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SPECULATIVE LISTENING

Re-enchanting the world through new media practices

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Progress means: humanity emerges from its spellbound state no longer under the spell of progress as well, itself nature, by becoming aware of its own indigenoussness to nature and by halting the mastery over nature through which nature continues its mastery.

(Adorno, 1983-1989, as cited in Morton, 1996)

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Abstract

The aim of this experimental artistic research is to explore how we can use sound to engage with critical social and ecological topics that demand urgent intervention. In the next pages I will examine how I have tried to guide my artistic production towards a speculative sonic practice with the potential to propel our world towards better futures.

More specifically in the next pages I will pose the questions of how can listening practices raise awareness about the ecological and social impact of technology, whether the amplification of more than human voices can help us redirect our attention towards systems of collective benefit and how can speculative interfaces challenge our idea of *otherness* and reconfigure our understanding of nature and technology.

Through a retrospective observation of my artistic practice, which is informed by neo materialist, decolonial and acoustic ecology theories, I will try to show how speculative sonic practices can identify world problems and point towards regenerative futures.

0 Introduction

During my studies in Interface Cultures, the climate crisis we are witnessing made it urgent for me to tackle in my art with the ways we relate to nature. This led me to explore how my artistic practice can be something more than a means of personal expression or the articulation of an aesthetic output. In particular I've wanted to see how I can use sound and new media to propel activism, to challenge existing perceptions about technology and to nourish narratives of social and ecological repair.

In the first chapter I will talk about my artistic trajectory from field recording based sonic composition to sound installation. I will explain how my listening practice brought about my ecological awakening and how I try to evoke this experience to my audience through performance, music production, installation and podcast.

In the second chapter I will introduce the conceptual framework of re-enchantment in which the three artworks I will talk about later are nestled. I will offer a reading of the history of ecological crisis through the lens of the disenchantment of the world to later identify artistic strategies for re-enchantment within which ecologically engaged new media practices can emerge.

In the third chapter I will talk about the design of geomantic interfaces in my work as a re-enchanting strategy that reconnects technology with nature to point towards futures of earthly healing.

This dissertation traces the evolution of my perspective on the transformative power of sound and new media in fostering positive social change. It also provides a retrospective of my journey as I contextualize my artistic practice within the realm of environmental ecologies in new media art. The following chapters are organized in a chronological order corresponding to the unraveling of my thoughts. This is a story rich in references and theoretical twists, however I promise that if you bear with me, you will gain a valuable insight into my work.

1 Listening to Nature

As a kid I was trained in both European and Greek traditional music and harmony. In my teenage years, tired of the rigidity of classical training, I became more interested in musique concrete approaches, influenced by the pioneering French composer, musicologist, and radio engineer Pierre Schaeffer's philosophical stance and practice which focuses on recorded, environmental sounds as raw material for musical composition¹.

Working with non-musical material opened me up to experiencing sound not just as an exercise in harmonic and aesthetic mastery, but as a powerful way to connect to the world. I have found that as an artist and an audience, listening to natural sounds can cause a profound and lasting sense of communion with the surrounding world, and transcend the binaries of subjectivity and objectivity that so often separates us from one another. This process can eventually be healing on an individual and a communal level.

I've always thought of sound as a carrier of stories, and working with more-than-human sounds soon made me wonder what kind of stories did my recorded sounds themselves carry, who is telling them, and how those stories interfere with the stories me, or any artist wants to tell through their work. I thus realized that composing with environmental sounds can be a collaborative process between me and the more-than-human musicians that generated this material.

This way of thinking about sound making as a collaborative practice drew me to the work of Brandon LaBelle, an artist, writer, theorist and professor at the Faculty of Fine Art, Music and Design at the University of Bergen. According to his work *Relational Body*, the act of listening is inherently a form of conversation, where bodies literally *bump into each other*, creating a dynamic force of relation (LaBelle, 2018, p. 1). Since my material is often recorded with natural sounds, my compositional practice emerged under this scope as a dialogue between me, my audience and the natural world..

Donna Haraway, an important eco-feminist thinker that works at the intersection of science, technology and nature, also talks about the collaborative character of any creative practice in her influential work *Staying with the Trouble: Making Kin in the Chthulucene*, published in 2016. In this book, Haraway uses the term *sympoiesis* to refer

¹ My approach here is very much influenced by Pierre Schaeffer, a pioneering French composer, musicologist, and radio engineer who played a pivotal role in the development of musique concrete. In his book *De La Musique concrète et la Musique Même* from 1977, he reevaluates our perception of music, emphasizing the intrinsic musicality found in everyday sounds. The creative potential in manipulating and organizing these sounds, allows for a broader and more experimental approach to composition which is important for my sonic practice.

https://monoskop.org/images/9/9e/Schaeffer_Pierre_De_la_musique_concrete_a_la_musique_meme_1977_FR.pdf, Accessed: December 6th, 2023

to the interconnected and entangled nature of life on Earth in the face of the ecological crisis. *Sympoiesis* (from Greek *sún*, together, and *poiēsis*, production) means collective creation or organization, and as Haraway asserts, “it is rather a simple word; it means *making-with*” (Haraway, 2016, p. 58).

These theoretical references allowed me to reframe my compositional practice as a conversation between human and more-than-human subjects. This shift in my work encouraged me to think of it in the context of post-anthropocentric, object-oriented theoretical and artistic strategies from that moment and on.

Non-cochlear sound art

I like to think of my sonic practice as what the professor of Art History Seth Kim-Cohen defines as non-cochlear sound art (Kim-Cohen, 2009, p. 21). As he encourages sound artists to embrace the postmodern conceptual turn in their sonic practice, Kim-Cohen coins the term *non-cochlear* to distinguish the kind of sound art that extends beyond the aural properties of sound, and becomes a way to reflect on other fields of our complex reality.

A non-cochlear sonic art according to Kim-Cohen, seeks to replace the solidity of the sonic object of sound-in-itself, with the discursiveness of a conceptual sonic practice. As Kim-Cohen argues, sound is so much more than a sensuous experience: it is constituent of, and constituted by, the relations included in its expanded situation: sociality, gender, class, species, race, politics, power, ecology, history and economics. Quoting the French economic and social theorist Jacques Attali, Kim-Cohen notes: “what must be constructed is more like a map, a structure of interferences and dependencies between society and its music”(Kim-Cohen, 2009, p. 130).

1.1 Object-oriented sonic practices

In this section of my thesis, I would like to situate my work in the context of a wider movement towards object-oriented artistic practices and to talk about the importance of such cultural shifts to enable us to recreate our bond with nature and put an end to practices of environmental degradation. First I will establish a theoretical background to define what an object oriented artistic practice entails. In continuation I will show how sound can help recenter more-than-human agencies. Finally, I will explain why I think this is important and how I have applied it in my work.

Object Oriented Ontology (OOO) is a new materialist 21st-century philosophical perspective which opposes the tendency to prioritize human existence over the existence of nonhuman objects. OOO tells us that objects exist in themselves

autonomously from peoples' ideas about them. In the last decades various artists have situated their work within this context.

Bermudian writer Mandy Suzanne Wong in her essay "The Thingness of Sounds" (Wong, 2018), makes an attempt at an object oriented take on sounds which I find aligned with my perspective. In her text Wong asserts that we can talk of sounds in the same way OOO talks about objects, as entities that exist independently from human perception. Wong states that arguments against sound's autonomy (from people) are generally motivated by human-centered ideologies, which presume humans' ontological supremacy to nature and its sounds (Wong, 2018). Inspired by these object oriented, anti-representational, materialist approaches to sound, in most of my work I take care so that the sonic materials I use in my compositions remain identifiable. It is my artistic choice to use environmental sounds in such a non-referential way.

This is the point at which I think that the potential of object-oriented artistic practices to recenter the more-than-human becomes crucial. The conviction of human superiority has caused significant and irreversible environmental damage. However, by acknowledging the sounds of nature as expressions of its agency, we can transform our relationship with the natural world. This shift restores the more-than-human realm as a community of subjects rather than merely a human representation, empowering both humans and non-human creative agents to collaboratively guide our world toward re-enchanted, reparative futures.

1.2 Deep listening

The theory of object-oriented sound is not enough in its capacity of restoring the communicative function between human and the more-than-human world without a somatic practice. As my artworks were being shaped by the influence of object-oriented ecologies I started to practice deep listening. This opened up a whole new way of embodying sound and relating to the world through sound. I started to look for ways to recreate this experience of augmented aural perception and embodiment of the environment creating participatory listening environments for the audience of my sonic arrangements.

Deep listening is a practice developed by north-american composer Pauline Oliveros in the 1970s. It is as much a compositional manual, as it is a sonic meditation handbook. The practice it proposes aims to help the sonic practitioner to cultivate and extend their sense of hearing so as to be able to grasp the full complexity of sound.

For Pauline Oliveros, listening is a form of attention. Its span extends far beyond the terrain of musical sound. For Oliveros like for Kim-Cohen, sound is not merely cochlear.

The cochlear aspect of sound is perceived by hearing, but Oliveros puts the emphasis on the distinct qualities of listening.

In Oliveros' words, deep listening means "to connect to the whole of the environment and beyond", *encompassing the full spectrum of sound/silence, and expanding consciousness far beyond the individual aspect of it* (Oliveros, 2005, p.15). Influenced by Tibetan Buddhist teachings, Oliveros talks about the power of listening to deepen the sense of compassion (Oliveros, 2005, p. 16).

As Oliveros points out, sound is not just an aesthetic form, or a commodity used for relaxation. Conversely, for Oliveros much more than that, sound is a carrier of intelligence and a means of creating "an atmosphere of opening for all to be heard, with the understanding that listening is healing."

1.3 Experiments

Influenced by an object-oriented approach to sonic practice and my deep listening experience, I developed a field recording practice which consisted in the use of different kinds of microphones to amplify and record the sounds of the natural world. Equipped with a Tascam sound recorder, LOM's electromagnetic microphones, DIY contact mics and hydrophones I started listening, recording and processing all the sounds in my environment that were before filtered out for me. Through my field recording practice I realized that there were so many secret sounds around us and that listening to them was a way to connect with the more than human bodies we share space with. These sounds, as explained previously can be viewed from a sonic materialism perspective as the voices of silenced natural bodies, that have been commodified and reduced to resources. Amplifying them with the use of audio technologies holds the possibility to reenact their agential power and reconstitute their much-needed influence in our world.

My first exploration of environmental sounds led me to release a music album based on field recordings. *Água Viva*² is a collection of sonic compositions based on the digital manipulation and musical arrangement of a sole audio recording of raindrops on different surfaces, which I had made that autumn during a camping trip at Montseny, a mountain in Catalunya. My work in *Água Viva* not only sought to capture the raw essence of water but also to prompt listeners to engage with the element on a deeper level, inviting contemplation of the agency and vitality of the rain, embedded within its

² *Água Viva* means "living water" in Brazilian Portuguese and it is also Clarice Lispector's book that serves as a meditation on the nature of life and time. My album with the same name was released on September 4, 2020 on *tsss tapes*(IT) <https://tsssstapes.bandcamp.com/album/gua-viva> Accessed on December 5th, 2023 from

seemingly mundane and overlooked sonic cadence. In doing so, these field-recording based compositions can become a vessel for reconnecting with the often silenced and commodified voices of nature, fostering an appreciation for the vibrant vitality of our environment.

During that same period with my curatorial duo *Cachichi*³ I co-organized an event commissioned by the Catalan artist Consol Llupià with the theme of human and cetacean communication, developed during Consol's research residency in Hangar. We decided to create a series of sonic acts to raise awareness about cetacean listening and the cruel consequences of noise pollution at sea. Within the context of this event, in a collaboration with Błażej Kotowski, I designed *Balaenofon*⁴, a microphone that enabled the audience in our event to speak with whales, by converting human voice to a bandwidth that cetacean species can hear and use to communicate. The receiving interface was a seashell with a microphone hidden in its interior, whose output was being processed real-time by a max/msp patch that was modulating the incoming signal's frequency. We positioned the *Balaenofon* in the middle of the room and people were invited to come close and tell a secret to the whale, which we would all be able to hear. It was successful because the interaction with the object was very intuitive and the voice manipulation was entertaining and made it impossible to hear what the content of the message was. We encouraged people to utter wishes for the cetaceans related to the sonic awareness of marine noise the event was devoted to.

1.4 Afterthoughts

Balaenofon created a participatory listening experience that was entertaining but at the same time sensitizing the audience towards more than human livelihoods and raising awareness about cetacean lives and their precarisation caused by human made technology. Through this interaction, the audience was being suggestively informed about the degradation of marine ecosystems and the impediment of the communication between whales due to the interference of low frequency sound waves such as the ones used in sonar and marine technologies. In retrospect I see *Balaenofon* as my first collaborative speculative interface for interspecies communication that paved the ground for my later works presented in the last chapter of this thesis. That was the first time that I created a participatory listening experience that was helping to raise awareness about the ecological impact of technology. It was also the first time I used the gesture of listening to seashells as a medium for the reenchantment of the world, a pattern that will also appear later in my work.

³ Cachichi is a curatorial platform for sound art, experimental music and listening awareness based in Barcelona, Spain <https://soundcloud.com/cachichi> Accessed on December 6th, 2023

⁴ To know more about *Balaenofon*, visit the webpage of my collaborator Błażej Kotowski <https://blazekotowski.com/balaenofon.html> Accessed on December 7th, 2023

2 Re-enchanting strategies

In this chapter, I aim to introduce some strategies for *speculative re-enchantment*, the area within which I position my artworks. To explain my position, I will first illustrate how processes of *disenchantment* and *re-enchantment* act as a guiding thread for my research questions, ultimately influencing my artistic output. As I cannot divorce my medium from its context, in the following pages, I will also demonstrate how the concept of disenchantment and *re-enchantment* weaves into the landscape of art and technology, the space where my artworks find their place.

As I was exploring different ways of using my artistic medium to nourish futures of environmental healing, I felt that to have a real proposition I needed to first answer questions about the roots of the ecological crisis. This helped me understand how the climate crisis is interwoven with technology and with other global phenomena. Becoming fluent with these topics was important for my artistic process because it allowed me to decide which issues are critical to talk about in the field of ecologically engaged new media art and in which way a new media artist should position themselves in order to talk about really sustainable futures.

The focal point that I found useful to follow the route and trajectory of environmental devastation is that of *disenchantment*. Disenchantment is a term which refers to the era of Enlightenment, or Age of reason, when the pursuit of knowledge based on reason was established as the driving force of European civilization. The term ‘disenchantment’ is also used to refer to a lot of practices that with this agenda have been used to strip our perception of reality from ‘magical’ ideas and to replace it with a scientific, technocratic belief system. These disenchanting practices are diverse and change over time, but what they have in common is that they remove the idea of subjecthood from the material reality and instead they turn it into commodities which can be manipulated by humans. The disenchantment of the natural world divides reality into two domains, one reasonable subject that can attain knowledge through representation, and that of nature that is for lack of reason rendered devoid of any intelligence and is since now considered inert matter. This feature of the ideology of disenchantment allows for the prevalence of the archetype of human genius and mastery over nature and puts the foundations for the environmental crisis our era of the Anthropocene⁵ where man-made ecosystem collapse is putting the future of our planet at stake.

One of the processes through which disenchantment was historically constructed was European colonialism, its erasure of indigenous peoples and their ways of knowledge. The ancestral wisdom of First Nations was tied to nature and life in their form of social organization depended entirely on the correct interpretation of the signs of nature. This has led to a popular scheme towards the end of the 20th century, when ecological movements started to arise, where indigenous peoples that survived colonization were

⁵ The Anthropocene is a term introduced by biologist Eugene Stoermer in the 1980s. It highlights the impact of human actions on the including its physical, chemical, and biological attributes. from <https://en.wikipedia.org/wiki/Anthropocene>, Accessed: December 7th, 2023

warning the white people that a disaster would come if he wouldn't stop exploiting nature. One famous message can serve as an example for me to continue with my argument here. The Kogi people that live in the Sierra Nevada of Colombia in the film *From the Heart of the World* (Erreira, 1991, 0:16) send a message to the 'little brother', as they call director who is filming them and his community: Their message is long but this excerpt is a good summary for it:

"You mutilate the world because you don't remember the Great Mother. If you don't stop, the world will die."

For the Kogi the Great Mother is the Earth, which they consider a living and thinking system, with subjectivity and agency, that has desires, resilience and the ability to act and react. The Kogi listen to nature to understand what it wants so that they can live peacefully within it. They do so literally in their practices as they sit and listen to the bubbles of the water in the rivers of their territory to interpret the messages from nature.

The Kogi's listening practice is a form of divination that belongs to the realms of magic, animism, or paganism. But when we look at this listening practice through the scope of *deep listening*,⁶ then it is revealed as a practice of care, compassion and empathy with the world that surrounds us. As demonstrated in the following pages, practices of care like these were eradicated during the age of *disenchantment*, along with magic. However, some thinkers argue that the revival of such practices, termed the *re-enchantment of the world* (Landy, 2009), holds the power to reattribute agency to nature, repair our connection with the more-than-living world, and ultimately help us redesign a world, mitigating environmental collapse.

In the next pages, I will begin by providing clear definitions to the terms of *disenchantment* and *re-enchantment*. Following that, I will talk about the resurgence of magical elements in ecology and technology, and propose artistic strategies that reintroduce magic into the world. This theoretical framework lays the foundation for the presentation of my artworks in the next chapter.

⁶ Here I refer to the way Pauline Oliveros redefines *listening* as an act of compassion, attention, care and connection with the full spectrum of our environment (Oliveros, 2005, p.14)

2.1 Definitions

The word *disenchantment* literally means *de-magic-ation* or the breaking of a magic spell.⁷ The term in this context is a reference to Max Weber's concept of *entzauberung* (Weber, 1917-19, p. 488), that refers to how the world has been stripped of its mystery and magic as a result of positivist science and rational thinking.

Adorno and Horkheimer (Adorno & Horkheimer, 1947, p. 23), define disenchantment as the demise of animism, the end of the belief in spirits inhabiting objects, and the transitioning from pagan polytheism into organized monotheistic religions. According to their perspective, the gradual erosion of spiritual beliefs is replaced by a disenchanted world where everything can be subjected to technical measurements and economic valuation. Ultimately in our times it is capitalism that has taken the leading role in this process by commodifying and monetizing the world, reducing it to quantifiable economic entities.

In a rather critical stance, the vitalist materialist philosopher Jane Bennett (Bennett, 2010) defines disenchantment as our disengagement from the material world. Bennett tells us that the world has never really been really stripped of its magic, the tale of disenchantment, has real consequences, and results in lack of community and meaning. According to Bennett this demagification maintains *a world of inequity and violence, a cynical world of business as usual, nature as man made, and affect as the effect of commercial strategy*. And so it happens that in a world construed as disenchanted we can no longer tell the difference between power and legitimate authority. This is why Bennett goes on to say that we need to deconstruct the tale of disenchantment, to free the world from the ethical and political cynicism and corruption it entails.

In their 2021 essay *Monster as Medium*, Litvintseva and Wagner discuss 18th-century experiments in European medicine measuring human recesses (Litvintseva & Wagner, 2021). The duo conclude that the quantitative models those experiments yielded, dispelled fantastical notions disenchanting the European body, marking its shift from the monstrous to the rational. Similarly in their artwork *Constant* (Litvintseva & Wagner, 2022, 0:22) the duo contemplate on how the 17th century's standardization of measurement contributed to the disenchantment of the natural world. The abstraction of land measurement allowed, they argue, became a colonial tool employed to subjugate through the dichotomy between technology and nature.

Similarly the Italian feminist philosopher Silvia Federici argues that in 14th century Europe the mission to disenchant the world in the name of positivist science, is

⁷disenchantment, definition in The Britannica Dictionary <https://www.britannica.com/topic/disenchantment-sociology> Accessed: December 6th, 2023

materialized in the witch hunt (Federici, 2004, p. 174). By the end of that period the extermination of traditional mystiques and healers and the co-optation of ancestral practices by institutionalized science, according to Federici, enacted an enclosure of knowledge, of our bodies, of our relationship to other people and to nature. Based on Federici's analysis the beginning of capitalism coincides with the demise of communal property relations that happened alongside the witch hunt, which allowed the state to gain total control over women's bodies and by extension, reproductive labor, and to secure the transition to a societal model based on wage employment instead of collective agriculture. At this point Federici defines disenchantment as the emergence of a world in which our capacity to recognize the existence of an infrastructure other than that of profit-based growth becomes dubious (Federici, 2018, p. 188). For Federici, the *re-enchantment* of the world lies in the discovery of reasons and logics other than those of capitalist development, and thus it becomes a precondition for the end of the exploitation of human and more than human life on earth.

So it appears that the beginning of modernity marked a shift from a worldview of a living world where human and more-than-human agencies are understood as a continuum to the worldview of a world divided between two categories. On one side we have intelligent agents, which means humans, and on the other side we have inert matter, which means machines, animals, plants, minerals, dehumanized colonized others. But in a sudden shift in the last decades, both ecological movements and new technological miracles have created a revival of magic that seems to call for the re-enchantment of the world.

This *re-enchantment would* consist in the re-emergence of the sense of magic, mystery, wonder and awe for nature, and the recovery of the emotional connections between human and all living systems. It would also mean a state of increased awareness of our interconnectedness with all living (and non-living) systems, where a greater knowledge of the conditions that determine our lives is available and interesting to us (Greyson, 2019, p. 55), or the recovery of a sense of openness towards the captivating quality of our active relations with material objects. (Bennett, 2001, p. 137)

I find the call for *re-enchantment* a very inspiring approach to the ecological problem and for this reason I have tried to incorporate this line of action in my artistic practice, as a way to nourish futures of earthly solidarity and environmental repair. In order to create artworks that evoke a re-magic-action of the world I have tried to identify some artistic strategies which enact it. Before delving into the specifics of my artworks employing these strategies, I'll provide a brief overview of what they consist of.

2.2 Methods

The artistic strategies I am about to introduce here are speculative⁸, which means that they are based on guesses or ideas about what might happen or be true rather than on facts. Their function is to contemplate alternative ways of how our world and cosmologies could be re-enchanted towards a model of environmental and social healing, and ultimately to serve as a catalyst for positive social changes. These are speculative strategies for re-enchantment that I have adopted in my artworks that seek to creatively reconfigure the world as we know it.

As I showed earlier, a lived sense of separation from nature is foundational to disenchantment. Artistic practices that aim to reconnect the artist and the audience with nature are speculative strategies for re-enchantment.

Animism revival

Disenchantment came about with the eradication of animistic beliefs and the indigenous cultures that were nurturing. The revival of animism where the artist and audience recognise the vitality present in all beings is of the interest of any re-enchanting practice. However the integration of animism in an artistic practice must be accompanied by the challenging of colonial narratives. Recognizing the agency and rights of indigenous communities that are actively working towards the preservation and restoration of our planet is crucial and must be part of any artistic practice that aims at the re-enchantment of the world.

Embracing magical practices

Disenchantment often eradicates practices of magic, prayer, divination, and ritual. In the pursuit of re-enchantment, an effective strategy is to reclaim and incorporate these practices. The use of elements of magic, prayer, and ritual in my artistic practice is a means to reintroduce enchantment.

Centering nature

Disenchantment is rooted in anthropocentrism. Recentering nature through my artistic practice is a means for re-enchantment. This entails that with my artworks I recognise the agency of nature and matter, I pay attention to my intra-actions with the material world and I amplify them to foster a harmonious relationship with the more-than-human.

⁸ speculative, definition in The Britannica Dictionary <https://www.britannica.com/dictionary/speculative> Accessed: December 6th, 2023

The mechanics of disenchantment abstract nature to a representation. Re-enchantment, in turn, involves reconnecting things with their materiality, transcending the artificial boundaries that separate us from the tangible aspects of reality.

Amplifying material agency

Disenchantment renders the material world devoid of agency. A re-enchantment strategy involves looking at the material world as a living entity full of intention, acknowledging its active role in shaping our collective experience.

Recognizing more-than-human intelligence

If disenchantment limits intelligence to the human realm, recognizing the intelligence present in the natural world is a strategy for re-enchantment. This shift can challenge anthropocentric perspectives, acknowledging the cognitive capacities inherent in non-human entities.

Acknowledging kinship between human and more-than-human

Similarly making visible the in-human aspects within humanity and emphasizing that what we perceive as exclusively human traits are not confined to people alone is re-enchanting our worldview and consequently the world.

Rematriating technology in nature

Technology and nature have been dissected in our modern minds, but identifying this as a disenchanting mechanism allows us to see how machines, people and nature actually exist in a continuum. Revealing and reconstructing the connections between them is a re-enchanting strategy.

Strategic anthropomorphism

Detecting human speech in non-human sounds as I do in my artwork of which I will talk later is a form of anthropomorphism as the one where we see human faces in inanimate matter. Many scholars warn us that such anthropomorphism is anthropocentric when it ends up with telling stories that are more about humans than the more than human characters they were supposed to be depicting (Rowley & Johnson, 2016). However, I prefer to see my use of anthropomorphism in my installations as strategic, as defined by Jane Bennett. Bennett suggests that anthropomorphism can be a valuable tool for expanding our understanding of agency to encompass nonhuman entities. She emphasizes that by implementing anthropomorphic strategies we can recognize that agency is not exclusive to humans and that it has parallels in the natural world. Such

strategic use of anthropomorphism not only does not encourage but it actually challenges anthropocentric views.⁹

Speculative interface design

In the chapter that follows, I will talk about my artworks which employ these re-enchanting strategies to amplify futures where nature takes center stage in societal narratives and structures, challenging the artificial separations imposed by disenchantment and fostering a kinship between human and more-than-human agents. The three artworks I am about to introduce are interfaces, since they act as points of interaction between a user and a tool (Maughan, 2023). They are speculative because they mimic technologies that do not yet or cannot exist (Rettberg, 2021, p.2), such as a seashell that is a portal to the future, or a device that translates stone-speech to human language. They are technologies of geomantic listening, because they direct our attention to the sound of geological elements which are carriers of more-than-human realms of knowledge. The first artwork, with the title Sonic Utopias will be presented after an introduction about more-than-human divinatory systems and mythic models of seashell sound in particular. The last two installations Stones are Angels, Egolith Xenolith, and the performance Invoking Angels which are a triptych, will be preceded by an introduction on the ways digital technology is entangled with geological and geopolitical phenomena because this is what my research in digital materiality

⁹ Vibrant Matter: A Political Ecology of Things (2010)

In a society that conditions the public to find discomfort or outright fear in the errors and malfunctions of our socio-cultural mechanics—illicitly and implicitly encouraging an ethos of 'Don't rock the boat!'—a 'glitch' becomes an apt metonymy. Glitch Feminism, however, embraces the causality of 'error' and turns the gloomy implication of glitch on its ear by acknowledging that an error in a social system that has already been disturbed by economic, racial, social, sexual, and cultural stratification and the imperialist wrecking-ball of globalization—processes that continue to enact violence on all bodies—may not, in fact, be an error at all, but rather a much-needed erratum. This glitch is a correction to the 'machine' and, in turn, a positive departure.

(Russell, 2013)

3 Speculative listening interfaces

3. 1 Sonic Utopias



Figure 5: *Sonic Utopias* at *Interface Cult* at Ars Electronica 2021, Part of *Kunstuni Campus Loops of Wisdom*, photo credit by Indira Di Benedetto

In 2021, during my first year in *Interface Cultures*, I was invited to make a podcast for *Onassis Foundation's Stegi Radio* in my hometown Athens, Greece to develop a podcast. This invitation developed into an opportunity for me to start my research in re-enchanting narratives and futuring practices under the title *Sonic Utopias*. 'Utopias', because I wanted to create through sound narratives that depict worlds where we have succeeded in addressing ecosocial problems, as opposed to dystopias, that are narratives of unhappy futures.

The Canadian futurist Norman Henchey introduces four distinct perspectives for contemplating the future: the potential future, the feasible future, the likely future, and the desirable future (Hancock & Bezold, 1994, p. 2-3). I focused particularly on preferable futures, so I selected and curated collaborations that would envision futures free of discrimination based on gender, speciesism, race, class or ability. I chose to collaborate with individuals whose futuring and artistic practice were informed by posthuman, decolonial, intersectional feminist theories and invited them to speculative future fictions together. Each episode was an opportunity to form a new team of people and exchange insights and approaches to futuring.

Sonic Utopias developed into a transdisciplinary, collaborative futuring practice that allowed me and my colleagues to listen, to engage our attention, collectively towards futures of ecosocial healing through speculative reconfigurations of human and nonhuman cooperation. Within the framework of sonic divination, our futuring narratives took the form of audio world-building and resulted in audio fictions that were enacting instructions for and prophecies from alternative futures.

At the end of my first semester in *Interface Cultures*, I decided to turn *Sonic Utopias* into an artwork that I would expose in the *Ars Electronica Campus* exhibition. For the installation format of the podcast, I created a setting in which the audience could listen to the futures summoned during our futuring sessions, arranged in the form of audio fictions, from the mouth of a seashell. Thus the seashells would be the nonhuman media that would retransmit the collaborative speculative fictions co-developed within my Stegi Radio residency as a message from the future we co-created with my collaborators. The seashell in this case was the divinatory device allowing the listener to grasp a glimpse of a better future and to intuit ways of bringing it forth. There are two themes that I would like to touch upon that are relevant to my choices in the *Sonic Utopias* installation: the former is the concept of *clairaudience* and the latter is the idea of a more than human subject as an oracle.

3.1.1 Clairaudience

Sound has the privilege of permeating both material and immaterial bodies, and in various cosmologies it is used to make the bridge with the world of the spirits and that of matter. These divinatory practices based on hearing are referred to as *clairaudience*.¹⁰

With this in mind, I have intended for the seashells integrated in my installation of *Sonic Utopias* to have the function of divinatory devices that foretell futures of preferable futures and allow the user to have a glimpse of them.

Divination as knowledge

Divining is a method of accessing and decoding previously unknown models of knowledge (Tedlock, 2001). The diviners are those who can tune into unknown realms to construct usable knowledge from their cryptic messages. More-than human models of knowledge are alien to our anthropocentric cognition. Material agencies we share the planet with have their ways of communicating and shaping reality that are cryptic to us. We often dismiss them as noise, but what would happen if we would listen to them as if they actually were saying something?

In the installation of *Sonic Utopias*, I wanted the listener to become the diviner through listening to the messages encrypted in the seashells. It was a gesture that felt like a direct metaphor to me for the necessity of listening to nature and listening *with* nature in order to create better futures for our planet.

More-than-human oracles

Another concept that was inspiring for me at the stage of envisioning the artwork was more-than-human divinatory systems, in particular conchomancy, which is a form of geomancy¹¹ by casting seashells. In West Africa and in diasporic Afro-American religions, but also in India, and in East Africa various divinatory practices involve the use of seashells, especially cowrie, to learn how to navigate the future. The choice of the seashell as the divinatory object for the *Sonic Utopias* installation was based on my research in more than human divination systems, as well as on the special sounding properties of the anatomy of seashells that makes them an archetypical listening object.

¹⁰ *Clairaudience* in the work of composer and environmentalist Murray Schafer (Schafer, 1992, p. 4) is clear hearing. In his use the term holds no metaphysical extensions. It merely refers to the exceptional listening capacity of environmental sounds.

¹¹ geomancy definition definition in The Britannica Dictionary <https://www.britannica.com/topic/geomancy-method-of-divination> Accessed: December 6th, 2023

3.1.2 Seashell sound

Many of us can recall the familiar act of lifting a seashell to our ear, captivated by the ocean-like sound it produces. Scientifically, this auditory phenomenon is attributed to the shape of the seashell, which has the affordance of trapping air within its structure. The air, constrained yet in constant motion due to molecular fluctuations, generates resonant frequencies that create a perceived sound of white noise, that we often think of as the sound of the ocean.

In his essay *Seashell Sound* (Helmreich, 2016) Stefan Helmreich examines within the framework of anthropology how seashell sound has been interpreted through time in what he calls *folk acoustics*. In his retrospective in poetic literature he finds the seashell to be a *whisperer of secrets*, a *mouth*, an *ear*, or *the primordial murmurings of the universe*. Helmreich finds that different interpretations of what the seashell sound means are assigned under different mythic models in the literature he examines. One model considers seashells channels for voices from a communal past, while another thinks of seashells as resonant chambers of individual experience. But in William Wordsworth's cited poem *The Prelude or, Growth of a Poet's Mind*, a third model emerges, as the narrator brings the seashell to his ear and listens to "A loud *prophetic* blast of harmony". This is the mythic model I was interested in: a mythic model of the seashell as a channel for voices from a communal future.

3.1.3 Installation

For the *Sonic Utopias* installation five seashells were placed on a tray of sand, holding in their bowels another future narrative that can be listened to by bringing the shell close to our ear.

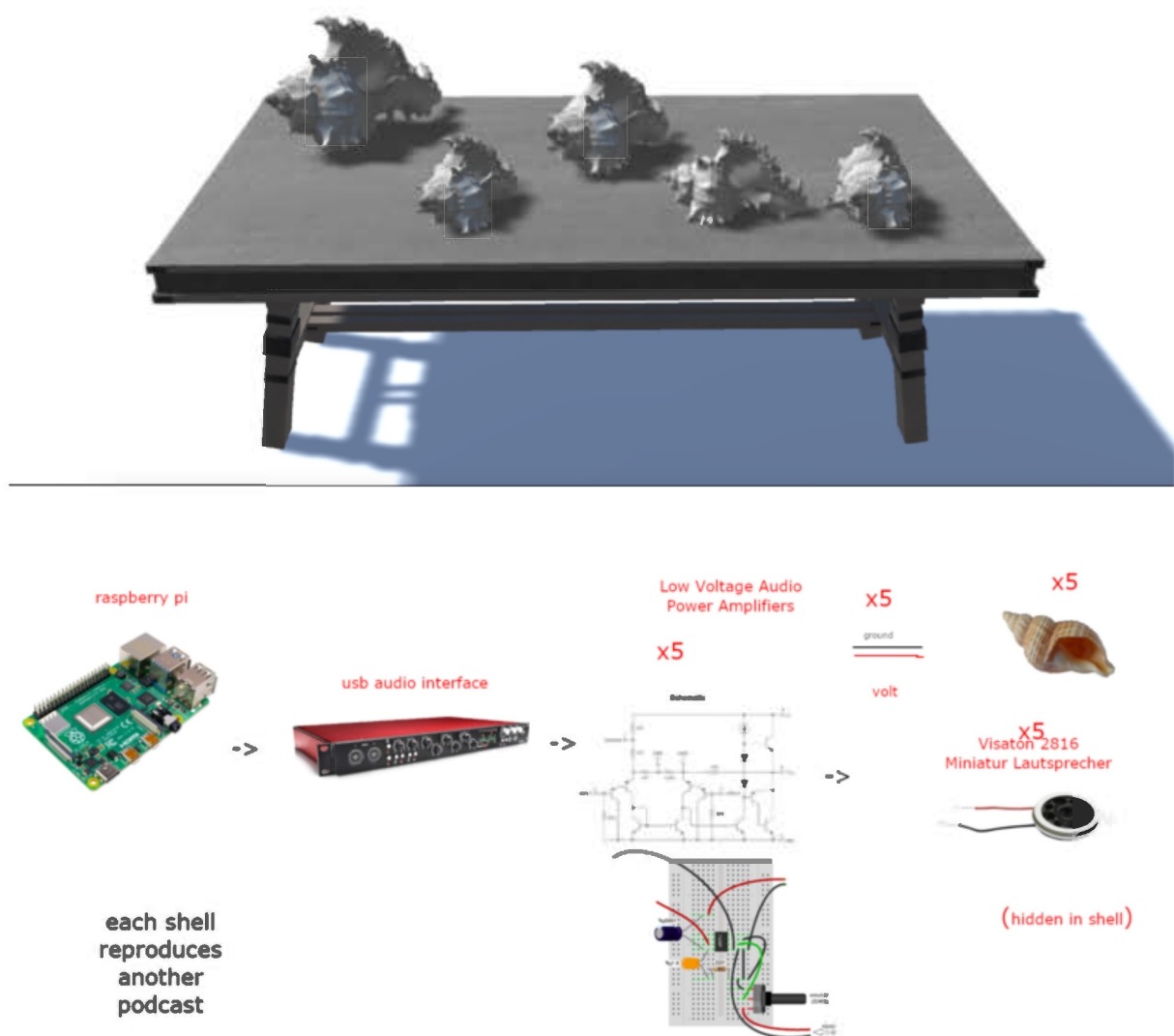


Figure 6: *Sonic Utopias* first sketch

I collected the 5 seashells I needed for the *Sonic Utopias* installation on my trip to Greece in the summer of 2021, two months before the *Ars Electronica* Campus exhibition 2021 *Loops Of Wisdom*. One belonged to my friends and I had put it in my ear to listen to the sea so many times in the past. Another was a present to my parents from

our old fisherman neighbor, he had found it in the bottom of the sea. Another was a seashell I found in Berlin in the garden of my house years before I moved to Linz. And another two I searched and found in the Monastiraki flea market of Athens that summer.

Once I got all the shells and brought them to Linz, I soldered the tiniest speakers I found at Conrad and glued them to the interior of each shell-speaker. I also bought some wooden boards and cut them in a certain way to build the sand tray. I then made holes on the bottom part of the sandtray under each seashell and passed through them the cables that were coming out of each seashell-speaker. The cable was long enough to allow a tall person to bring the seashell to their ear and listen without having to crouch. I soldered the other side for each seashell onto an amplifier and glued the five amplifiers under the bottom of my sandtray. The audio cable that was coming out of my amplifiers was going into a jack input of a multichannel audio interface.

A raspberry Pi was connected to that same interface and was playing the five Sonic Utopias in a loop, one on each channel.

The sandtray was standing on trestle legs. I set it all up at the center of the exhibition space so that people can move around it freely and so that it's possible for up to five people to listen at the same time.

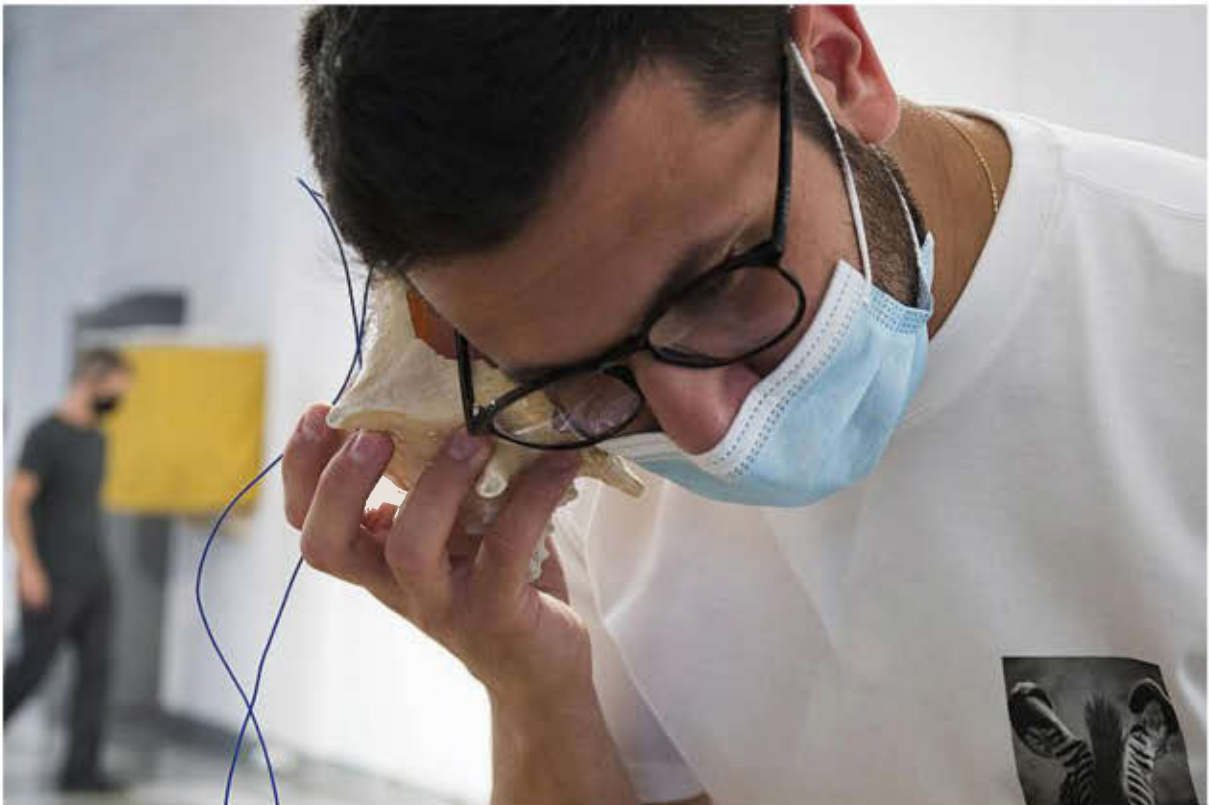
I glued a basket under the sandtray to hide all the cables. I wanted it to look a bit provisory like many DIY, improvised or poorly made constructions found in Greek beaches. Realism was also the purpose of the colorful cables sticking out of the sand. I wanted them to be reminiscent of the various disposed electronic objects that are slowly rusting in the Greek coastline, devastated by poor public policies and overtourism.



Figure 7: *Sonic Utopias* at *Interface Cult* at Ars Electronica 2021, Part of *Kunstuni Campus Loops of Wisdom*, photo credit by Indira Di Benedetto



Figure 8, 9: *Sonic Utopias* at *Interface Cult* at Ars Electronica 2021, Part of Kunstuni Campus *Loops of Wisdom*, photo credit by Indiará Di Benedetto



Figures 10, 11: Sonic Utopias at Interface Cult at Ars Electronica 2021, Part of Kunstuni Campus Loops of Wisdom, photo credit by Indira Di Benedetto

3.1.4 Afterthoughts

I was happy with the way people received the artwork and with the way they interacted with the installation. I saw kids and old people have fun picking up each seashell and listening and passing shells to one another laughing. That was the playful experience and attitude I wanted to create. What I would like to improve in the next iterations of the Sonic Utopias installation would be to make the stories visible with a graphic representation or a book to make sure that people can follow.

Another way to go would be to put some puffs where people could lie down and actually listen. But the truth is that that was supposed to be a glimpse of the narratives and if anyone would be interested they could listen online. The audience cannot spend too much time with any artwork in an exhibition. The format is more that of the flaneur/passersby from artwork to artwork. Picking up the seashell and holding it against one's ear is anyway not that comfortable so no one would do it for as long as really needed to absorb an 1-hour long audioplay.

In the end the idea is that the stories are always there whether we listen to them or not. We can pick them up from a different moment in time and continue. Stories are told and retold and only sometimes we tune in and connect with them. Those are my favorite times and I think I shared them successfully with the people that visited the exhibition. Using the practices of divination and animism through assigning speculatively the role of the oracle to the seashell, I think that I have managed to point towards the direction of the reenchantment of the world with this installation. I hope my installation of the collaborative *Sonic Utopias* podcast points towards a way to use technologically mediated animism to nurture preferable futures.

This installation encouraged me to work with geological elements such as seashells, and sand as story-tellers of preferable futures and allies in our learning to nourish them. However the stories the seashells in Sonic Utopías were telling were human made stories. This wouldn't satisfy my interest in sound as a means to hear and amplify more-than-human stories. I started thinking in other configurations of interactive sound installations which had more-than-human elements at their center, while also using more-than-human sound to tell more-than-human stories. I explored this in my installations that followed *Sonic Utopias*, namely *Stones are Angels* and *Egolith Xenolith*, of which I will talk in continuation. Before I delve into the artworks however, allow me to share with you how I chose the main character for them, which turned out to be the stone.

3. 1.5 Relevant works

In *Sonic Utopias*, a persisting feature of the artwork is interactive storytelling, and I would like to delve here into some works that explore this approach by Janet Cardiff & George Bures Miller. The Canadian duo's artworks are inspiring for me because of their use of audio elements and spatial design to foster narrative engagement and participant interaction.

In their work *The Cabinet of Curiosities* (Cardiff & Miller, 2010), an antique wooden card catalog with multiple drawers, invites participants to engage actively with its contents. As each drawer is opened, a unique audio experience is triggered, creating an immersive and personalized narrative for the viewer. The juxtaposition of visual and auditory elements transforms the cabinet into a vessel of stories, blurring the lines between fiction and reality. This work exemplifies the potential of interactive storytelling to evoke a dynamic and participatory relationship between the artwork and its audience. It allows the audience to transform into composers, physically arranging the sonic material and choosing to navigate from drawer to drawer.

I have wanted to create a similar experience in my multichannel installations *Sonic Utopías* and *Stones are Angels*, where the audience is given the choice to employ a gesture to modify the soundscape and influence the experience and atmosphere of the exhibition space.



Figure 11. The Cabinet of Curiosities, Janet Cardiff & George Bures Miller
from <https://cardiffmiller.com/installations/the-cabinet-of-curiousness/>
Accessed December 18th, 2023

3.2 Stones are Angels

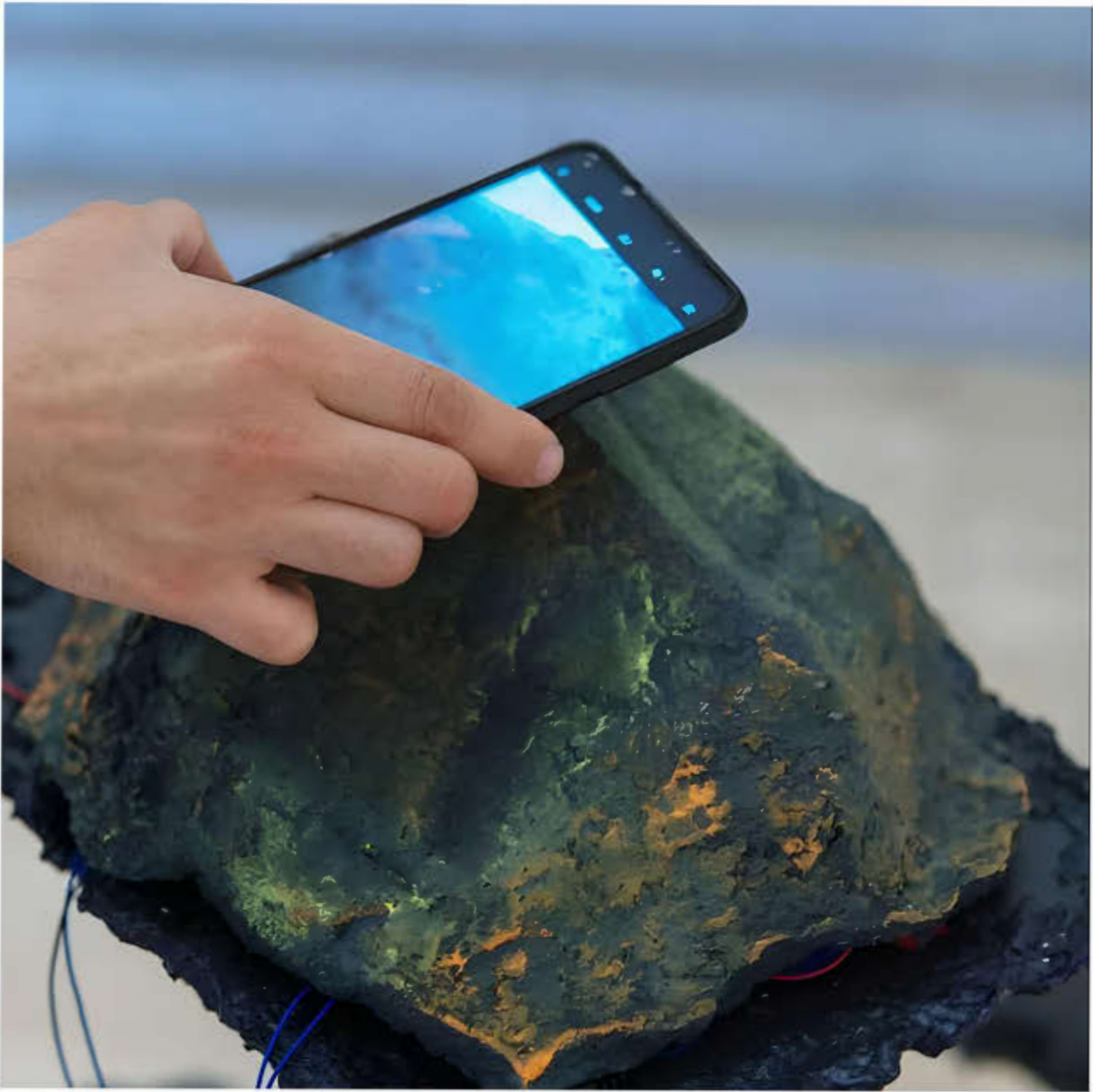


Figure 12: *Stones are Angels* at the *Poetics of Obsolescence*, Atelier Salzamt 2022, photo credit Błażej Kotowski



Figure 13: *Stones are Angels* at the *Poetics of Obsolescence*, Atelier Salzamt 2022, photo credit Błażej Kotowski

In my second year in *Interface Cultures*, the vibrant environment of new media art I encountered in Linz, led me to tackle the topic of technologies through my artworks. With listening as my research method, and amplifying nature as my core practice, I started to investigate the sounds of digital technology, on the way we listen to them and on how these sounds and the bodies that emit them relate to nature.

The lens of *digital materiality* proved a good guiding thread in this endeavor. To begin with, I started to examine the materiality of the technology I use to produce, record and reproduce sound, so my computer, my phone, microphones and speakers. I wanted to know how digital technology works, but also what it is. What is it that I hold in my hand when I hold my phone, what is that makes the membrane of my speaker shake, which materials, which more-than-human agencies do I interact with everytime I type “space”, and what are their voices, how do they sound and what stories are they to tell? Trying to answer these questions taught me a lot about the mineral origins of technology and the ecological and geopolitical phenomena the production and disposal of electronic devices is entangled with.

In our times the prevalence of wireless communication technologies and translocal infrastructures create an illusion of immateriality that often triggers visions of emancipation from matter. However, this perspective can only be maintained through the disregard of the tangible, earthly origins of the materials upon which new technologies are built. This perceptual detachment of digital media is examined in Jussi Parikka's *Geology of Media* (Parikka, 2015) where the Finnish professor and media theorist examines the connection between digital media, geophysical nature, and the geopolitical mapping crucial for technological sovereignty. This distinction hinders our ability to address ecological problems effectively, because it alienates the environmental crisis from the (geo)political processes that permeate it (Latour, 2004, p. 18-19).

As artists in the new media art field, if we want our artwork to be ecologically engaged as I do, we need to understand how technology shapes the ecological problems of our world. Once we recenter the material nature of digital culture, this becomes possible. This re-engagement with matter is a strategy of re-enchantment Jane Bennet talks about when she underscores the necessity of re-engaging with matter (Bennett, 2001, p.3)

My artworks *Stones are Angels* and *Egolith, Xenolith* deal with these issues using speculative animism to restore in our perception the material dependency of the technologies that we daily use.

In the next pages I will talk about the materiality of digital culture citing researchers and following threads of thought that were important for the conceptualisation of my artworks *Stones are Angels*, *Egolith Xenolith* and *Stones are Angels*. I will then proceed into talking about my installations in the last part of this chapter.

3.2.1 Materialism vitalism

New materialist perspectives expand the definition of matter to the point that it encompasses things that are not traditionally considered material. When intangible forces like electricity, magnetism, light, sound are redefined as material, we can talk of a digital materialism (Reichert&Richterich, 2017, p.6). This digital materialism, which reconfigures our way of relating with, reflecting on and ultimately using new media points towards a media theory which finally includes the nonhuman in the conversation about technology. By doing so a new media ethics emerges, which takes into account the material foundation of today's media, and acknowledges in them a certain *activity of matter*, consisting in the nonhuman forces expressing themselves as part of this media (Parikka, 2012, p. 21).

Going one step further, materialist vitalist philosopher Jane Bennett uses the concept of *vital force* (Bennett, 2001), to propose a materialism where the vital energy inside of things, often perceived as vibration, abolishes the previous conception of matter as inert and renders unnecessary the division between life and matter. This allows us to see nonhuman players as active intentionalities that shape the world and that abolish the exceptionality of the human will. This material agency is what Bennett calls *thing-power*, a force that is often more perceptible in its negativity, as a form of internal resistance (Bennett, 2004, p.361).

Recognising the creative potential of Bennett's approach, the media theorist and sound practitioner Brandon LaBelle applies the concept of the vibrancy of matter in the field of sound. "In enabling an animate flow to pass between bodies and things, sound is fundamentally a vibrant matter" he writes (LaBelle, 2018, p. 61). LaBelle, who constantly expands upon sound as a tool for political imagination, thus poses questions on the potential of the material vitality of sound to subvert dominant narratives by making unheard stories audible:

As forceful movements - of rhythmic and resonant intensities, of vibrational and volumetric interruptions - sound works to unsettle and exceed arenas of visibility by relating us to the unseen, the non-represented or the not-yet-apparent (LaBelle, 2018, p.2).

Inspired by these approaches and the strategies they emanate, in my works *Stones are Angels*, *Egolith Xenolith* and *Invoking Angels*, I created speculative interactive interfaces where the amplification of the electromagnetic noise of the users' desktop devices would allow them to listen to noise as a form of protest from behalf of the nature in our computing devices. In this case they would be protesting against the extractivist practices of the tech industry deployed to produce new technologies, and the social and ecological deterioration they cause in the habitats they are mostly active

in. In this way, I aimed to invite people to listen to noise as an invitation to reflection and rebellion, a sonification of electromagnetism that results in glitch, which in the definition of *glitch feminism*, is a sound that expresses a vitality that was never designed by humans. Yet this sound and its vitality is made perceptible, present and loud as it oscillates in the circuits of our personal computing devices, while also permeating our bodies, and the walls of our buildings, carrying messages across space, and even time.

In this gesture of amplifying the nonhuman vitality of the mineral and metal assemblages that our devices are, I wanted to formulate a plea for solidarity with the humans and more-than humans that are being affected by the violence imposed by the extractivist practices of the tech industry, fostering empathy and reconnection with our shared existence with our fellow earthlings.

3.2.2 Computing minerals

Mineral and metal components within a cell phone play indispensable roles in the intricate electronic circuitry and antenna systems. Copper is crucial for electrical devices, providing wiring and conductive connections. Silicon is vital for integrated circuits, the foundation of computational memory. Neodymium, a rare earth metal, is essential for loudspeaker magnets. Lithium powers renewable technology batteries. Tantalum is necessary for capacitors in electronic circuits. Tungsten is used in smartphone speakers and microphones. Tin, titanium, and platinum are indispensable for data center equipment in cloud computing infrastructure. The global supply chain supporting these materials involves numerous transactions from extraction to product delivery, raising questions about the unseen processes behind our personal devices.

These components are fundamental for the generation, transmission, and reception of electromagnetic signals, that encompass cellular communication, Wi-Fi, Bluetooth messages, and internal communications among a cellphone's microprocessors, memory, and sensors. The dynamic interaction of these materials collectively contributes to the electromagnetic field (EMF) emitted during the phone's regular operation. By sonifying the EMF of a cell phone, one can discern and follow these internal interactions. While electromagnetic fields are inherently inaudible to the human ear due to their oscillation frequencies beyond our hearing range, electromagnetic field pickup microphones, also known as inductive pickups, have the capability to convert these fields into audible sound.

When an electromagnetic microphone is in proximity to an electromagnetic field, it detects the field due to the material properties of its coil, typically crafted from a conductive metal like copper. The electromagnetic field induces a current in the microphone's pickup coil, as copper is an effective conductor. As the microphone's coil responds to the magnetic field fluctuations it aims to capture, it generates an electric

signal reflecting the variations in the electromagnetic field. This electric signal undergoes amplification and is then transmitted to a speaker, where it prompts the diaphragm to vibrate, producing audible sound waves mirroring the original input. The fluctuations in the electromagnetic field translate into the pitch of the sound wave, with the frequency of the current changes aligning with the frequency of tone changes in music. This process results in sounds like humming, buzzing, or chattering, occurring at the frequencies of the local power grid, such as 50 Hz in Europe and most parts of the world, and 60 cycles per second in the US. It's essential to recognize that this is not a natural sound but a sonification of the electromagnetic field's fluctuation patterns. Nevertheless, sonifying electromagnetic fields provides a meaningful way to convert these fluctuations into a perceivable form for humans.

Unlike analog current-based electrical devices, cell phones and computers operate on direct current (DC) for their internal power, supplied by the battery. Although the current in direct current circuits doesn't exhibit as vivid fluctuations as analog circuits, the electromagnetic fields of digital devices are still generated due to electronic activity and interactions within the device's circuitry and materials. Despite being less easily detectable with electromagnetic microphones, personal computing devices produce oscillating circuits that can be captured audibly. When we listen to the electromagnetic field of our personal computing devices, we perceive the audible electromagnetic fields generated by interactions between components like the CPU, memory, and antennas. Powering up cell phones near an induction pickup coil microphone, especially when activating various components through running applications, amplifies the electromagnetic field and the resulting sound waves. Unlike the limitations posed by AC power grid frequencies (50 or 60 Hz), the microphone captures a broad range of frequencies, including those within the audible range (20 Hz to 20,000 Hz) and beyond, reproducing sound corresponding to the variations in the encountered electromagnetic field.

3.2.3 Installation

Stones Are Angels is an interactive multi-channel sound installation crafted to heighten awareness about the mineral substratum of our ethereal technologies by enhancing our engagement with personal computing devices on-site. The artwork speculates on the potential expression of the earthly agencies inherent in the minerals and metals constituting our personal computing devices, made audible through the amplification of their electromagnetic field noise using pickup coil microphones. Through the amplification of hardware sounds from the audience's smartphones, the installation seeks to illustrate how sound and listening technologies serve as a means to connect with nonhuman intelligences, unveiling their agencies and narratives.

During the period of ideation, I planned the installation to be a spatial, multichannel sound setup. Initially, I thought of scattering several speaker-stones around a central microphone-stone to create a spatial experience and enhance immersion. The acoustics would naturally dictate the positioning of the speaker-stones around the central mic-stone. To align with the user's starting point at the mic-stone, I centered it and surrounded it with the speaker-stones. As discussed earlier, electromagnetic field sonification is a practical way to reveal the internal interactions within the components and materials of our smart devices. It offers a direct, non-representational link to the material assemblages through their conductive interactions. Consequently, I opted for electromagnetic microphones to amplify the inherent vitality of the audience's phones, presenting the sound in its raw form, much like a material before being processed for human needs. The goal was to encourage the audience to perceive this noise as a message from the nonhuman agencies within their personal devices. To bring this vision to life, I used an electromagnetic sensor called *Elektrouši* in my field recording sessions, modifying the original design sourced from LOM's github to accommodate four sensors (microphones) and four speakers.

I initially enrolled in a ceramics course with the intention of crafting stone sculptures to conceal the speakers and microphone. However, my direction shifted when I crossed paths with Sheyda Ramhormozi, a fellow student from the Sculpture Department, and we opted for collaboration. After compiling visual references, including images of critical minerals and conflict minerals¹² like tungsten, nickel, cobalt, manganese, lithium, and pictures of Hormuz Island landscapes, Sheyda skillfully crafted realistic papier-mâché sculptures inspired by these elements. Following their completion, I

¹² Conflict minerals are minerals that are mined in conditions associated with human rights abuses and armed conflict. The term is commonly associated with certain minerals originating from specific regions, such as the Democratic Republic of Congo (DRC) and its neighboring countries. Critical minerals are on the other hand minerals that are deemed essential for various industrial and technological applications, and their availability is considered crucial for the economic and strategic interests of a country. source: OpenAI. (2023). ChatGPT [Large language model]. <https://chat.openai.com>

integrated the microphone circuit and installed custom-made speakers inside. For the installation's presentation, Sheyda designed pedestals to elevate the sculptures, placing them at the audience's eye and ear level.

The audience would walk around the stone sculptures and trigger different noise-scapes by exploring the surface of the receiver-stone with their cell phone.

3.2.4 Afterthoughts

There are a few things I'd like to improve about this exhibition. It was difficult for some people to find the spots where the sensors were hidden and where the electromagnetic field could be heard. At the spots where the textures on the surface of the stone-sculpture were more interesting and thus people would be intuitively attracted to put their phones against, the very technique of making those textures implied that there are more layers of paper between the sensor and phone. That forced us to place the sensors in places that were a bit more counter-intuitive for people to find. Normally it would make sense to put the sensors where the paper was really thin so that it won't isolate and filter the electromagnetic signal. However, those positions where we finally had to hide the sensors because of their high sensitivity, were the least intuitive for the audience to approach with the phone. As a solution, next time I would try to build the sculptures after finishing the sensor circuits and installing them permanently into the sculptures.

Another problem that appeared is that not every phone's electromagnetic field makes as much noise. I had tested this installation with my smartphone and apparently iPhones are more shielded and make less loud sounds when scanned with a pick-up coil. In general phones' electromagnetic field is activated when there is some activity going on in their systems: when there is a call, or when a person is interacting with the touch screen. The rest of the time there is some interference that can be picked by the sensors but not that many and not as high. Also different spots on a phone depending on the activity that's going on at the moment are more or less active. This makes it interesting but it also made it difficult for some people to activate the installation as they had to be searching both for the spot on their phone that has an active electromagnetic field, and for the spot on the stone-sculpture that can pick that field up.

It might indeed be a better choice in the future if I create a solid base like a holder that would allow for the audience to leave a phone on the receiver/mic-stone and walk around to explore the space and experience the electromagnetic soundscape that emerges. I was satisfied with the way the installation worked in terms of audio spatiality, as the people could walk in between the stones and listen to the sound activate in different locations as a phone would be moved around the sensor-stone. All in all I think I managed with this installation to point out the mineral origin of our technologies and

to make people think about the *secret voices* and *inner worlds* of their personal electronic devices, as well as their intimate relation with the stones found in nature that contain minerals and metals. I also think that the installation succeeded in speculating on sound and noise as a manifestation of the material agency of machines.



Figure 14: *Stones are Angels* at the *Poetics of Obsolescence*, Atelier Salzamt 2022, photo credit Błażej Kotowski

3.2.5 Relevant works

A prevalent theme in *Stones are Angels* is the use of stones as interfaces for communication. I will highlight another artwork that shares my interest in speculatively pointing towards mineral agency and the entanglement between nature and technology.

*Memorylith*¹³, a collaborative creation by Athens-based industrial design studio Neda and Dutch designer and filmmaker Joshua Olsthoorn, for the latter's movie *Studio Stone Age*. The sculpture commissioned by Neda represents a *memory-stone* characterized as a 'fictional yet living entity within a complex geological stratum of technofossils—a meta-technosphere organism.' Composed of fragments of data, information, and symbols, this amalgamation autonomously perceives its own existence. The artwork, according to the artists, reflects on the profound impact of contemporary technology on the concepts of progress and sustainability in the Anthropocene era (Danai Niki Chania, 2021).

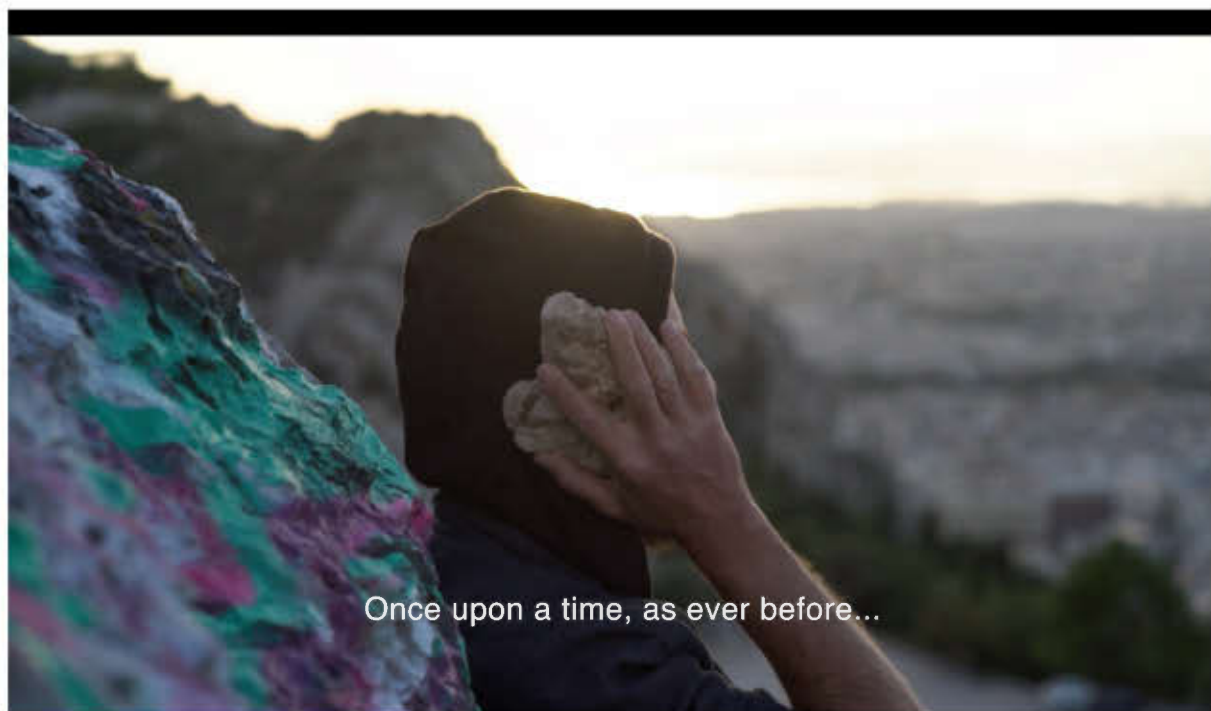


Figure 3. Still from *memorylith* in *Studio Stone Age* by Joshua Olsthoorn, 2022

¹³ *Memorylith* was exhibited as a mixed media spatialised film in Esto Association in co-production with Typical Organization and the Epigraphic Museum of Athens. <https://www.currentathens.gr/events/event/3927-stone-age-studio> Accessed on December 18th, 2023

The selection of the topic and the speculative methodology employed in developing this work resonate with my approach in *Stones are Angels* and *Egolith Xenolith*. In *Studio Stone Age* the *Memorylith* serves as a communication device, seemingly granting the user the ability to traverse through memory and time. The act of placing the stone near the user's ear activates a theme reminiscent of my work in 'Sonic Utopías,' where I encourage users to listen to the nonhuman. However, in my works, the artistic output functions as an interface, offering a different user experience centered on interactivity and attentive listening, in contrast to the reflective mode associated with watching a film and contemplating a passive object.

3.3 Egolith Xenolith





Figure 15-16: *Egolith Xenolith* at *CYENS: WIP Arts and Technology Festival, 2022*, photos credit Błażej Kotowski

Another output of my research on the entanglement of digital technologies and mineral agencies was *Egolith Xenolith*, an interactive installation produced for *CYENS WIP Festival 2022*, developed in collaboration with Diana Bogucka and Błażej Kotowski.

Egolith is an invented word that resembles regolith, that is the layer of unconsolidated solid material covering the bedrock of our planet. As a portmanteau of the words "ego"(I) and "lith," (stone), it points at some kind of fusion between our sense of identity and that of a rock. A xenolith on the other hand is a rock fragment that is foreign to the igneous rock in which it is found. *Xenoliths* are often older rocks or minerals that have been incorporated into a molten mass of magma as it rises through the earth's crust and solidifies into an igneous rock. They provide valuable insights for geologists because they can represent samples of the earth's crust or mantle that are otherwise difficult to access. I like this quality of theirs, because it gives us access to profound information that is valuable and conveys important knowledge once made accessible. That's what I'd like to do with my artworks too. *Egolith Xenolith* points at the alien (xeno) in us, the foreign in our body, the *I* in you, our otherness before what we consider our own and our complicity with what we consider *other*, the inseparable entanglement of organic and inorganic matter.



Figure 17: *Egolith Xenolith* at *CYENS: WIP Arts and Technology Festival*, 2022, photo credit Błażej Kotowski

Egolith Xenolith was the title of the geomantic installation I presented in Nicosia in 2022, to speculate on ways of solidarity with the mineral otherness. It was an attempt to create an interface that enables the communication between human and mineral form, and allows for the interpretation of noise as the language of stones. Once again, as in my previous installation *Stones are Angels*, the noise from the visitors' cellphones is picked up using electromagnetic field pickup coils. This time, the electromagnetic frequencies of the sonification of the cellphone's field are picked up by the microphone and translated into the English language. They tell us stories in their stuttering language of stones, stories that they have witnessed: stories of extractivism, dispossession, human suffering and ecosocial devastation that are inherent yet invisible within the production of new technologies.

In *Egolith Xenolith* I created multimodal layers of story-telling in collaboration with Diana and Błażej. Two electromagnetic field passive sensors were hidden inside one of the stone-sculptures Sheyda had made for *Stones are Angels*. The receiver-stone was placed on a table and two speakers were hidden under a heavy black tablecloth covering it. Those speakers were emitting the noise of the visitors' phones as they approached the receiver-stone. On the table there was a screen with Diana's 3D underground mine walkthrough, the stone, and a burning candle. The narrative I had developed around the installation could be read in a printed version I left next to the artwork, a little fanzine styled book.

3.3.1 Installation

In many animistic, indigenous worldviews, beloved individuals transform into stones after passing away (Kahn, 1990).¹⁴ In many animistic indigenous cosmologies, beloved individuals transform into stones after passing away. This belief, connecting ancestral spirits to the stones of their territory, reflects the profound bond indigenous communities share with their land and the perceived continuity between life and matter in these cosmologies. In *Egolith Xenolith* I incorporated this animistic element into a speculative fiction where a young girl, who lives in a world that has turned to a mine, where humans can biologically generate critical minerals during life and upon death, engages in a conversation with her dead grandmother through the interactive stone presented in the installation. The stone featured in the installation serves as a translation device between the language of stones and the English language, facilitating communication between the character embodied by the user and the deceased grandmother. In this speculative world, once people die and turn to stones they are processed and turned into electronic components. Thus, the character's grandmother might be inhabiting the circuits of the visitors' phone, and becomes reachable through the audible electromagnetic field of the device when brought close to the receiving stone of the installation. In this way I wanted the archetypal myth of the deceased's descent into the underworld to become a post-anthropocentric exploration of our kinship with non-living matter, but also to highlight the simultaneity of violence against environmental and human subjects in the context of the extractivist industry that is the basis for technological production.

To turn the electromagnetic noise into language, I created an index with a speculative narrative I had developed based on my research on technology, colonialism and ecocide. Once I gathered the material, Blazej designed an algorithm which was deploying the technique of cut-up to rearrange my database of words into new text formations. A lot of times the result was nonsensical but it's what I expected from a language of stones: to be fragmented and difficult to fathom by humans, even when translated. Still sometimes the words would organize in an order that would make sense.

¹⁴ for example, in *Stone-faced ancestors: The Spatial anchoring of myth in Wamira, Papua New Guinea*) it is stated: "Some stones were said to be sitting circles where important elders sat in the olden days. Some were reminders of mythological events. Some were said to be specific ancestors or ancestresses. And some were even known to walk around." source: *Stone-Faced Ancestors: The Spatial Anchoring of Myth in Wamira, Papua New Guinea* on JSTOR. (n.d.). www.jstor.org. <https://www.jstor.org/stable/3773481> Accessed December 10th, 2023



Figure 18, 19: *Egolith Xenolith* at *CYENS: WIP Arts and Technology Festival*, 2022, photo credit Błażej Kotowski

These artworks were my renewed attempts to explore the potential of deep listening as a means of amplifying more than human sounds, in particular electromagnetic noise, as carriers of critical stories, and of nonhuman agencies that manifests their will to perhaps demand our solidarity with the nonhuman *other* inside us and around us.



Figure 20: *Egolith Xenolith* at *CYENS: WIP Arts and Technology Festival*, 2022, photo credit Błażej Kotowski

3.3.2 Relevant works

In *nimiia cétii* the Berlin based Finnish artist Jenna Sutela works with biological and computational systems to expose a visual language of bacteria. In this work the artist documents the interactions between a neural network, audio recordings of early Martian language, and footage of the movements of extremophilic bacteria to channel messages from entities that usually cannot speak. As a film depicting the morphological development of a bacterial colony unfolds on a screen, the colony's movement observed through computer vision is traced in the form of language and transcribed against the background images. The slowly evolving architecture of the bacteria colony is used to create a sequence of letter characters, which resemble words in a nonhuman language.



Screenshot from Jenna Sutela's video *nimiia cétii*
<https://www.youtube.com/watch?v=3ge5aWvRPxw> Accessed December 18th, 2023

In a similar fashion in *Haemocyanin* (Laitinen, 2019) the movements of an octopus evoke fonts that are transposed onto the moving image. The Finnish artist who tackles the themes of symbiosis and language through his works, used this process to contemplate the notion that the octopus's bodily gestures might function as a form of semantic language.

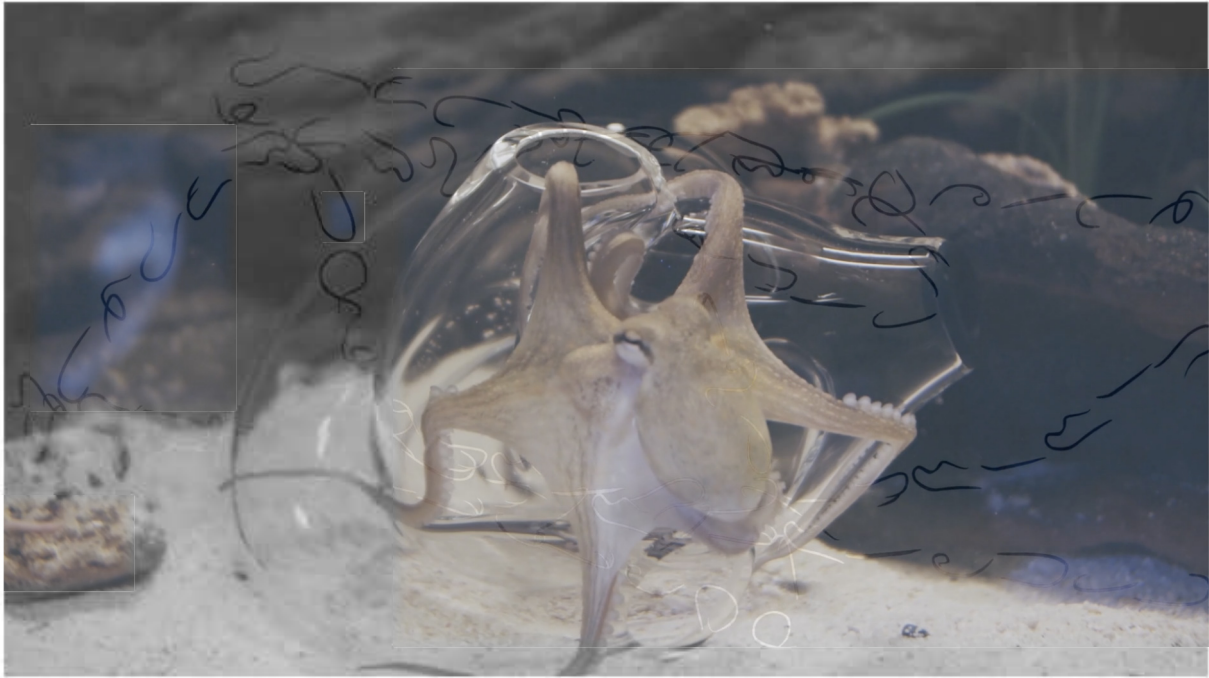


Figure 2. Still from Tuomas A. Laitinen's *Haemocyanin*, 2019 from <http://www.tuomasalaitinen.com/> Accessed December 18th, 2023

In *Egolith Xenolith*, I refrained from conjuring a figurative visual language based on the morphology of nonhuman movement. Instead, I translated electrical movement into sound and used the audio features of this sonic outcome to construct phrases in English by selecting words from a database. Nonetheless, my intention is aligned with the objectives of the artists mentioned above in the pursuit of a means to convey the activity of nonhuman players to a perceptual layer understandable by humans.

3.3.3 Invoking Angels

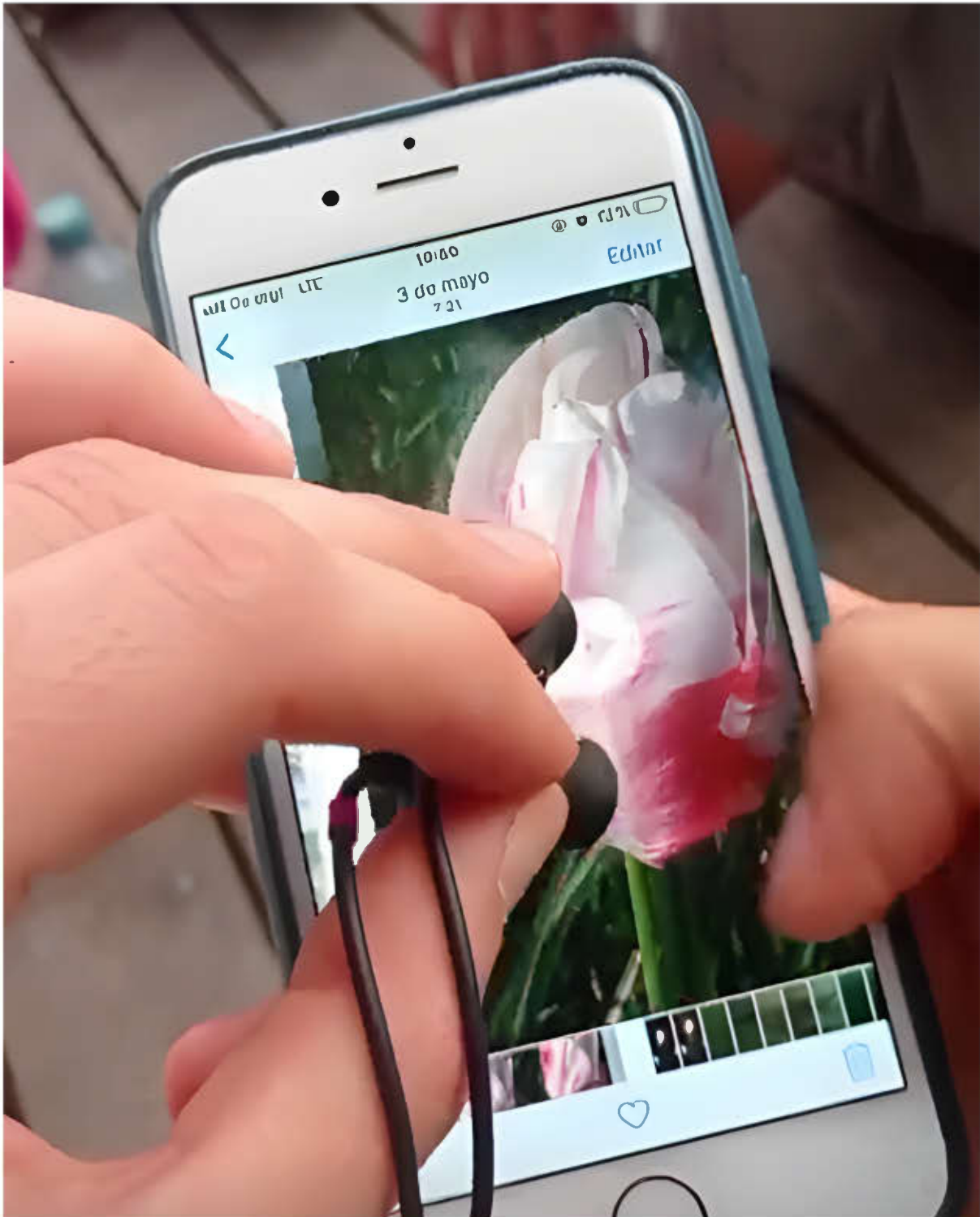


Figure 21: *Invoking Angels at Sonic Territories Festival 2022*

At the opening of the exhibition for *Stones Are Angels* in *Poetics of Obsolescence* at Atelierhaus Salzamt and at the opening of WIP Festival at CYENS, Nicosia where *Egolith Xenolith* was exposed, I presented *Invocation to Angels*, a participatory performance that augments the encounter between our electronic devices in situ, co-arranging real-time their/our interaction in the form of a collective composition. I performed the same piece under the name *Calling on Angels* some months later at the Sonic Territories Festival in Vienna.

During this participatory performance I used LOM's *Elektrouši*, a pair of passive electromagnetic sensors to amplify real-time the phones of the people in the audience. With my sensors attached to a long audio cable I would walk among the people and invite them to give me their phone, then I would scan it with the *Elektrouši*. The input signal was being sent to an audio interface that would feed it into *Ableton Live* that was running on my computer. There, with the use of a gate and various samples arranged in a timeline the live signal from people's phones was triggering sounds selected by me before.

The sounds were meant to tell the story of all different stages of the production of a cell phone, from raw materials mining to the purchase of the final product and personal use: drilling and excavating machines noises, stones cascading into haulage trucks, explosions, crushing and grinding and digging, sounds of metals and stones and glass and heavy things moving around and the sounds of engines. But also earcons, notification sounds, jingles, ringtones, startup sounds, auditory cues produced by software applications and user interfaces, designed to alert of specific events or activities on our devices. These are the sounds that comprise the digital soundscape of our lives: ethereal, pleasant, funny, abstract, gamified. And they exist in juxtaposition with the hidden sounds the materials of our cellphones have oscillated with in their recent past: the earthly, violent sounds of industry. I created various sonic pieces based on different combinations of these two layers of sound and narrative to interpolate between these two distinct environments. I drew a timeline based on the real chronological order of extraction-transportation-production-purchase-disposal and embedded it in a sonic narration. The sounds of mining machinery and stones being processed, then transported, would slowly mutate into the purely synthetic sound design of our auditory displays as raw materials mutate into electronic gadgets.

I was positively surprised with the reception of the audience. People were excited to participate as it felt like each phone was triggering another audio piece and each sound was unexpected. They all wanted to know what ghosts, which echoes were hiding in their phones. What was the sound of the photographs they had taken in the morning or the sound of the messages they had received a moment ago. One layer of the output sound was the raw electromagnetic noise from the phones, and another was a digital soundscape composed by the aleatory sequencing of ethereal and earthly sounds triggered by my electromagnetic exploration of the field of each individual's cell phone.

Although I was not really amplifying or scraping sounds that existed in people's phones, but merely using the phones to trigger sounds elsewhere, the sonic narration depended on the phones to continue. During the whole time of the performance I had to keep 'extracting' those sounds from people's phones to tell the story.



Figure 22: *Invoking Angels at The Poetics of Obsolescence*, still from video by Sara Piñeiros

<https://www.youtube.com/watch?v=GhXlyOnYb8o> .Accessed December 18 2023

3.3.4 Afterthoughts

In *Invoking Angels*, the need for participation from the part of the audience allows me to break the fourth wall, to subvert the distance between audience and performer. I really enjoy that through these participatory practices I can have some one-to-one time with people as it happens when I have to go very close to each member of the audience to scan their phones. While the room was full of the sound I had a chance to talk to them in a more intimate way and I often do, as a lot of them were asking what is happening to their phones. The idea of using the audience's phones as an instrument is also something that creates an interesting contract between performer and audience. The members of the audience were allowing me to go through their digital archives to listen to the sounds they create. They shared with me in this way intimate extensions of their personal lives as a material for my piece. That's something I hadn't designed but which I really liked about the dynamic of my interaction with the audience as it conveys the relation of earthly interdependence and collaboration I wanted to expose with my work: I really needed them to play this piece. They were amplifying the story I had prepared for us to listen to together. Without them listening, the story could not have been told.

4 Conclusions

Through *Stones are Angels*, *Egolith Xenolith* and *Invoking Angels* I hope to have made people's senses open to what non-human nature might have to tell us. I hope I have amplified the testimonies of violence and grief the minerals and metals in our phones may hold. I hope I have emphasized that noise can be speculatively perceived as the language of the inanimate.

For archaeologists stones are vessels of information invisible to the human senses. Digital storage of information is a way of engraving. If we could only recognise and listen to the messages of stones instead of imposing our own message on them, they could help us create a better earthly future for both human and more than human, living and nonliving systems in our planet.

With the artworks I have talked about in the previous pages, I have tried to explore ways to amplify more than human sounds and to make sense of them within a speculative, techno-vitalist theoretical framework. I have done so with the intention to develop a practice within the field of new media which implements artistic strategies that redefine the boundaries between technology, humanity, and nature.

When such practices succeed in re-enchanting our perspectives, we relate to digital technology and new media no more through the deceiving lens of human mastery and transcendence. Instead, we can get to see digital technologies as a *parliament of things* (Latour, 1993), a dynamic space of material-discursive intra-actions where human and non-human entities intersect, collaborate, and influence one another, shaping and reshaping our world.

In my installations I have tried to bring together my engagement with the fields of sound and new media to create speculative interfaces for earthly reenchantment. I have explored how tech animism can be an artistic strategy for the reenchantment of the world, recover the lost magic and reconnect us with the living and nonliving systems we cohabit the planet with. I hope I have shown how a new media art practice informed by neo-materialist and decolonial perspectives can harness the creative potential of technology to create positive social and political change that can foster futures of ecological repair.

Appendix

Sonic Utopias (2021-Ongoing) is a podcast commissioned by Stegi radio¹⁵ and produced by *Onassis Stegi, Onassis Foundation, Athens, Greece*. *Sonic Utopias* aims to depict post-capitalist futures through sound narratives, fostering structures of both individual and communal resistance. The installation *Sonic Utopias* materialized within the framework of the *Interface Cult* exhibition, part of *Loops of Wisdom, Ars Electronica Festival 2021*, featured collaborative audio fictions created for *Stegi Radio* between September 2021 and June 2022. Below I will list each episode with a short description and the credits.

-Smart Fossils: *A post-apocalyptic future world of obsolete electronics, thunderstorms, landslides, mineral sympathies and noise.*

-Trikakia Against Logic • A Prophecy: *Two voices are broadcasting on a pirate radio in the near future, hoping that there are people out there risking their lives to listen to them.*

Credits: Giannis Galiatsos, Flomaria Papadaki, Agelos Pascalidis aka Agatha

-Land of Ahhnsgrwrh: *Yuri Tuma from Madrid's Institute of Postnatural Studies¹⁶, explores posthuman identities through hybrid animal-human avatars in a furry world.*

Credits: Yuri Tuma, Carincur & João Pedro Fonseca

-Fungal Friends

A posthumous dream of a scientist who enters a network of mycelia to become immortal.

Credits: Faun Collective, Giulia Deval, Ekin Bozkurt

-Picarx A Snake Opera

A coming of age story of a non-binary Oracless on their journey to attain prophetic power to help their land and their people.

Credits: Julia del Río, Jassem Hindi

¹⁵ *Stegi radio* is the Onassis Foundation radio which started as *Movement Radio* and was renamed to *Stegi* in 2023. The archive for *Sonic Utopias* can be found on their archive: <https://stegi.radio/podcasts/Sonic-Utopias> Accessed on December 18th, 2023.

¹⁶

The Institute for Postnatural Studies is a center for artistic experimentation from which to explore and problematize postnature as a framework for contemporary creation. <https://www.instituteforpostnaturalstudies.org/> Accessed on December 18th, 2022

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Bibliography

Bennett, J. (2001). The enchantment of modern life: attachments, crossings, and ethics. <http://ci.nii.ac.jp/ncid/BA56336134>

Bennett, J. (2010). Vibrant Matter: a political ecology of things. <https://ci.nii.ac.jp/ncid/BB01877711>

Cahn, P. S. (2009). The Re-Enchantment of the World: Secular Magic in a Rational Age (review). *Anthropological Quarterly*, 82(4), 1087–1089. <https://doi.org/10.1353/anq.0.0092>

Cox, C. (2011). Beyond representation and signification: toward a sonic materialism. *Journal of Visual Culture*, 10(2), 145–161. <https://doi.org/10.1177/1470412911402880> (Accessed: December 6th, 2023)

Federici, S. (2004). Caliban and the Witch: Women, the body and primitive accumulation. https://openlibrary.org/books/OL8696448M/Caliban_and_the_Witch

Federici, S. (2018). Re-Enchanting the World: Feminism and the Politics of the Commons. https://openlibrary.org/books/OL29408537M/Re-Enchanting_the_World

Greyson, L. (2018). Vital re-enchantments: biophilia, gaia, cosmos, and the affectively ecological. In *Punctum Books*. <https://doi.org/10.1353/book.66821>

Hancock, T., & Bezold, C. (1994). Possible futures, preferable futures. *PubMed*, 37(2), 23–29. <https://pubmed.ncbi.nlm.nih.gov/10132155>

Haraway, D. (2016). Staying with the Trouble. <https://doi.org/10.1215/9780822373780>

Helmreich, S. (2016). Sounding the limits of life. In *Princeton University Press eBooks*. <https://doi.org/10.1515/9781400873869>

Horkheimer, M., & Adorno, T. W. (2020). Dialectic of enlightenment. In *Stanford University Press eBooks*. <https://doi.org/10.1515/9780804788090>

Kim-Cohen, S. (2009). In the Blink of an Ear. In *Continuum International Publishing Group Ltd eBooks*. <https://doi.org/10.5040/9781501382796>

Latour, B. (1994). We have never been modern. *Choice Reviews Online*, 31(09), 31–4888. <https://doi.org/10.5860/choice.31-4888>

Latour, B. (2004). 1. Why Political Ecology Has to Let Go of Nature. In *Politics of Nature* (pp. 9-52). Cambridge, MA and London, England: Harvard University Press.
<https://doi.org/10.4159/9780674039964-003>

Latour, B. (2004). 1. Why Political Ecology Has to Let Go of Nature. In *Politics of Nature* (pp. 9-52). Cambridge, MA and London, England: Harvard University Press.
<https://doi.org/10.4159/9780674039964-003>

Morton, T. (1996). Shelley's Green Desert. *Studies in Romanticism*, 35(3), 409–430.
<https://doi.org/10.2307/25601182>

Oliveros, P. (2005). Deep listening: a composer's sound practice.
<https://ci.nii.ac.jp/ncid/BA78961879>

Parikka, J. (2015). A geology of media.
<https://doi.org/10.5749/minnesota/9780816695515.001.0001>

Parikka, Jussi. New Materialism of Dust. *Artnodes*, 2012, Num. 12,
<https://doi.org/10.7238/a.v0i12.1716>.

Pournara, L. (2017). Ramón Reichert and Annika Richterich, eds., *Digital Material/ism* Vol. 1, Issue 1 – Digital Culture and Society. *European Journal of American Studies*.
<https://doi.org/10.4000/ejas.11965>

Russell, L. (2020). Glitch Feminism: a manifesto.
https://openlibrary.org/books/OL28676106M/Glitch_Feminism

Rowley, L. & Johnson K. A. (2018) Anthropomorphic Anthropocentrism and the Rhetoric of Blackfish, *Environmental Communication*, 12:6, 825-839, DOI: 10.1080/17524032.2016.1167757

Schafer, R. M. (1993). The soundscape: our sonic environment and the tuning of the world. <http://ci.nii.ac.jp/ncid/BA51274040>

Séguy, J. (1995). Weber (Max). *Wissenschaft als Beruf* (1917-19); *Politik als Beruf* (1919); Studienausgabe. *Archives Des Sciences Sociales Des Religions*, 90(1), 139.
https://www.persee.fr/doc/assr_0335-5985_1995_num_90_1_988_t1_0139_0000_2

Serres, Michel. Angels, a modern myth. (1996). *Choice Reviews Online*, 34(02), 34–0868.
<https://doi.org/10.5860/choice.34-0868>

Online resources

Chania Danai Niki [@neda__ath]. (2021, April 27). *Memorylith* [Photograph]. Instagram. <https://www.instagram.com/p/COKON7Ar0R1/> Accessed: December 18th, 2023

Finkel, J. (2021, June 21). *When Bots and Antibodies Are Art Materials*. The New York Times.

<https://www.nytimes.com/2021/06/18/t-magazine/lynn-hershman-leeson-art.html>

(Accessed: December 6th, 2023)

Laitinen, T. (n.d.). *Haemocyanin*. <http://www.tuomasalaitinen.com/> (Accessed: December 18th, 2023)

Litvintseva & Wagner. Monster as Medium: Experiments in perception in Early Modern Science and Film - Journal #116. (n.d.).

<https://www.e-flux.com/journal/116/379558/monster-as-medium-experiments-in-perception-in-early-modern-science-and-film/>

Maughan, A. (2020). 338. In American Artist & Aliyu, Z. (Eds.), *Dictionary of Dark Matters*. School of Poetic Computation. <https://darkmatters.xyz/> (Accessed: September 5th, 2022)

Miller, J. C. & G. B. (n.d.). *The Cabinet of Curiousness* | Janet Cardiff & George Bures Miller. Janet Cardiff & George Bures Miller.

<https://cardiffmiller.com/installations/the-cabinet-of-curiousness/> Accessed: December 18th, 2023

Peek M. P., *The silent voices of African Divination*. (n.d.). Harvard Divinity Bulletin.

<https://bulletin.hds.harvard.edu/the-silent-voices-of-african-divination/> (Accessed: December 6th, 2023)

Rettberg, J. W. (2021). Speculative Interfaces: How Electronic Literature Uses the Interface to Make Us Think about Technology. ResearchGate.

https://www.researchgate.net/publication/355192103_Speculative_Interfaces_How_Electronic_Literature_Uses_the_Interface_to_Make_Us_Think_about_Technology

(Accessed: December 4th, 2023)

Russell, L. (n.d.). #GLITCHFEMINISM. from

<https://www.legacyrussell.com/GLITCHFEMINISM> Accessed on December 19th 2023

Olsthoorn et al. *Studio stone age*. Esto Association. (n.d).
<https://estoassociation.com/Studio-stone-age>

Sutela, J. (2023, January 4). *nimiia cétii* [Video]. YouTube.
<https://www.youtube.com/watch?v=3ge5aWvRPxw> Accessed: December 18th, 2023.

Tedlock, B. (2001). Divination as a way of knowing: embodiment, visualization, narrative, and interpretation. *Folklore*, 112(2), 189–197. <https://doi.org/10.1080/00155870120082236>

Wikipedia contributors. (2023, July 13). Object-oriented ontology. Wikipedia
https://en.wikipedia.org/wiki/Object-oriented_ontology (Accessed: December 6th, 2023)

Wong Mandy-Suzanne. *The Thingness of Sound*. Sonic Field. (2018b, September 11).
<https://sonicfield.org/the-thingness-of-sound-essay-by-mandy-suzanne-wong/>
 (Accessed: December 6th, 2023)

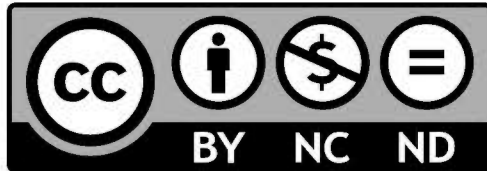
Sutela, J. Bienal de Artes Mediales de Santiago. (2023, January 4) *nimiia cétii*
<https://www.youtube.com/watch?v=3ge5aWvRPxw>
 Accessed: December 18th, 2023

Miller, J. C. & G. B. (n.d.). The Cabinet of Curiousness | Janet Cardiff & George Bures Miller. Janet Cardiff & George Bures Miller.
<https://cardiffmiller.com/installations/the-cabinet-of-curiousness/> Accessed:
 December 18th, 2023

Video

Erreira, A. (Director). (1991). From the Heart of the World: The Elder Brothers' Warning [Film]. BBC.

Litvintseva & Wagner. (Directors). (2022). Constant [Film]. Chak Films.



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