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Vomiting Lobsters, Cat Pianos, and Radical Interdisciplinary

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The Joys of Scientific Curiosity

My Love Letter to Fungi is my attempt at finding the joys of scientific curiosity.

Indigenous peoples have been communicating the importance of valuing nature, but yet Westerners continue to ignore them (Nenquimo, 2020). Contemporary scientific endeavours are not providing joyous experiences for women, black, latinx, etc. individuals. More women switch out of STEM majors compared to men (Singh, 2020), white men make up more than half of science and engineering occupations (National Science Foundation, 2017), and there is little to no representation of women currently in STEM for younger audiences (Petroff, 2017). When there are no opportunities or examples for minority groups, then there is no motivation or joy in scientific research. When there is no concern for indigenous practices and understandings of nature, then Westerners exclude valuable knowledge from scientific research.

Kircher demonstrates an, “imperfect grasp of science” (Findlen, 6, 2003) and I argue that this is the key, along with creating more inclusive environments, to finding the joys of scientific curiosity. Bio data sonification became my own Kircheran experiment where I found my own joy in scientific curiosity. I also have an “imperfect grasp” on bio data sonification, but it opened my eyes to exploring fungi in a way I had never seen (or heard) before. Perhaps fungi are a “secret of nature” (Findlen, 12, 2003) and bio data sonification presents an opportunity to uncover an aspect of the natural world that is inaccessible to us. On the other hand, bio data sonification may simply be human interpretation of something intranslatable to human understanding. Regardless,

My Love Letter to Fungi embraces the ambiguity of bio data sonification, as well as, takes a Kircheran perspective in finding the joys of scientific curiosity.

Bio Data Sonification

My initial plans for the final project were to conduct my own bio data sonification, however there were a few roadblocks. Many of the blog writers and citizen scientists that were exploring bio data sonification were white men and ultimately the research is limited. Bio data sonification is defined as, “measuring microcurrent fluctuations occurring across the surface of a plant’s leaf [or fungi surface], [the synthesizer] generates MIDI notes when a change in conductivity is detected” (electricity for progress). Important to note that, “The data which is produced is not inherently ‘musical’ in itself. The biodata readings do not occur ‘on beat’, rather a note is generated when a change is detected within the plant with pitch corresponding to the amount of change” (electricity for progress). The MIDI notes may be programmed to whatever instrument desired and sounds may be manipulated, thus creating something that sounds ‘musical’¹.

The potential of this technology may broaden computer music and create inter-species partnership in music making. Videos of mushroom bio data sonification feature usually a single mushroom (occasionally two) grown in lab-like conditions attached to the synthesizer where the mushroom is either sprayed with water, cut up, touched by a human, and more.² Bio data sonification may be used to understand how plants and fungi react to anthropogenic environmental destruction outside of the lab. The technology already exists to use portable synthesizers to listen to plants and fungi in forests, parks, etc.³ Recording these MIDI notes presents opportunities for research, as well as, computer music as climate art because it may

¹ See Appendix 1 and 2 for examples of bio data sonification.

² See Appendix 2.

³ See Appendix 3.

bring awareness to endangered species, the role of fungi in an ecosystem, and more. Bio data sonification requires humans and plants/fungi for music making and it may even influence human understanding of other species, ecologies, and environmental issues.

I grew a fascination with bio data sonification of fungi because of Anna Tsing and Louie Schwartzberg. Anna Tsing's *The Mushroom at the End of the World: On the Possibility of Life in Capitalist Ruins* explores the commerce of the matsutake mushroom (a specific species that grows in human-disturbed forests). Exploring capitalism through the lens of this mushroom demonstrated to me just how much we don't know about mushrooms and human relationship to these species can only extend itself as far as our understanding and communication. "When Hiroshima was destroyed by an atomic bomb in 1945, it is said, the first living thing to emerge from the blasted landscape was a matsutake mushroom" (Tsing, 3, 2015). Without humans matsutake mushrooms could not thrive and without matsutake humans would not have the beloved mushroom. While fungi do not seem necessary to humans, Schwartzberg says otherwise. In his film *Fantastic Fungi* there is an explanation of how mushrooms may possibly be responsible for the beginnings of human language (Schwartzberg, 2019). Without human feces psilocybin mushrooms would have no environment to grow, and without the mushrooms humans may have taken longer, a completely different form, or may have never formed human language (Schwartzberg, 2019). Perhaps bio data sonification may offer a way to understand mushrooms in a way that mushrooms have taught us to communicate and understand one another.

My experimentation with matsutake mushroom and bio data sonification ended up failing. Matsutake are only in season from September to January, so I used beech mushrooms as a substitute because they are similar in species. Beech mushrooms are also found in Japan and even have a similar taste to the matsutake (Mushroomsite.com, 2020). Unfortunately the

harvested beech mushroom did not have any detectable conductivity and no sound was produced when connected to the synthesizer (Personal communication, April 11, 2021). When I asked the citizen scientist known online as MycoLyco about my experiment he said that it was possible to have some conductivity from the beech mushroom I used, but growing my own mushrooms would produce better results (Personal communication, March 14, 2021). In my research I did not find any other person of a different gender or race showcasing their experiments with bio data sonification. I decided to turn to Kircher to guide me in my next steps of my project.

Kircheran Perspective

Paula Findlen describes Athanasius Kircher as a man with an “imperfect grasp of science” (Findlen, 6, 2003) and this imperfection may be the key to a joyous scientific endeavour. A perfect demonstration of this “imperfect grasp” is from the sunflower clock:

Kircher had already demonstrated his heliotropic plant, a nightshade whose seeds allegedly followed the motions of the sun when affixed to a cork bobbing in water... Peiresc described it admiringly as “a great miracle of nature,” the best of the many “secrets of nature” that Kircher claimed to be able to explain... Kircher kept promising to improve his transcription, citing his “imperfect Egyptian” as a reason for the delay, but Peiresc began to wonder if there weren’t other reasons (Findlen, 12, 2003).

Perhaps Kircher had an imperfect understanding of this “secret of nature” and had difficulty translating it to human language, especially a language he already had difficulty with. On the other hand, the mysticism may be an aspect of the sunflower clock and he could not uncloak the “secrets”. It peaked Peiresc’s curiosity just as much as it peaked mine, regardless of whether the experiment is true or not. While there are times that science should take itself seriously, such as considering the ethical implications of a cat piano, I find that there are times where playfulness should be encouraged, such as when we are designing the center of the Earth. Kircher’s drawing of the interior of the planet is just as mystic and playful as the sunflower clock⁴. I find that

⁴ See Appendix 4 and 5.

contemporary scientific endeavors should embrace mysticism and playfulness, especially with diverse perspectives.

I question how women, black, latinx, etc. individuals are scientifically curious when it comes to the “secrets of nature”. If STEM occupations were as playful and mystic as Kircher made science seem to be, perhaps these fields would be more diverse. However, this can only exist if opportunity and representation are brought to more women, black, latinx, etc. individuals. Science as it is presented to younger audiences must continue to be joyous as they get older, as well as, showcase individuals of various backgrounds who find genuine curiosity in their work. I took a new perspective with fungi when I began to consider how they are a “secret of nature” (I am inclined to believe that Tsing and Schwartzberg agree) and how bio data sonification may be a tool to uncovering this “secret”. Regardless of whether mushrooms hold some sort of secret or not, it made my scientific curiosity more joyous. I am curious about how female, black, latinx, etc. citizen scientists think about “secrets of nature”, such as fungi. I wanted a way to embrace my own unique perspective of my knowledge of fungi and bio data sonification. Kircher encouraged me, despite my bio data sonification failure, to continue experimenting with this complex technology and showcase my appreciation for my imperfect grasp of science.

My Love Letter to Fungi

I filmed and edited my own short film, *My Love Letter to Fungi*⁵, to demonstrate my personal relationship to bio data sonification and fungi. The audio, fungi, and setting were all chosen for the purposes of demonstrating my imperfect understanding of bio data sonification and my relationship with these species. Firstly, I discuss the audio chosen for this film and the significance it holds. Following this I describe the fungi showcased in the film and why they were included. Finally, I discuss the settings of the film and why they were chosen. I take into

⁵ See Appendix 6.

account my perspective as a young, female experimenter through the creative outlet of film. I desire for this film to introduce the idea of bio data sonification, as well as, joyous scientific endeavours to young people of various backgrounds, so that they too are not intimidated by an “imperfect grasp of science” and are encouraged to find joy in science. This film would not be possible without the inspiration of Nemonte Nenquimo and her activism related to protecting the sacredness of nature.

The audio for this short film was the sounds of blue oyster mushrooms from citizen scientist MycoLyco.⁶ In the words of MycoLyco, “Through the use of bio data sonification and a eurorack synthesizer we are able to listen in as two blocks of oyster mushrooms talk for perhaps the first time.... [Eurorack synthesizer] is a module specifically designed for this purpose and converts changes in resistance into analog control signals” (MycoLyco, 2020). I chose this audio because I was fascinated by the idea of two blue oyster mushrooms “speaking” with one another. The idea of how mushrooms may have helped humans communicate with one another (Schwartzberg, 2019) was represented in this film as humans listening to mushrooms “communicate” with one another. As mushrooms may have been key to our understanding and communication, so may bio data sonification may provide insight to inter-species understanding.

I have chosen and identified six mushrooms represented in this film to demonstrate my research and relationship to fungi. The star of the film is the blue oyster mushroom since oyster mushrooms are my favorite fungi (especially to consume) and are also the same species from the audio. I purchased a blue oyster mushroom from a local farmer at the Union Square Farmers Market and brought it to my home to film. The reishi mushroom was found on the decaying log in Central Park in the opening scene of the film. This mushroom was chosen to represent the mysticism I have in my relationship with fungi because I had to physically uncover them by

⁶ See Appendix 7.

moving the decaying log. My knowledge of fungi classification is not strong and I am not confident in my identification of the mushroom as a reishi mushroom, but I chose to embrace this imperfect grasp of fungi. Following this scene I showcase the various mushrooms sold at the Union Square Farmers Market including the caesar's mushroom, shiitake, lion's mane, and king oyster mushroom. These mushrooms were showcased in the film to represent the accumulating knowledge of bio data sonification and fungi I have acquired, especially because many of these species were showcased in *Fantastic Fungi*.

The settings of this film were chosen to demonstrate how fungi exist all around us and are vital to our Earth. I visited Central Park to witness how fungi are integral to the micro-ecosystems of New York City because even in the smallest of places life exists. I transitioned to the densely populated Union Square to showcase that despite the busy lives of New Yorkers, fungi are present. Finally I brought the camera into my own home because my relationship to fungi has become personal and intimate. The film illicites an unsettling tone because as Anna Tsing describes in her book we are living on a damaged planet and this is reflected in human relationships to nature (Tsing, 2015). Nenquimo, and many other Indigenious peoples, have brought attention to this damage and relationship. As we educate younger audiences of various backgrounds it's crucial to communicate that damage and the problems of Western relationship to the planet.

Conclusion

To bring joy into scientific curiosity we must find what excites us, such as “secrets of nature”, and embrace imperfect understandings of science, as well as, honor the sacredness of this land, the Indigenious people that were stolen from, and give opportunity and representation to peoples of various backgrounds. The creation of this film was one of the most joyous aspects of

exploring bio data sonification. Further exploration of this technology may be used as not only climate art in the form of computer music, but also potential for understanding how fungi species may communicate with one another. This complicated, yet crucial understanding of how humans cohabit on this planet with other species may bring more interest into contemporary scientific endeavours. The voices of female, indigenous, etc. groups are momentous in forming a relationship that honors the sacredness of nature in our science. May this film be only the beginning of understanding the consequences of living on a damaged planet.

Appendices

Appendix 1

[Example of a Snake Plant using the 'Chimes and Bow' Instrument in Live 9](#)

Appendix 2

[MycoLyco's Youtube Channel that showcases various bio data sonifications of mushrooms](#)

Appendix 3

[PlantsPlay \(An example of a portable bio data sonification device\)](#)

Appendix 4

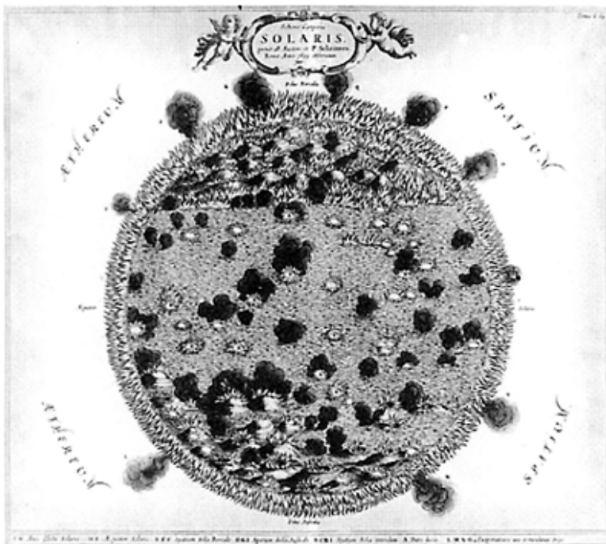


Figure Intro.2. Kircher's image of the sun. *Source:* Athanasius Kircher, *Mundus subterraneus* (Amsterdam, 1665). Courtesy of Special Collections, Stanford University Libraries.

Athanasius Kircher : The Last Man Who Knew Everything, edited by Paula Findlen, Taylor & Francis Group (2003). ProQuest Ebook Central, <http://ebookcentral.proquest.com/lib/nyulibrary-ebooks/detail.action?docID=200821>.

Appendix 5



Figure Intro.3. The sunflower clock.
Source: Athanasius Kircher, *Magnes, sive de arte magnetica*, 2nd ed. (Cologne, 1643). Courtesy of Special Collections, Stanford University Libraries.

Athanasius Kircher : The Last Man Who Knew Everything, edited by Paula Findlen, Taylor & Francis Group (2003). ProQuest Ebook Central, <http://ebookcentral.proquest.com/lib/nyulibrary-ebooks/detail.action?docID=200821>.

Appendix 6

[My Love Letter to Fungi](#)

Appendix 7

[Five Minutes of Blue Oyster Mushrooms Talking](#)

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