision, only the two most important themes will be explained: the Prison theme, and the Dysphorian mode.

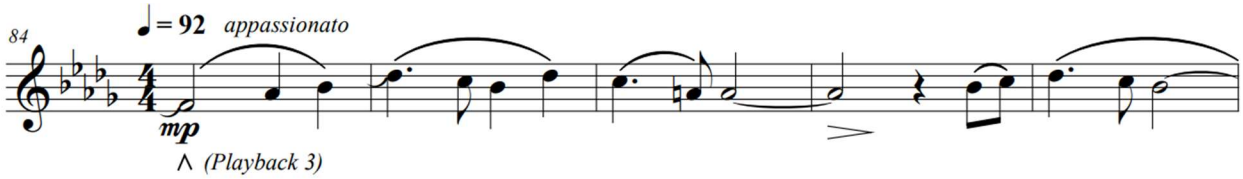
Firstly, the opening melody on the saxophone is based on the first two measures of the Prison theme, and this variation appears repeatedly throughout the piece. This is intended to reflect that the mechanical monster that has appeared is acting as a prison guard, attempting to keep the peace of the prison under control.

Figure 17: *Stand Before It,* Alto Saxophone, mm. 7-10



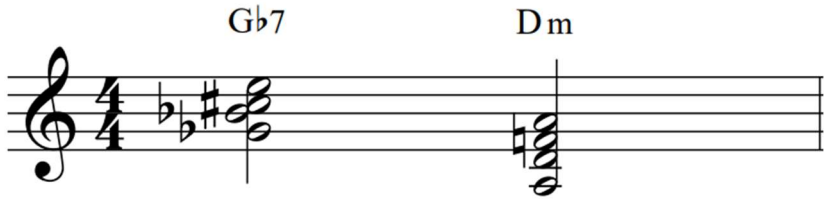
The Prison theme very clearly returns later in *Stand Before It,* primarily in the saxophone beginning at mm. 84. Here it is meant to represent that Ayerora seeks to destroy the prison and fight for the world's freedom from it. This is communicated through the poetry, and the sudden change in tempo reflecting a change from frantic panic to stoic determination.

Figure 18: *Stand Before It,* Alto Saxophone, mm. 84-88



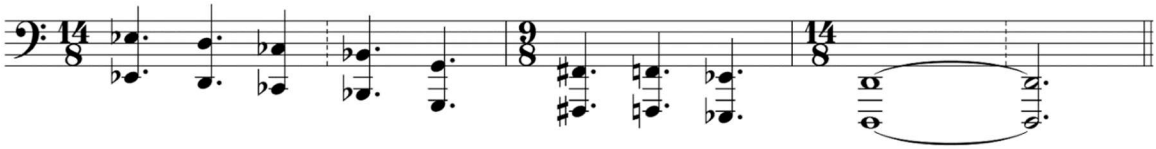
Next, the Dysphorian mode is used twice in *Stand Before It.* Its first appearance is the opening chords in the chiptune playback's pulse channels, which alternate between G flat 7 and D minor chords, covering all of the pitches of the previously-established scale based on D.

Figure 19: Chords Used in *Stand Before It,* mm. 1.



The Dysphorian mode occurs once again, more clearly this time, by both pulse channels and the triangle channel in the playback at mm. 13, now based on E flat.

Figure 20: Bass Line, *Stand Before It,* mm. 13



This is the first time the Dysphorian mode does not correspond to a moment when Ayerora, while she is known as Sephtos, is overcome with dysphoria. Thus, a connection is being made between that feeling of hopelessness and the mechanical monster, suggesting that it and its actions are directly creating and causing dysphoria.

There are a number of other intentional choices about which themes are included or excluded in each piece. For example, the pieces centering around gender dysphoria and gender euphoria use parallel themes to suggest their opposition to one another: *Dysphoria, the Blight* features the Masculinity theme to represent the gender Ayerora feels imprisoned by, and the Dysphorian mode to represent the distress it causes her. Contrastingly, in *Finding Euphoria,* the

Femininity theme's inclusion represents the gender Ayerora is currently experiencing for the first time, and her own theme accompanies it to show that she identifies with and is freer within this other side. However, the Prison theme occurs in both pieces, reminding the listener that both pieces take place within the same oppressive gender structure.

There are many more appearances of these themes throughout *Ayerora* to strengthen narrative conveyance and establish connections between pieces and throughout the album. The use of these melodies creates unity within a fairly varied album. They are the core of this album's purpose.

CHAPTER IX: CONCLUSIONS

Ayerora is the product of my life experiences, the most significant of which being from my experience with gender, with coming to realize my own identity as a woman and interacting with the world in an entirely new way. It uses recurring themes, a consistent formal structure, bombastic solos, and numerous key modulations to convey, as clearly as it can through the subjective meaning of music (in addition to supplementary writing), its narrative. This narrative tells of a person who defies the construct of gender, comes to fully realize who they are, and eventually changes the entire world in the process. This story, the center and purpose of the album, expresses the feelings and thoughts I have gathered over my years of questioning, accepting and transitioning.

It is also a product of my musical background. It was inspired by progressive rock music such as Emerson Lake & Palmer's *Tarkus*—conceptual albums and songs that told a whole story through music, through albums that were greater than the sum of their parts. *Ayerora* seeks to create a musical narrative, one that creates greater meaning than any single piece can. It is also a work of chiptune, a medium I have been immersed in for over a decade. It is the product of listening to countless video game soundtracks from classic games, and to modern chiptune concept albums to such Jake Kaufman's *FX3* and *FX4.*

Ayerora combines three of the most important aspects of my own life into one complete piece of deeply personal, yet accessible musical work: video games, transgender identity, and music.

BIBLIOGRAPHY

Arcelus, Jon, Bouman, Walter Pierre, Jones, Bethany Alice, Richards, Christina, Jimenez-Murcia, Susana, Griffiths, Mark D. "Video Gaming and Gaming Addiction in Transgender People: An Exploratory Study." *Journal of Behavioral Addictions* 6, no. 1 (2017): 21-29. https://doi.org/10.1556/2006.6.2017.002.

Collins, Karen. *Game Sound: An Introduction to the History, Theory, and Practice of Video Game Music and Sound Design.* (Cambridge, MA: MIT Press, 2008).

Contributors. "Gameboy sound hardware." Gbdevwiki. Last modified November 25, 2020. Accessed June 5, 2023, https://gbdev.gg8.se/wiki/articles/Gameboy_sound_hardware.

Contributors. "List of Games with Expansion Audio." NESdev Wiki. Last modified January 15, 2023. Accessed June 5, 2023. https://www.nesdev.org/wiki/List_of_games_with_expansion_audio#NEC_%C2%B5PD7755C_(Jaleco).

Contributors. "FDS Audio." NESdev Wiki. Last modified July 12, 2019. Accessed June 5, 2023. https://www.nesdev.org/wiki/FDS_audio.

Contributors. "MMC5 Audio." NESdev Wiki. Last modified April 3, 2023. Accessed June 5, 2023. https://www.nesdev.org/wiki/MMC5_audio.

Contributors. "Namco 163 Audio." NESdev Wiki. Last modified April 14, 2023. Accessed June 5, 2023. https://www.nesdev.org/wiki/Namco_163_audio.

Contributors. "VRC6 Audio." NESdev Wiki. Last modified November 20, 2018. Accessed June 5, 2023. https://www.nesdev.org/wiki/VRC6_audio.

Elicker, Martina. "Concept Albums: Song Cycles in Popular Music." In *Word and Music Studies: Essays on the Song Cycle and on Defining the Field: Proceedings of the Second International Conference on Word and Music Studies at Ann Arbor, MI, 1999.* Eds. Walter Bernhart, Werner Wolf, and David L Mosley (Rodopi, 2001). 227-248.

Emerson, Lake, and Palmer. *Tarkus*. LP. Advision Studios (Fitzrovia, London), June 14, 1971.

The Engineering Staff of TEXAS INSTRUMENTS Semiconductor Group. *SN76489 AN – Manual.*

Gumball2415. "Dn-Famitracker Releases." GitHub. Last modified May 2023. Accessed June 5, 2023. https://github.com/Dn-Programming-Core-Management/Dn-FamiTracker/releases.

HertzDevil. "0CC-Famitracker Releases." GitHub. Last modified May 20, 2018. Accessed June 5, 2023. https://github.com/HertzDevil/0CC-FamiTracker/releases.

Jones, Carys Wyn. "The Album as a Work of Art." In *The Rock Canon: Canonical Values in the Reception of Rock Albums* (Routledge, 2017). 42-53.

Kaufman, Jake. "FX3 Remastered." Bandcamp. June 4, 2013. Accessed June 5, 2023. https://virt.bandcamp.com/album/fx3-remastered.

Kaufman, Jake. "FX4." Bandcamp. March 1, 2013. Accessed June 5, 2023. https://virt.bandcamp.com/album/fx4.

Liss, Jonathan. "Downloads." Famitracker.com. Last modified February 4, 2015. Accessed June 5, 2023. https://web.archive.org/web/20130507092257/http://famitracker.com/downloads.php.

Macan, Edward. "Four Different Progressive Rock Pieces." *In Rocking the Classics* (Oxford University Press, 1997). 85-125.

Márquez, Israel. "Playing New Music with Old Games: The Chiptune Subculture." *Game*, no. 3 (2014): 67-79.

McAlpine, Kenneth. *Bits and Pieces: A History of Chiptunes* (New York, NY: Oxford University Press, 2019).

Nielsen, Danielle. "Identity Performance in Roleplaying Games." *Computers and Composition* 38 (2015): 45-56. https://doi.org/10.1016/j.compcom.2015.09.003.

nyanpasu64. "j0CC-Famitracker Releases." GitHub. Last modified August 1, 2020. Accessed June 5, 2023. https://github.com/nyanpasu64/j0CC-FamiTracker/releases.

Romano, Aja. "Janelle Monáe's Body of Work Is a Masterpiece of Modern Science Fiction." Vox. May 16, 2018. Accessed June 5, 2023. https://www.vox.com/2018/5/16/17318242/janelle-monae-science-fiction-influences-afrofuturism.

SEGA. *Genesis Sound Software Manual.* February 21, 1992.

Shaw, Adrienne. “Talking to Gaymers: Questioning Identity, Community and Media Representation.” *Westminster Papers in Communication and Culture* 9, no. 1 (2012): 67-89. https://doi.org/10.16997/wpcc.150.

Shuker, Roy. “Album.” In *Popular Music Culture: The Key Concepts*, 5th ed. (Abingdon, Oxon: Routledge, 2022). 10-11.

Shuker, Roy. “Rock Opera.” In *Popular Music Culture: The Key Concepts*, 5th ed. (Abingdon, Oxon: Routledge, 2022). 303.

Smith, Belinda . “How 8-Bit Music, or Chiptune, Moved from Illicit Origins to Mainstream Popularity.” ABC News. August 9, 2019. Accessed June 5, 2023. https://www.abc.net.au/news/science/2019-08-10/chiptunes-8bit-music-of-video-games-reimagined/11383632.

Sturges, Fiona. “The Return of Concept Album.” The Independent. October 2, 2009. Accessed June 6, 2023. https://www.independent.co.uk/arts-entertainment/music/features/the-return-of-concept-album-1796064.html.

tildearrow. “Furnace Releases.” GitHub. Last modified May 2023. Accessed June 5, 2023. https://github.com/tildearrow/furnace/releases.

Youens, Susan. "Song cycle." Grove Music Online. 2001; Accessed 10 Jun. 2023. https://www-oxfordmusiconline-com.libproxy.uncg.edu/grovemusic/view/10.1093/gmo/9781561592630.001.0001/omo-9781561592630-e-0000026208.

Zhu, Xiaohua Awa. “Choice-Based Games and Resilience Building of Gender Nonconforming Individuals: A Phenomenological Study.” *Digital Transformation and Society* 1, no. 2 (2022): 198-218. https://doi.org/10.1108/dts-08-2022-0039.