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Exploring Sense of Self - Climate Change and Anxiety Through Music

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ABSTRACT

This thesis showcases a concept album of original music, [*Atlas Park*](#), that addresses the themes of self-care, anxiety, and climate change. The story focuses on the author of the music and this thesis (Jack Flannery) having recently graduated college and trying to adjust to a new job while still working through their mental health issues. With one of their mental health issues being anxiety, much of the music focuses on trying to let go of social related anxieties and to live the life they have always wanted to- which includes being able to support the fight against the climate crisis. Some of the tracks have climate data sonified elements to them- whether it be how often an instrument or sound is heard, time signatures, or the melody, they are controlled by mappings from climate change related datasets. Some of these datasets include global temperature deviations since the 1880s, natural disasters across the globe, and usage of coal for energy in the United States.

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I would like to express my gratitude to all the content creators whose royalty free sounds I used on this album. These specific credits are given in the Appendix.

Motivation

The Initial Inspiration

At the beginning of my thesis ideation process, I knew I wanted to explore the intersection between sustainability, technology, and audio. Being such a niche interdisciplinary combination, my initial research revealed a small number of previous projects in this area. There were some companies doing material sciences related work to build speakers out of recycled materials such as plastics or wood (dornob.com, n.d.) - but the only other major projects I could find pertained to climate data sonification. Data sonification, specifically with data related to the warming of the planet, is the process of mapping the trends in these datasets to different elements of musical pieces such as what note to play in the key, what the rhythm of the song will be, the timing of each note, etc. This concept excited me- the idea of encoding data directly into music seemed like a unique and interesting way to write music about climate change. I did an entire project that took annual greenhouse gas emissions data (carbon dioxide emissions in kilotons) from different countries and used this dataset to control how loud each note was played, what frequency was played, and how much stereo panning each note had. The stereo panning was controlled by the angle between the listener of the piece (hardcoded to be State College, PA- although a location API could be used for this purpose as well since these mappings were generated in Python) and the location of the emissions based on longitude and latitude coordinates. I did that project as an experiment to see if I liked data sonification enough to design a whole methodology for creating data sonification with software. This project influenced my

use of nature sounds within my musical works, and as you will read about I used climate data sonification in some of the pieces. However, every bone in my body was telling me to put my own artistic touch on the work I was creating, instead of having it all controlled by numbers.

The Concept Album

Since I wanted to have more creative freedom over how the music produced for this thesis would sound like, I ended up deciding that climate data sonification is a useful tool to be implemented in some aspects of my music, but in no way does it have to be the main attraction of this work. The result of this realization was the thesis turning into my first attempt at writing and producing a full-length musical album. The album aims to tell a story about a potential future for myself. It is a coming-of-age story about me starting my life as an independent adult while also grappling with the mental health ramifications of climate change and dealing with my ongoing anxiety. As much as this work is about sustainability for the environment, it is also about sustainability of the mind- it took me too long to realize that I cannot help the other people in my life, and I cannot help the world towards tackling climate change, if I do not feel stable in my life. This concept album is meant to spread awareness around the profoundly serious issue of climate change through having people realize that they will not have the time and energy to help change the world if they do not take care of themselves first. The album cover can be seen below, which depicts two futures- one where I do not follow through with my aspirations which is the dreary, darker side with the dead tree and the lightning storm, and the other where I do support climate change movements and I am more confident in my musical abilities which is the sunnier side with the flourishing tree. This is meant to equate the state of my mental health with the health of the planet, saying that the human race cannot help the planet if we do not take care of ourselves.



Figure 1 - Atlas Park Album Cover

Atlas Park

It is highly recommended that anyone reading this paper should listen to the album in order before continuing. You can find the album [*Atlas Park*](#) on my Bandcamp under Jack Flannery's releases.

Narrative

As stated in the previous section, the goal of this album is to tell a story about a young person growing up and feeling nervous about what they think they can accomplish with their life. Putting that vague statement into more context, the story is about myself graduating college and starting a job in the financial industry while also struggling with knowing if I will have the time, energy and resources to support curbing the effects of climate change in whatever community I may be residing in. Within this section, I will be going through the album track by track and explaining the narrative significance of each track as well as each track's significance to me. In the next chapter, each track will be explored from its musical and any climate data related elements.

Track #1: Bird Watching

The idea for this track was based off one of the first audio projects I completed at Penn State called *Prelude to a Dream* (Jack, 2019). While the execution could most certainly be improved upon, given that I made this my second semester in my first college level audio class, the story of the piece remains the same. You come home from a long day, take your shoes off, crawl into bed and escape from the real world by dreaming. I like to imagine the dreamscapes I put into my pieces to be connected to nature, not only to represent people's subconscious' calling them to interact with the natural world but also to display the serenity that these walkabout dreams can foster. *Bird Watching* accomplishes this relaxing dreamscape through inviting the listener to dream of simpler times; there is a literal disembodied voice that asks the listener if they want to go bird watching- an invitation to walk around outside, listen to birds chirping and forget about all your troubles. In terms of the climate related narrative being told, this first track harkens back to the 1800's when the atmosphere was less polluted with greenhouse gases and there was more natural land for wild animals and people to explore alike. This relaxation is juxtaposed with the business and stress that the character feels during the rest of the album due to modern life to show that humanity's connection with nature has been lost over time due to overdevelopment. This leads into the second track, where the character wakes up from their dream and begins their busy day.

Track #2: Tea Time

Some of my friends and I like to end our days having tea with each other and making really bad jokes. While this can be seen as innocently spending time with one another and becoming closer friends, part of me views teatime as a place to unwind and process the events of the day. These elements of teatime inspired me to write this piece about a relaxing morning that introduces myself, Jack, as the main character. The inclusion of the climate change news clip is meant to give listeners the idea that portions of the story pertain to climate change. This clip is included as foreshadowing events to come in Blind Eye to Progress where climate change has a direct impact on the life of the main character. The phone call between the character and their mother (played by my wonderful mother Kelly Flannery) is included to give insight into the main character's emotions and events happening in their life. This phone call shows that the main character is nervous about starting their new job. While this alone does not signify the anxiety the main character carries with them, this phone call combined with interactions in future tracks should reveal this.

Track #3: Retrograde

The previous track ends with the main character leaving their home to travel to the airport. While this is not explicitly stated, the main character lives in an unnamed city. While they are walking through the city to catch a ride to the airport, the main character is processing many thoughts about their current life situation. For example, the lyric “do you know, what you’ll find? ... It could be anything” shows that the main character is not entirely sure if the path they are currently on is the right one for them. The lyric “steep incline” is repeated not only to be a joke about Penn State’s campus being mostly uphill but also to represent the struggle the character feels to continue to live the way they are- always rushing from place to place and constantly full of worry about getting done what they need to accomplish. This feeling is well encompassed by the lyric “the birds are flying high, but you don’t see them rise” with the birds symbolizing the freedom the main character wishes they had; the birds cannot be seen because the main character would need to face their own issues and try to change how they live their day-to-day life to accomplish the same freedom the birds mentioned have. The lyric “Do you see, how I dream? ... Recalling memories” calls back to Bird Watching in terms of the main character relishing those calm dreams and wishing they could feel like that throughout life. This travelling through the city leads directly to the character finding a ride to the airport, but not before getting interrupted at an especially important juncture in their thought process.

Track #4: Branching Out

The main character attempts to get over to the taxi they see before getting stopped by someone at a climate protest to talk about climate change. When asked to sign a petition to have the city ditch coal as a power source, instead of doing what the character would like to do and say “Yes of course! I’d love to help out!”, their anxiety about making their flight on time forces them to respond with “I’m sorry I’d love to but I’m gonna be late to my flight.” I have learned through my time as a student leader in behavior change on Penn State’s campus that one of the main methods for stopping people’s negatively connotated behaviors is to disrupt their routine at the point where the behavior is acted on. Following along with this idea, as the character is trying to block out all other distractions and make it to the airport on time to catch their work flight, the climate change protester (played by the magnificent Anna Bohsali) directly contradicts their actions with their beliefs. They point out a good fact about how damaging flying is to the Earth’s environment, and still the main character presses that they care but they feel like they do not have the time to act on their desires to help. The song that follows this conversation was originally written as a breakup song about people who did not treat me with equal respect in past relationships. The reason this song is included is because giving your partner equal value and respect is just as important when living life on your own terms. “Find me someone who will treat me nice and kind” is a lyric that applies to relationships with others as well as your relationship with yourself. If you do not treat yourself with the same love and respect that you would give to a partner, then you are not truly living for yourself. The main character goes through this same struggle where they want to be able to love themselves enough to explore climate change issues and help out where they can- but their anxiety and other issues holds them back from truly allowing themselves to follow through. In the lyric “Why does everyone think they can push me

around,” everyone includes the main character themselves. The ending of the song is supposed to foreshadow a possible dark ending to this story, where if the main character does not learn to be available for the aspects of life that matter to them most, then they will end up being hyper focused on the wrong issues and being unhappy.

Track #5: Learn to Fly

The main character finally arrives at their taxi, where they spark up a conversation about what they contemplated about during the music in *Branching Out*- being nervous about going to their first work conference and always worrying about the next big task in front of them. The taxi driver (played by Evan Spevak) acts as a confidant for the main character, listening to what they are currently worrying about and allowing the listener to have a more direct idea of what the main character is struggling with. A taxi driver was specifically chosen for this role, as their job involves quickly getting people from place to place. As the driver states, “no one ever takes the time to stop and think about how I feel,” giving the character someone to relate to for how they feel about their current life situation. The main character feels like they do not give themselves the time to stop, breathe and check their emotions. Many of the narrative themes from *Branching Out* continue into this track, especially since the taxi driver prompts the main character to divulge how they are feeling. These sorts of emotions cannot be processed over just one song. In the musical portion of this track, the lyric “Face the questions you don’t wanna ask” refers to the exact questions the taxi driver was prompting like “Why in such a hurry?” which only leads to deeper conversations about anxiety. The lyric “scared for the moment you wake up from the dream and come back to Earth, what was all the time I wasted worth” is not only another reference back to the peace and serenity from *Bird Watching* that the character is yearning for but is also an indicator that the character is beginning to regret all the time they spend worrying instead of acting on helping to save the planet or live life a bit more freely. The anxiety portion, the worrying about the uncertainty of the future, is best highlighted in the lyric “My gravity isn’t strong enough to keep the planets from aligning; to keep my life from flying, away from me” as the main character does not believe that destiny is on their side and is imagining their worst case

scenario in which they spend so much time worrying about their job or other little aspects of their life that they do not get the chance to help reverse effects of the changing climate. The track ends with the main character exiting the taxi, paying the fare, and entering the airport.

Track #6: Fresh Air

The beginning of Fresh Air brings us to the main character boarding their flight. The main character searches for their headphones, and upon finding them exhales a breath that sounds like much stress is being unloaded off their back. Since Tea Time, the main character has been worried about making their flight on time, and now that they finally have, they feel as if their worries have finally left them. The next track, Blind Eye to Progress, makes it evident that this short-term peace does not last. Even though the main character's anxieties have been resolved for the time being, their mindset towards hyper fixating on their job or other responsibilities is still a habit they have not beaten. This is without mentioning the creeping feeling that they are not doing enough to help solve the climate crisis, which comes to a head in this next track. The original intention of the musical portion of this track was to be a song about remembering to breathe, take breaks and focus on your passions once and awhile. However, in the context of this album, the song takes on a new meaning. The lyric "Things have gotta get good, it's only up from the ground" is not only a joke about flying but also signifies that the main character has the belief that their worries are over because they made their flight. "Got a taste of good luck, not giving it up ... The winds are blowing anew" shows that the main character believes that luck is on their side in this temporary moment of bliss. However, the next track should make the listener realize that this feeling was mildly temporary because the main character accomplished the task they were worried about. There may be a feeling of peace, but there will always be another task to cause new anxiety to replace the ones that preceded it.

Track #7: Blind Eye to Progress

This track puts the main character in quite a dangerous situation, as they are on a plane during a thunderstorm. The captain tells everyone on the plane to stay seated and remain calm, but the ensuing thunder causes some people to panic. This experience is meant to make the main character realize that there are more important aspects to life than worrying about their job and other responsibilities- as when there is the possibility of death looming in front of you, one tends to begin to regret anything they have not crossed off their bucket list or did not spend as much time doing as they would have wanted. While flying is socially innocent, doing an activity that emits greenhouse gases during a natural disaster points to the rise in natural disasters due to the warming of the planet. It also contradicts the notion that climate change has not already begun impacting the lives of everyone on the planet. This metal song that represents the danger of increasingly severe natural disasters has many lyrics that come from an aggressive perspective about what humanity has done to the planet in terms of pollution and climate change. For example, the lyric “Mother nature’s got a bounty on you and everyone else” is a metaphor for how time is running out for the effects of climate change to be prevented and/or reversed. The fleeting feeling that comes from climate change continuing to be set aside for societal convenience, or eco-anxiety, is represented well in the lyric “close your eyes and hope for the best, nature will take care of the rest.” The almost paralyzing idea that you are trying to prepare for your future, but the future continues to look more apocalyptic every time you check the news, best sums up the anger and fear that are portrayed in this piece. The lyrics of the chorus, mainly “we’ve turned a blind eye to progress” is a call to everyone to realize that while we are making some progress as a species towards reversing climate change, that does not excuse our continued emissions when we know what our fate will be because of it.

Track #8: Atlas Park

This track is meant to be the “calm after the storm” following the traumatic near-death experience the main character had on the plane. The main character exits the airport and almost gets in their ride share before hesitating and saying that they will be taking the subway instead. They are still struggling with the thoughts flowing around in their head and their anxieties, but the important moment here is that the character makes a conscious decision to take public transportation to their destination, a more environmentally friendly option than getting a ride share for just themselves. Due to the character’s choice to take the subway, they hear about a park that peaks their interest. Allowing the mind to explore, giving in to those “what if I took the subway because it is more environmentally friendly, even if it takes a bit longer and I could be late to my meeting” thoughts instead of always following the “I am feeling anxious so I should get a ride share because it will guarantee I will get to my conference on time” thoughts. This exploration leads to the main character having a very relaxing time within Atlas Park, a fictional park name I chose due to the meaning of the word atlas and its connection to maps. You can either follow a map someone else has drawn out for you and not deviate from that path, or you can make your own map and forge your own path in the world. The easier option may be to follow the predetermined path, but the goal is that by the end of the story the main character wants to be in a position where they are no longer afraid to carve out their own journey.

Track #9: Bug Jam

This track finds the main character falling asleep in the park after an incredibly stressful day. The idea of listening to music in nature while asleep is supposed to mimic the dream had in Bird Watching. This acts as a form of escape from the real world- dreaming of fantastically serene places to visit and places disconnected from society where you do not have to worry about any aspect of your day-to-day life. My family has a reunion in Jim Thorpe, Pennsylvania where we camp out and have a fire, and I always feel super calm on this weekend because I get to spend so much time outdoors. This is translated well into this piece, as it is written to be like a song you would hear played by the campfire with friends and family. The song is about letting go of your troubles and embracing the life you are living in the given moment. The lyric “hear the trees talk, they don’t need a reason why” is meant to represent not needing a specific reason to go on a hike or to enjoy time outside. Whatever else is going on in my life, time immersed in nature is important in reestablishing my inner peace. In the chorus of the song, “it’s the dilemma, you can’t even understand” references the dilemma of anxiety and self-doubt that one might feel about someone else, or about not feeling good enough to explore their passions more. The irony here is that many people experience the problem that is the “bug jam” - the one of feeling so small and powerless that you cannot control your own life. This song relates to feeling powerless against the climate crisis specifically. A lyric like “From down there, everything seems so small. But once you see the bigger picture, you can be on top of it all” addresses the issue that many people feel helpless to try and stop climate change- what can they do as an individual person to change the system? “Seeing the bigger picture” references being able to discuss climate change with those you know, becoming more educated on the issues in your local area, or any action you can take to make a difference and see how it fits into the combined effort of likeminded people.

The track ends with the main character waking up to three voice mails from their coworker about the conference the main character was supposed to attend but fell asleep during instead. The talk of scheduling more flights and continuing to worsen the climate change issue- just for a conference that work deems as important- makes the character anxious when the track ends.

Track #10: Leaves

This track begins with the main character hyperventilating and feeling like “their life is flying out of control.” Luckily, a passerby notices the distress, asks if the main character is feeling okay and invites them to see the band that was performing nearby in the park. This song was written by myself and my bandmates in Dogwood Company Jordan Emely and Forrester Connor. Credits to the lyrical content go to Forrester, but with his permission I am including this track on the album because the song is about grief and coming to terms with a loss. The main character is trying to process many complex emotions about their place in the world- finding the confidence to follow their true passions is accompanied by the death of an old way of living and thinking. The lyric “And I can’t take it, I can’t fake it anymore” in the context of this album is associated with the character’s desire to reject their anxious tendencies and to finally live for themselves. However, during these vulnerable moments the anxiety still lingers, hence the question “did I lose myself in the war?” While the lyric “It’s for the best, or the least of it all, when your fist is stuck in the wall” is in the beginning of the song as well, it really takes on its meaning after the guitar solo when Forrester sings it with more energy and passion. Healing from past traumas and fears is never an easy process, but overall, it will be better to feel the painful emotions and process them.

Track #11: Smile

After hearing Dogwood Company play *Leaves* and feeling cheered up after the interaction with the stranger (played by Forrester Connor), the main character finally reflects on what they are doing with their life. They have finally had enough time where they were not worrying about some aspect of their life to unravel some of their unhealthy thought patterns such as being a workaholic. This is not to say that the character is suddenly healed, but after the incident on the plane in *Blind Eye to Progress* proceeding blowing off that climate advocate in *Branching Out*, the peace they were able to experience in Atlas Park along with Bug Jam, and the grief they were able to process during *Leaves*, they were ready to find a better balance in their life between work, passions and finding peaceful moments. Having the main character drop their phone in the water is a small nod to how being on my phone too much causes me anxiety. Having their phone inaccessible is supposed to be a sign that the character is now actively conscious about their anxiety issues and is willing to live more freely now. The lyric “I wish I had a sailboat to float across the sea” references the escapism that the main character uses to feel better about their own life by imaging themselves in fantastical adventures. The line “and she said, get out of your head” is a reminder to the main character that it’s okay to dream, but living in reality is useful in gaining more control over their life. The other verse lyrics are like this, with another one being about going to space to live with the stars. However, one of the verses is a bit different stylistically, with the lyrics being “you’ll see, how great life can be. Among the clouds, lost in sound.” The main character is finally letting go of some of their anxieties and metaphorically flying freely with the birds as was sung about in *Retrograde*. The chorus lyrics also compare natural aspects of the world with relinquishing worries, especially the line “see the Northern Lights, but let them be” which implies that the main character needs to stop caring so

much about what others are doing or how others are perceiving them. The main character puts the thoughts of others on this seemingly untouchable pedestal, much like the beauty of the northern lights, but instead of investing energy into these nervous ideations they should be left alone. The lyric “the way I smile when I’m alone” is meant to represent the moments where the main character truly allows for the perceptions of others to not matter as much to them.

Music & Climate Data

The music created for this album does not fit into one definite genre or category, rather the mediums chosen for songs were chosen to best match the context of the story. Many of the songs were written from scratch for this album, some songs are ones I wrote for my band Dogwood Company, some songs are old unused song ideas from my other band Elastic Blur, and others were fun collaborations between friends. In each section I will describe any inspirations for the songs, why mixing choices and arrangement choices were made, and if climate data was utilized as part of the piece.

Track #1: Bird Watching

Outside the scope of this thesis, Bird Watching and Retrograde are part of the same piece as one larger song called Bird Watching. I wrote this song for my band Dogwood Company with the help of our vocalist Forrester Connor and our percussionist Jordan Emely. My friend Bo-Yoon Lee was kind enough to provide the “Do you wanna go bird watching?” dialogue at the beginning of this track. This dialogue acts as a call for the listener to go out and explore nature more. This song has a mix of influences from Jethro Tull’s guitar string pull-off filled acoustic tracks (like Wond’ring Aloud) and some math rock influence from the band Chon. These influences stay true for Retrograde as well. Including the bird songs is most likely influenced by the band Yes’ Close to the Edge where they have a stream and birds playing at the beginning of their progressive rock epic. All bird songs included in this piece were recorded by me in a collection of locations in Colorado and Pennsylvania. The bird songs in this piece were created by directly mapping deviances from temperature data spanning the years 1880 – 2021. The birds heard in this piece were mapped from the data from 1880 – 1910 to signify a time before the Earth’s atmosphere and surface was as polluted as it is today. The temperature anomaly data was provided by the National Centers for Environmental Information and is the NOAA Global Temperature Dataset (*NOAA Global Surface Temperature Dataset*, 2019). The definition of the mapping is that the lower the global temperature was from the normal, the more often birds can be heard singing. The higher the global temperature was from the normal each year, the less often the birds can be heard singing. The normal for the given temperature dataset was determined by climatology from 1971 to 2000. The ambient portion of this track with the cellos in the background was included to instill a powerful sense of peace within the listener, like music to mediate to, to try and accurately recreate your brain dreaming.

Track #2: Tea Time

This piece was largely influenced by the lo-fi music that I listen to while trying to study or relax. Since narratively the goal is to showcase a peaceful morning before the main character has a stressful day, keeping the music at a slower bpm and sparse was essential. The piano chords of this track are the same chords that are used in Bug Jam later the album, although the chords in this track are in a key that is a whole step up from Bug Jam. This is done intentionally, as the next time the main character feels as calm as they did on this track is during Bug Jam. The foley work includes stretching, a cat meowing and pouring tea - all elements of a morning I find to be extremely comforting. While there is no climate data connection on this piece, the climate change news clip is included so that listeners know the climate fact that storms are getting more severe due to climate change. The ringtone that is used is an 8-bit version of an Elastic Blur song titled Amplifier.

Track #3: Retrograde

Outside the context of this thesis, the music in Bird Watching is the introduction of a song that has this track as the verses and choruses. The influences mentioned in Bird Watching's section above apply to this track, but I would say the Beatles' work on the album *Magical Mystery Tour* had an influence on this song. The piece was written to elicit the peaceful atmosphere of nature, which is juxtaposed with the ambience I recorded of myself walking around downtown State College. Cars can be heard passing by and footsteps on the concrete can also be heard. This is meant to represent the conflict the main character is experiencing- fall victim to anxiety and focus only on the "productive" elements of your life or have the courage to be more honest with yourself than that and follow the passions you want to. The cajon and the xylophone-like instrument were included to provide a more acoustic/outdoor atmosphere. The xylophone was an instrument I sampled myself at Penn State's Arboretum. The notes played by the xylophone are mapped from coal usage data across the United States. The coal usage dataset is from DataPlanet and it can be referenced here (*CO2 Emissions from Coal Consumption by Sector from the Energy-Related Carbon Dioxide (CO2) Emissions Database, 2022*). It is measured by millions of metric tons of carbon dioxide annually for each state. Depending on how much carbon dioxide was put in the atmosphere, a given note along the F# Minor scale was chosen. The code also makes sure no notes are repeated since the xylophone parts in this piece are so short.

Track #4: Branching Out

This track has no climate data connection. The music in this track has a variety of influences depending on the portion of the music. The verse has a slight Jimi Hendrix inspiration with how I sing it, and the ending has some Nirvana like influences, but besides for that I am not really sure where this song comes from. This piece was originally written as a breakup song, as it was meant to help process the emotions I was feeling while ending a relationship I was not equally respected in, but many of the themes ended up matching the story I was trying to tell in this track. The faster paced feeling verses are meant to represent the main character's mind racing about the good and the bad of trying to find a new relationship or try a new activity- becoming more independent and the vulnerability that accompanies that. The first verse represents the good, where all the excitement lives and where you paint a romantic picture of how the new relationship or life adventure could possibly go. The second verse, while the music behind the lyrics is the same to represent that these two feelings live in the same place in our minds, the lyrics focus on the fallout when these new experiences do not work out. This is where all the regret, embarrassment and ridicule live when you dedicate yourself to a person or organization that does not give you equal love and respect in return. The chorus followed by the Nirvana style outro are meant to represent coming to terms with the fallout of a new relationship or experience and eventually acknowledging as well as letting go of the fact that it went poorly.

Track #5: Learn to Fly

This track has no climate data connection. This is my first attempt at writing and producing rap. While I do not listen to much rap, the rap I do listen has inspired the style of spoken word poetry rapping that I use. Bands like Paper Void and Lamar Hall's verses on Jeff William's rock songs have been major influences on how I like to rap. The spacey reverb on the rhythm bass part, as well as the ambience of the whole piece, were chosen for reasons of juxtaposing it to the fast-paced rap portion. The character's mind is racing about their anxieties about not being worth enough or not being loved- even though they could be calm if they took the time to learn to love themselves or learned how to participate in their passions out of a love for themselves. This is what learning to fly means- it means giving in to the want to explore nature, write music and help solve the climate crisis; giving in to the spacey ambience and doing what you want to do with your life. This connects back to the line in Retrograde where the main character can't see the birds rise into the sky because they have not learned to fly – they have not learned how to live as carefree as the birds. Not necessarily important for the story of the piece, but many of the percussion instruments included on this track are household items. The shaker is a container of red pepper flakes, there is a pen clicking every so often, and the bass drum is my friend Patrick Bobko (who also helped me write this piece) pounding his fist on top of a hard bass guitar case.

Track #6: Fresh Air

There is no climate data connection in this piece. The foley in this piece, as well as the foley in the following track, is inspired by the Foo Fighter's Learn to Fly music video (*Foo Fighters - Learn to Fly (Official Music Video)*, 2009) in which the entire band plays every character on the plane. That is why I wanted to voice act for most of the other characters on the plane- including the baby who's crying, the person taking care of the baby, a stewardess and other passengers. The music included in this piece has inspirations from Jack Johnson, the Grateful Dead, and Jethro Tull. Since this song is about alleviating anxieties in the short term, it was fitting to write it as a relaxing song that has a certain "jump" or swing to the rhythm as to calmly make people want to walk around and explore.

Track #7: Blind Eye to Progress

This track is heavily inspired by bands like Black Sabbath and Megadeath, who have all written angry songs regarding major political issues such as Black Sabbath's War Pigs and Megadeath's Holy Wars... The Punishment Due. In that same vein, this track was written as a protest/aggressive environmentalist metal song to point out how humanity has been treating their planet awfully. The calmer chorus and bridge parts are meant to represent the moments in the character's head where they cannot think about whether they will make it through this situation alive, but they simply feel numb to the disaster happening right in front of them. The drum part switches between an exact part to a more improvised, sporadic part every two measures during the bridge to showcase this chaotic lack of feeling. This is meant to mimic people watching the news and seeing flooding or more intense storms in other cities or countries but doing nothing about it since there is no sense of immediate threat to their local area. This song represents the immediate threat of climate change, whether people can see it causing issues or not. All the distorted portions, especially the verses, represent the mixture of anger and sadness that the main character feels that they have not been supporting the fight against climate change as much as they would have wanted to and now they feel as if they are paying the price for the impact anxiety has had on their life. The main riff of the piece, the one that starts the track, is in the time signature of 5/4. The end of the piece, playing the same riff, is in multiple different time signatures. This is because the Geocoded Distasters dataset from NASA's EarthData project (Centre for Research on the Epidemiology of Disasters', 2018) was mapped to the time signatures of the outro of this piece. Each type of natural disaster got assigned a time signature; for example, storms got assigned 5/4, wildfire's 9/4, etc. The severity of the natural disasters

indicated how many measures the time signature lasted for, and the type of disaster determined the time signature.

Track #8: Atlas Park

While I believe the track to be inspired by the many original soundtracks written for the Halo video games by Martin O'Donnell and Michael Salvatori, I have been told that this track sounds like it belongs in a Studio Ghibli film soundtrack or that it belongs in a videogame. This piece features piano, viola, cello, and clarinets that have an extremely high wet mix on their reverb plugin in Logic Pro X. The first half of the piece represents curiosity- the idea of walking around in a brand-new area and finding all its nooks and crannies that to a local would be part of their everyday life. The curiosity elicited leads the main character to explore a nearby park. The music that enters during the park portion of the track is meant to be much more spiritual, a bit melancholy but ultimately about healing. The main character has just been through a stressful ordeal- and the held out piano chords are meant to represent a lack of creativity in that moment in favor of resting and recuperating. The bird songs that can be heard while the main character is in the park are a use of the data first mentioned in the section about Birdwatching in Music & Climate Data. The temperature anomaly data from 2000-2020 were mapped to how often the birds were heard in this track. It should be noticeable that the amount of birds heard in this track should be significantly less than the dream from the first track, since the anomalies are much higher in these years of the data.

Track #9: Bug Jam

This track has no climate data connection except for the fact that the birds from Atlas Park are heard again at the beginning of this track. The music on this track was inspired by an improvised jam session my friends Vishal Ramola, Patrick Bobko and I had. I then took bug chirping and fire crackling ambience I recorded at a woodland retreat I went on and mixed it with the song we played. This not only continues the theme of dreaming of nature to escape from the current reality, but it also reminds the audience that nature exists and is important to stay connected with. The music feels John Mayer inspired; at least that is how I interpret it for when I recorded the vocals for it. The same chord progression is repeated throughout the entire song. This acts as a representation of a mantra; the main character is trying to reiterate this idea to themselves that they do not have to stress about everything and can make life a bit easier. I've found a good way to heal is to talk to yourself about what is troubling you and then whenever you get worried about it in the future, repeat a simple mantra to yourself. The chords in this song represent that promise the main character is attempting to make with themselves- live on your own terms, without fear, and with a sense of appreciation for yourself.

Track #10: Leaves

This track has no climate data connection. This Dogwood Company track, Leaves, was recorded at a Live at the Lion radio station session that my band played on Penn State's campus. This performance was when we were in between bassists, so the arrangement is one acoustic guitar, one electric guitar, drums and vocals. Many aspects of this track are inspired by Wilco's alt-country music and David Gilmour's contributions to Pink Floyd. The changing moods of the song tell a particular story of grief. The song starts with an amazing but somber acoustic guitar chord progression which leads into the first verse and chorus which Forrester Connor sings and plays mostly alone. This represents the aspect of the grieving process where you must sit with your emotions and really start to unravel what you are feeling without anyone else. The rest of the band joining in for the second verse and chorus represents the support from friends and family that is usually needed to process such a complex emotion as grief. The free guitar soloing as well as the manic solo that follows it are meant to represent the peak of the intensity of emotions, whether it be angry, sad, etc. I picture this solo to be a moment where the person experiencing the grief is crying during the free soloing and then comes to terms with the situation following the higher energy, manic solo.

Track #11: Smile

This track was inspired by music from bands such as Cheers Elephant, Jethro Tull, Paul McCartney's solo work, and others to a smaller degree. The upbeat tempo of most of the track represents the main character's ability to finally stop worrying about what others are doing and live for themselves. The style of the vocals is different on this track than on the rest of the album in that they were doubled, which was mostly a choice for the genre of the song but also works narratively in the sense that the vocals sound fuller and more confident than in the other tracks, aligning with letting go of anxieties. The small rests in between the verses and choruses are meant to act as small moments to breathe, relax and just enjoy your surroundings similar to the themes of Fresh Air. The second half of the second verse is stylistically different than the others, in a way that is similar to some of the vocal processing on Paul McCartney's Uncle Albert/Admiral Halsey track. It is meant to act as the moment the main character realizes that they feel like themselves again; they feel like the person they want to be. The bridge is similar in tone, but is meant to represent the character consciously knowing they want to remove their anxious traits and saying goodbye to being that person. The more quiet, emotional guitar part with the strings is meant to bring other people into the headspace for growth.

Conclusions

This project has been so meaningful to me for a myriad of reasons. First of all, the amount of time that this thesis has allowed me to work on music from start to finish has been amazing. The repeated exposure to the process of storyboarding a track to writing the music to planning the foley interactions between the characters to mixing the music has not only improved my skills as a songwriter but also as a producer and storyteller. In addition to this, I have been able to bring in other musical works that I would have most likely never used otherwise. Blind Eye to Progress was a song I wrote when I was a sophomore in high school- the fact that it thematically fit into my thesis was spectacular. Bug Jam was based off a spontaneous jam I had with my two bandmates Vishal Ramola and Patrick Bobko that I happened to record. Learn to Fly was a rap song I wrote with my friend Patrick Bobko to help me get over a depressing breakup situation- only after the fact did I realize that it was perfect for applying to my issues of self-doubt tackled in this album. Making art always requires some sort of vulnerability, and with many of the tracks in this album I am wearing my heart on my sleeve and singing about many of the issues I have been facing in my life over the past two years or so. I am hoping that being open about these issues and connecting many of them to how society feels and treats the climate crisis will inspire others to feel okay expressing themselves and fighting for what they believe is right.

Appendix - Audio Recordings Utilized Other Than My Own

Track #2

- Thanks to the YouTube channel titled *New Tech* for offering an alarm clock sound under a creative commons license [here](#).
- Thanks to ABC News for use of their news clip found [here](#).

Track #5

- Thanks to the YouTube channel titled *HD Royalty Free - Sound Effects* for providing the engine revving sound [here](#).

Track #6

- Thanks to the YouTube Channel *Creative SFX* for providing the ambience of the interior of an airplane found [here](#).

Track #7

- Thanks to the YouTube channel *Techno Mania* for providing the thunder audio found [here](#).

Track #8

- Thanks to the YouTube channel *Relaxing Sounds and Sound Effects Media* for providing the car window rolling down audio [here](#).
- Thanks to the YouTube channel *Virtual Ambience* for providing the car engine starting and car driving away audio found [here](#).
- Thanks to the YouTube channel *SOUND AND IMAGE FX* for providing the elevator door opening audio found [here](#).
- Thanks to the YouTube channel *Audio Library PH* for providing the city ambience audio found [here](#).

Track #10

- Thanks to the YouTube channel *Sound Library* for providing the footsteps in the grass audio found [here](#).

Track #11

- Thanks to the YouTube channel *Nagaty Studio* for providing the dropping a rock into water audio found [here](#).

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Objective: Continue to improve my skills in programming, music production and songwriting

Education

The Pennsylvania State University - Schreyer Honors College
Bachelor of Science in Computer Engineering
May 2022 Expected Graduation

Work Experience

Capital One

Technology Internship Program (TIP) - Software | June 2021 - August 2021
- Successfully delivered an internal tool to analyze past states of relevant customer data in real-time
- Designed a state machine visualization UI for internal developer debugging using xState and Vue
- Learned and utilized AWS Lambda and DynamoDB to feed relevant customer data into our Vue web app

Penn State Sustainability Institute

Senior Program Coordinator of EcoReps | March 2021 - Present
Associate Program Coordinator of EcoReps | December 2019 - Present
EcoRep | September 2018 - December 2019
- Managing over 70 employees to coordinate campus-wide environmental outreach events
- Promoting responsible consumption in the residential areas on campus as student leaders in sustainability
- Designing environmental outreach programming for Penn State Housing

Clair Global

Software Engineering Intern | May 2020 - August 2020
- Restructuring OOP class relationships within loudspeaker testing software for easier code readability and more efficient modularization
- Assessed multiple software designs and implementations through detailed, written feedback

Volunteer Experience

Penn State Football President's Suite Zero Waste Initiative

Game Day Volunteer | September 2019 - Present
Supporting the President of Penn State in making several of the box suites at Beaver Stadium zero waste through proper waste collection, sorting and education

3 Dots Downtown

Arts and Innovation | January 2019 - March 2020
Painting, building, and advising on design space and functionality

Activites

co.space
- Networking, creative project ideation, community

Performing, Writing and Producing Music

EarthDNA MIT
- Climate outreach organization supporting bipartisan climate education

Technologies

Python
Vue
JavaScript
C
AWS Lambda
Java
Git
SuperCollider

Interpersonal Skills

Proactively asking for feedback from team members and potential users of projects in development

Delegating tasks and setting deadlines to ensure efficient delivery of project features

Agile Software Development

Audio

Recording and mixing in Logic Pro X

Synthesizing in SuperCollider (Music Programming)

Built noisemaker synthesizer

Actively working towards interdisciplinary undergraduate thesis on climate data sonification