



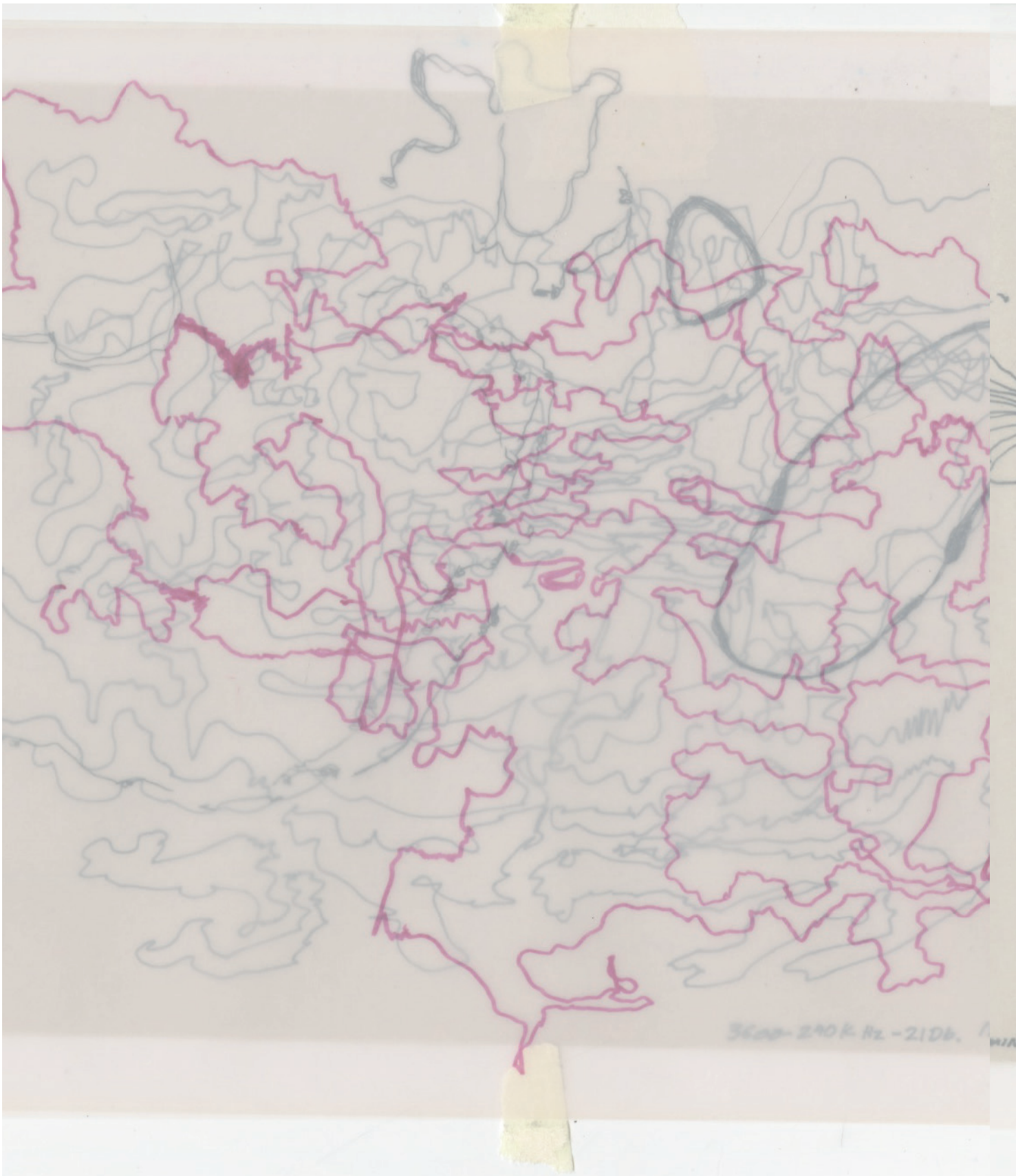
Listen Listen, What is it that you Hear?

Hannah C. Mackaness

A thesis by project, supervised by Dr. Catherine Guiral

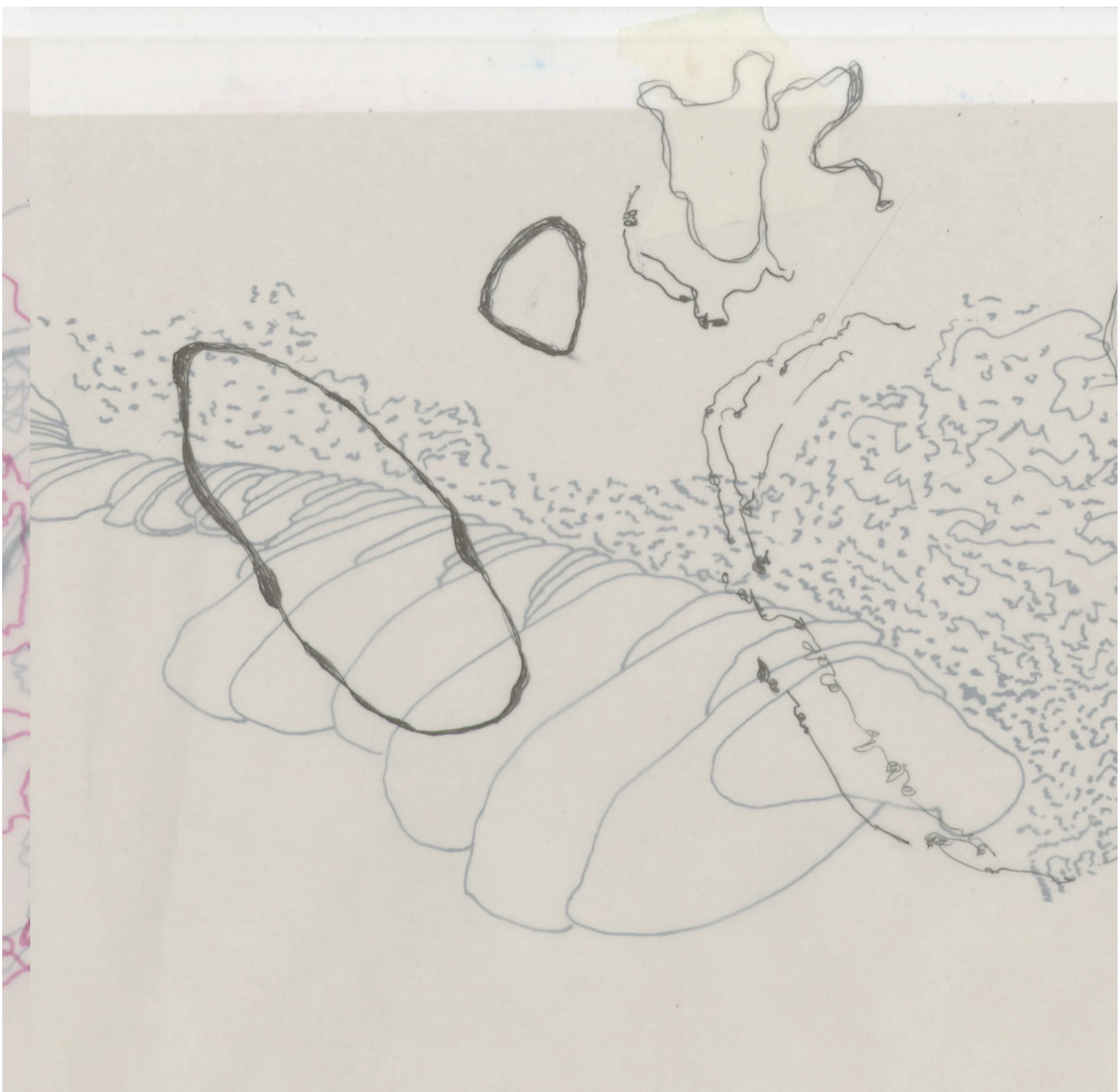
HEAD Genève, 2023

MA Design: *Espace et Communication*



3600-240K Hz -21Db.

3600-240K hZ at -21Db. 124528 (5 minute sample)



10 MINUTES OF BRAGIO ALPINE MEADOW

I wish to extend my gratitude for guidance, support and patience to both Dr. Catherine Guiral and to Joseph Curle.

Further thanks to the teaching staff, tutors, heads of departments, classmates and jury members; Jérémie Cerman, Axelle Grégoire, Rosario Hurtado, Arno Mathies, Noémi Michel, Joseph Popper, Sebastien Quequet, Sereina Rothenberger, Noam Toran and Noee Zahavy.

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R07_0046, 3 Minute sample. Baseline.

Abstract

EN

This essay addresses the Anthropocene's ecological crisis, proposing a thesis by project that advocates for local sonic observation of soils to expand our understanding of the world. Emphasising the urgent need for a paradigm shift, the work explores the interconnectedness of the Anthropocene with colonial views of nature and highlights the importance of direct observation of the local sonic environment as a countermeasure to this world view.

As part of my practice I have prototyped several sonic objects which represent a practical exploration of the theory. They are part of my fieldwork which includes the listening, recording and manipulations of sounds from underneath Swiss soils, imagined placemaking illustrations from those recordings and a series of speculative objects.

Through this analysis I will show that observation of one's own surroundings is a powerful starting point to understand the biosphere. Listening to the sounds of soils is an emergent practice across science, design and art, it is therefore a fertile ground for explanation of the potential of the combination of the observational and the imaginary.

Keywords; sonic ecology, soils, crisis of imagination, observation, *umwelt*

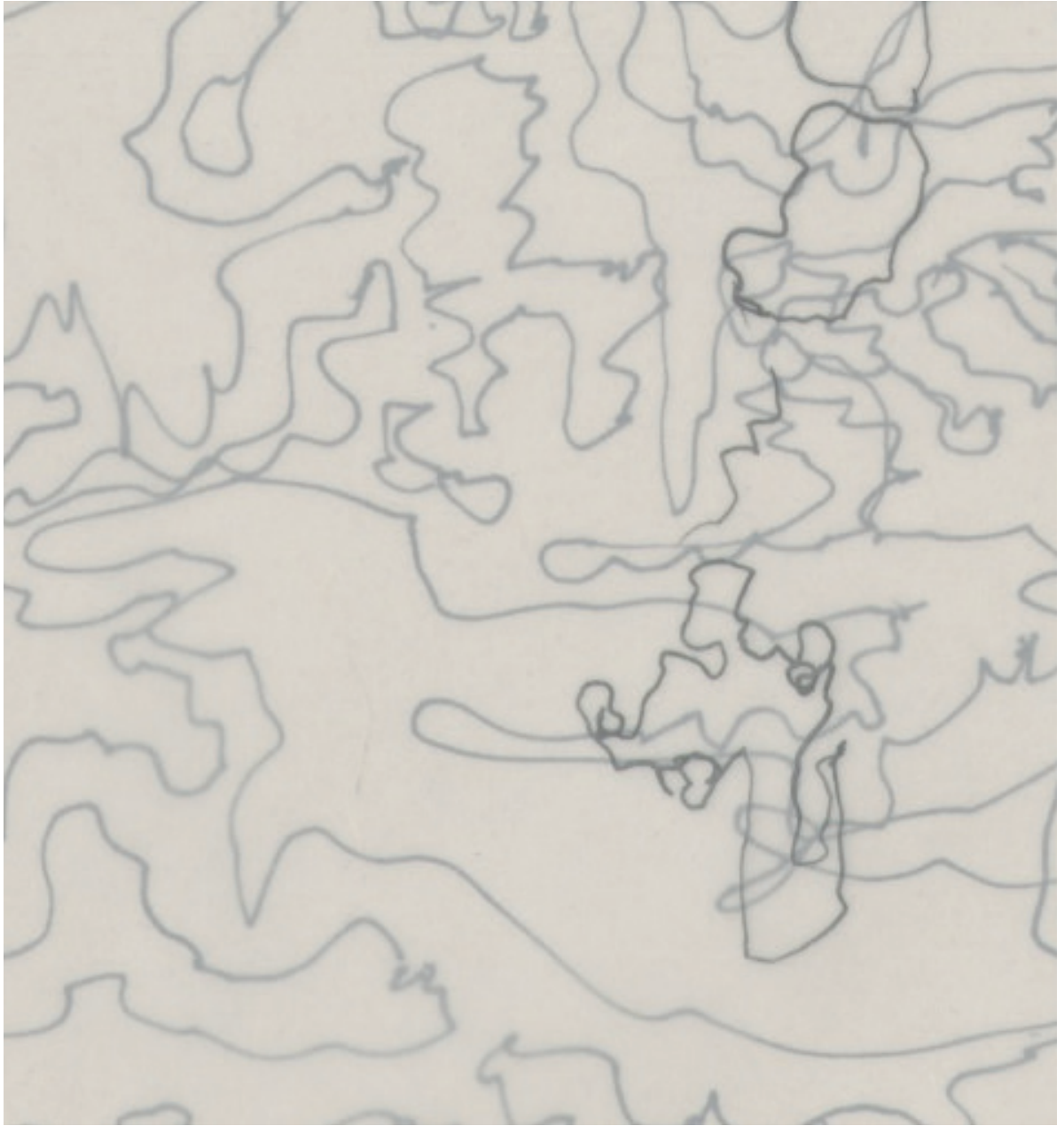
FR

Cet essai aborde la crise écologique de l'Anthropocène, en proposant une thèse par projet qui préconise l'observation sonore locale des sols pour élargir notre compréhension du monde. Soulignant le besoin urgent d'un changement de paradigme, le travail explore l'interconnexion de l'Anthropocène avec les visions coloniales de la nature et souligne l'importance de l'observation directe de l'environnement sonore local comme contre-mesure à cette vision du monde.

Dans le cadre de ma pratique, j'ai prototypé plusieurs objets sonores qui représentent une exploration pratique de la théorie. Ils font partie de mon travail de terrain qui comprend l'écoute, l'enregistrement et la manipulation de sons provenant du sous-sol suisse, des illustrations de création de lieux imaginées à partir de ces enregistrements et une série d'objets spéculatifs.

À travers cette analyse, je montrerai que l'observation de son propre environnement est un point de départ puissant pour comprendre la biosphère, ce qui, à son tour, pourrait restaurer l'espoir et donc la croyance qu'un changement positif de l'environnement est possible. L'écoute des sons du sol est une pratique émergente dans les domaines de la science, du design et de l'art, et constitue donc un terrain fertile pour l'explication du potentiel de la combinaison de l'observation et de l'imaginaire.

Mots clés : observation sonic, sols, crise de l'imagination, observation, *umwelt*



R07_0046, 3 Minute sample. Baseline.

Imaginaries, sounds, observations; A Sonic Journey into The Anthropocene

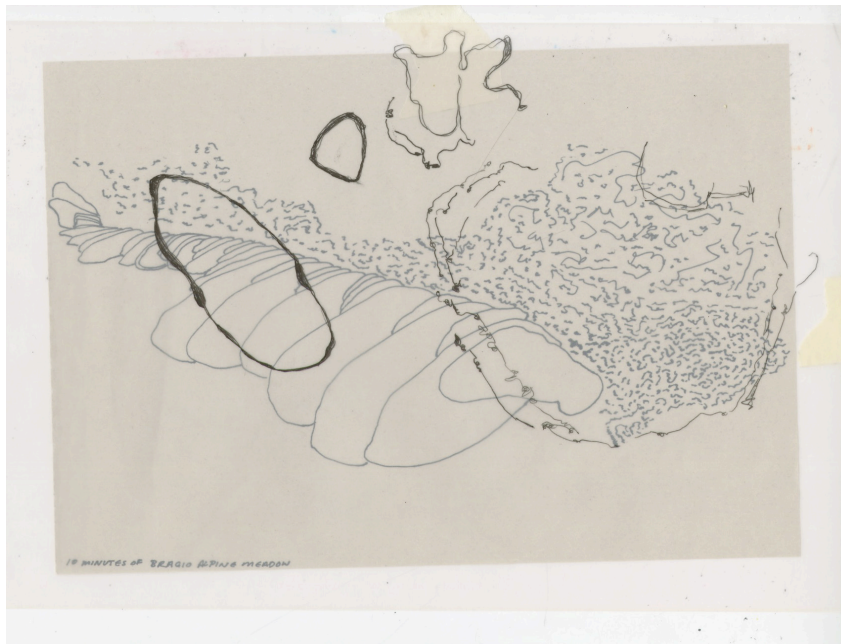
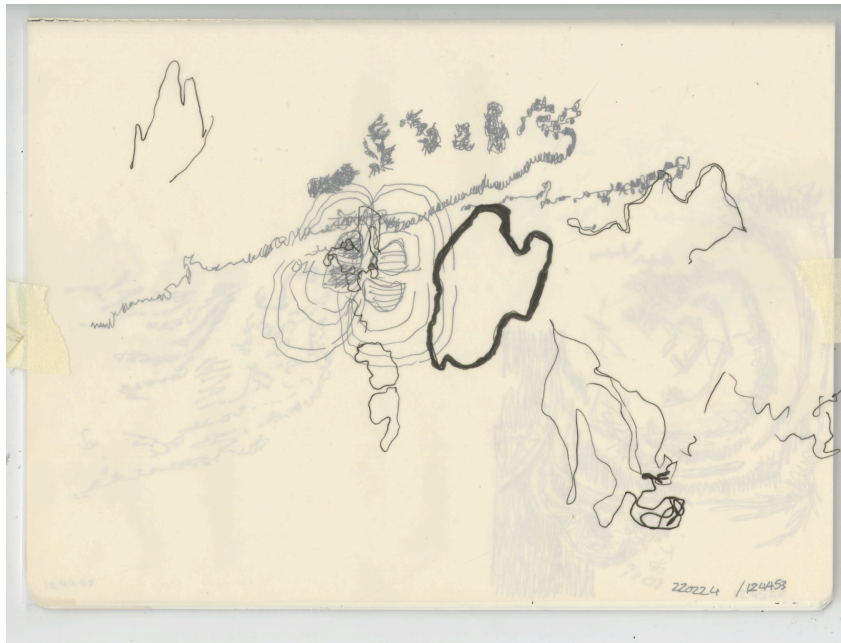
The current ecological crisis, The Anthropocene, has been characterised by many as a *crisis of imagination*¹ in which a lack of understanding of the world around us threatens our survival as a species. Characterised by irreversible man-made changes with impacts that are more than

the sum of their parts, on several different scales at the same time, we need new ways to understand and ultimately exit The Anthropocene. To get to grips with the current environmental crisis we, especially those in Western countries², urgently need new ways of understanding what we consider 'nature' and the position of human in the ecosystem. Direct

observation of our own physical surroundings can be an impactful way of understanding the world around us.

A thesis by project, I argue that sonic observation of soils can be a key way to start to expand our understanding of the world around us. What does the world look like if we engage differently in seeking to understand the biosphere? How might our futures look if those who are not engaged in the world around them started to engage? I will use the imaginaries as a design tool to think about a future in which we are more connected, and lay the theoretical groundwork for my final master's project. My work is situated at an emergent practice in design, ecology and the science of listening to soils. Each chapter contains either a physical or sonic object that explores an element of the practical exploration of theory. I have also included a number of 'sound drawings' labeled with their corresponding file name. These were made intuitively as part of attempts to visualise the recordings.

1 Amitav Ghosh, *The Great Derangement: Climate Change and the Unthinkable* (Chicago, IL: The University of Chicago Press, 2017).
2 The emphasis on those in the West is important to highlight given the outsized impact of behaviours and norms on the environment by those in the global West, in contrast with those in the global South.



Top 220224/124453
Bottom 10 Minutes of Bragio Alpine Meadow.

Critical Context; The Anthropocene

Initially, I will provide a contextual overview of this work; The Anthropocene. Subsequent chapters will explore how direct observation of local surroundings can be a powerful entry point to re-engage in the world and why this approach is necessary. I will continue with an explanation as to why I have started my investigations by listening to subterranean sounds and then reflect on this approach, which combines making, recording, drawing, listening, field work and writing as new tools to expand knowledge. Our current ecological crisis is contextualised in the current epoch; *The Anthropocene*³. From a purely scientific perspective, The Anthropocene is a 'geological epoch aimed at illustrating the transformative impact of human beings on the planet's ecosystem.'⁴ The nomenclature is normally reserved for geologists describing a period of deep time on a geological timescale distinct enough to have a designation of its own.⁵ However, human-made change has become so significant that we are now sharing the naming conventions reserved for geological changes with our own human-made changes. Many of these changes have had significant, irreversible impacts on what we understand as nature and the natural world. Post-colonial thinkers have been highlighting for many years the connection between The Anthropocene and the Enlightenment view of nature that we still hold, which is inextricably tied to colonial European ambitions to dominate the world.⁶ It is within this context that we understand the urgency with which we must act, Haraway

3 There are competing, nebulous interpretations of this term; Latour (2018) frames it as a crisis of modernity due to human detachment from objects of the material world whilst Bonneuil and Fressoz (2020) describe it as a term denoting the idea that we have hijacked the Earth system into a new geological epoch.

4 Angela Zottola and Claudio de Majo, 'The Anthropocene: Genesis of a term and popularization in the press.' *Text & Talk* 42, no. 4 (2022): 453-473, 454.

5 Timothy Clark, *The Value of Ecocriticism* (Cambridge: Cambridge University Press, 2019), 17.

6 Alf Hornborg, 'Artefacts Have Consequences, Not Agency: Toward a Critical Theory of Global Environmental History', *European Journal of Social Theory* 20 (2017), 95-110, 96. <https://doi.org/10.1177/1368431016640536>.

7 Donna J. Haraway, 'Anthropocene, Capitalocene, Plantationocene, Chthulucene: Making Kin.' *Environmental Humanities* 6, no. 1 (2015): 159-65, 160. <https://doi.org/10.1215/22011919-3615934>.

8 Bruno Latour and Peter Weibel, *Critical Zones: The Science and Politics of Landing on Earth* (Karlsruhe, Germany: ZKM Center for Art and Media, 2020), 36.

states 'I think our job is to make the Anthropocene as short/thin as possible and to cultivate with each other in every way imaginable epochs to come that can replenish refuge'.⁷

The damage to the world around us is not the only thing that compels us to exit The Anthropocene. Latour writes about the staggering speed at which changes are happening which 'impedes our ability to understand - or convey - a sense of proportion in time and space [...]'⁸ These rapid changes combine to create an impact which is both unpredictable and more than the sum of its parts. This compounds the complexity and further hinders our ability to grasp events. It is not just the speed of change which characterises The Anthropocene but also the irreversibility of many of these changes. As such, anthropologist Anna Lowenhaupt Tsing has suggested that the inflection point between The Holocene and The Anthropocene might be the wiping out of most of the refugia from which diverse species assemblages (with or without people) can be reconstituted [...]⁹

Given the nature of these changes, there is an undeniable urgency to engage differently in the times we live in, for people to bring about the collective change we so desperately need; ¹⁰ we can no longer claim that ignorance is bliss. It is not easy to conceptualise global environmental change, yet its profound impact is too significant to overlook. It hardly feels controversial to posit that to get to grips with the current environmental crisis we, especially those in Western countries, urgently need new ways of understanding nature and human relations within it.¹¹

9 Anna Lowenhaupt Tsing, 'Feral biologies'. In: Inaugural conference: Anthropological visions of sustainable futures. Organised by Brightman, M and J.Lewis. London: Centre for the Anthropology of Sustainability (CAOS), University College London. February 13, 2015.

10 This is especially important for those whose understanding of nature is founded in Enlightenment views of the world, that is (as defined by Cahoon, 2012) 'A civilisation founded on scientific knowledge of the world and rational knowledge of value, which places the highest premium on individual human life and freedom, and believes that such freedom and rationality will lead to social progress through virtuous self controlled work, creating a better material, political and intellectual life for all.'

11 Lawrence Buell, *The Environmental Imagination: Thoreau, Nature writing and the Formation of American Culture* (Boston: Harvard University Press, 1996); David Ferrier, *Anthropocene Poetics: Deep time, Sacrifice Zones and Extinction* (Minneapolis: University of Minnesota Press, 2019).



3600-240K hZ at -21Db. 124528 (5 minute sample)

Direct Observation; Investigating the local as a countermeasure

Haven't you ever worried that when you say that the Earth is a planet, that it is a globe, you actually have to mentally position yourself as if you are considering it from outer space?[...] humans don't live there and it's not what they see in front of their eyes.¹²

In 1634 the work of Czech astrologist Johannes Kepler, *The Dream*, was published. By imagining how a moon dweller would travel to the moon and perceive the solar system the essay promoted the emergent and unpopular heliocentric theory,¹³ which posed a significant challenge to the well established world order viciously protected and promoted by the Church; the Geocentric Model. The *Blue Marble*¹⁴ continues to be globally influential after its initial release in 1972 and is probably one of the most widely reproduced photographs in history.¹⁵ Much of their power lay in their ability to excite popular imagination.

Both *The Dream* and *The Blue Marble* propel the reader or viewer to voyage into space using their imaginations. Whilst these imaginaries are no doubt evocative, Latour later pointed out that they are not necessarily what we can directly observe.¹⁶ They contribute to a sense of otherworldly detachment from the place where we actually

12 Bruno Latour and Peter Weibel, eds *Critical Zones: The Science and Politics of Landing on Earth* (Karlsruhe, Germany: ZKM Center for Art and Media, 2020), 14.

13 Paul B. Selz, 'Space Travel to the Moon and Kepler's Dream.' *Proceedings of the Iowa Academy of Science* 79, no. 1, (1972): 47-48, 47. <https://scholarworks.uni.edu/pias/vol79/iss1/15>.

14 The founder of The Whole Earth Catalog Stewart Brand campaigned for NASA to release the photo with badges that read "Why haven't we seen a photograph of the whole Earth yet?". He was convinced the photo would change the way humans related to the Earth.

15 Al Reinert, 'The Blue Marble Shot: Our First Complete Photograph of Earth', in *The Atlantic* [accessed 23 November 2023]. <https://www.theatlantic.com/technology/archive/2011/04/the-blue-marble-shot-our-first-complete-photograph-of-earth/237167/>.

16 Bruno Latour and Peter Weibel, *Critical Zones: The Science and Politics of Landing on Earth* (Karlsruhe, Germany: ZKM Center for Art and Media, 2020), 14.

experience the everyday. Ziebritzki advocates that we need to unlearn this distant, objectifying gaze, stating; 'To perceive, describe, and relate can localise our perception and action in the precarious zone in which we live — namely, Gaia.'^{17 18} This aligns with feminist texts such as Haraway's *Manifesto for Cyborgs* which sees humans, nonhumans, culture and nature as inextricably *entangled*.¹⁹ Understanding, experiencing and imagining this sense of entanglement is not possible if observation is only done from afar. In beginning to understand the world differently, we must look to examine our own powers of perception.

One way to counter this distant view is through direct observation of the local, primarily through sense perception. Thomashow states; 'A beautiful sunset gets your attention. A cold, icy rain will make you very wet and uncomfortable. [...] these scenes evoke vivid sensory impressions, triggering memories and associations that reverberate throughout every corner of consciousness'.²⁰ He posits that 'biosphere perception' is possible by paying close attention to the place where one lives.²¹ He ultimately argues that understanding the local can be extrapolated to understand more complex global ideas including weather patterns, climate change and even the question of the validity of the binary of 'local' and 'global'. His work *Bringing the Biosphere Home* is centred around the idea that learning how to perceive the biosphere is crucial to understanding global environmental change. It is not clear if better understanding, specifically of the local, would lead to more comprehensive action or broader consciousness, but enhanced knowledge seems like a suitable start point for imagining this as a reality.

17 Johanna Ziebritzki, 'Sensorium Of The Earthbound', essay, in *Critical zones: The science and Politics of Landing on Earth*. (edt Latour and Weibel) 260-64, 263.
18 We understand that the biosphere is encapsulated by the concept of 'Gaia' as written about by Lovelock et al. Lovelock (the author of the Gaia Hypothesis) made the following distinction; 'Gaia will be used to describe the biosphere and all of those parts of the Earth with which it actively interacts to form the hypothetical new entity with properties that could not be predicted from the sum of its parts.' (James Lovelock, and L. Margulis 1974.

19 Donna J. Haraway, 'A Cyborg Manifesto: Science, technology, and Socialist-Feminism in the Late Twentieth Century,' in *Simians, Cyborgs, and Women: The Reinvention of Nature* (New York, NY: Routledge, 1991), 149-181.

20 Mitchell Thomashow, *Bringing the Biosphere Home: Learning to Perceive Global Environmental Change* (Cambridge, MA: The MIT Press, 2001), 47.

21 *ibid*, 5.

Sounds Local

Imagining a future where there is focused, sustained attention to the local area I have produced *Sounds Local*. This domestic object is a ceramic dish with beads that sit inside a channel.

A conceptual object designed to be placed at the doorway to a home, it strives to habitually bring the essence of the subterranean sonic inside. By pushing your finger around the inner ring and moving the beads, you can replicate the sounds that you can hear in your local subterranean area. The beads and channel are adjusted in size, shape and glaze to mimic sounds found in a specified local area.

I imagine it in the home of a family who have been able to listen to the sounds of their local subterranean. It should therefore serve as a link to observations carried out and the rhythms of everyday life. It is a reminder that when you leave the sonic environment of your home, you enter the sonic home of another.

This page *Sounds Local* in a home
Following page *Sounds Local* Fired and glazed







Direct Observation and expanding Umwelt; Increasing empathy and understanding of the non-human perspective.

Umwelt is defined by Korintenberg et al. as 'every life form [having] its subjective worldview.'²² Thomashow's definition emphasises the subjectivity of *Umwelt*; 'the physiological perceptual environment of any biological organism.'²³ Expanding *Umwelt* is possible, and is

essentially a practice of pushing the boundaries of your own empathy.

22 Bettina Korintenberg, Rachel Libeskind, Robert Preusse and Stefanie Rau, 'Glossolalia: Tidings from Terrestrial Tongues', essay, in *Critical zones: The science and Politics of Landing on Earth*. (edt Latour and Weibel) 301-320, 318.
23 Mitchell Thomashow, *Bringing the Biosphere Home: Learning to Perceive Global Environmental Change* (Cambridge, MA: The MIT Press, 2001), 93.
24 David Rothenberg, *Hand's End: Technology and the Limits of Nature* (California City, CA: University of California Press, 2000), xvi.
25 Frédérique Aït-Touati, *Fictions of the Cosmos: Science and Literature in the Seventeenth Century* (Chicago, IL: University of Chicago Press, 2011), 10.

Rothenberg writes about how technology can represent the amplification of *Umwelt*, specifically in reference to the telescope; 'By looking through a telescope you change the scale of your vision, making distant objects seem close, shrinking the expanse of time and space.'²⁴ Although increasing *Umwelt* doesn't always require technology, it necessarily requires the use of imagination

in combination with observation. It is this combination that worked so well for Kepler's *The Dream*, Aït-Touati notes: 'Astronomy, even when it becomes a science of observation thanks to the telescope, makes liberal use of the imagination. It has the characteristic of treating phenomena that are inaccessible or difficult to observe.'²⁵ Revealing the unknown is a critical part of bringing novelty and joy into the practice of observation which shines light on the idea that non-human lives exist, even if we can't perceive them. It helps us to expand our understanding of the scale of the lives around us, which is crucial if we are to develop an interspecies ethics.

Rethinking our own spatial and temporal scale well beyond our organismic limitation reminds us that life and sensing exist beyond our own limited range of sensing.²⁶ Rethinking the value of the non-human is critical if we (in Western culture) are to disrupt our current understanding of the world, in which humans consider themselves at the top of an imaginary hierarchy, rather than understanding that non-human life exists as critical parts of the ecosystems. Understanding this is a matter of survival; 'Humans cannot survive by stomping on all the others.'²⁷ Observation and imagination can help us to think through, or at least about, the non-human perspective and our position in the biosphere.

Combining observation and imagination in the sonic subterranean was possible with a specially designed soil microphone. This microphone amplifies sounds that the human ear alone cannot pick up or access, acting as a sonic telescope. This amplification is what gives soil a voice which enables us to shape our understanding of the planet through expansion of *Umwelt*. If we hear what exists below, we can begin to imagine the lives of others. Through my fieldwork, I collected a number of samples which I have presented in various ways.

26 For example, human hearing only detects sound between 20 Hz to 20 kHz whilst the Greater Wax Moth can hear up to 300 kHz which is thought to be used to help evade their main predators - bats. (Skals and Surlykke, 2000).

27 Anna Lowenhaupt Tsing, *The Mushroom at the End of the World: On the Possibility of Life in Capitalist Ruins* (Princeton, NJ: Princeton University Press, 2021), vii.

Listen Listen (What is it that you Hear?)



Scan the QR code of visit the following site to listen to the recordings; bitly.ws/33JLz

It is highly recommended to listen with headphones, or a high quality speaker set up. Laptop speakers are not recommended.

In my piece *Listen Listen*, I have used a microphone designed specifically for capturing the sounds of incredibly small creatures underground that would otherwise be inaccessible or difficult to observe. The recordings I have included also include the sound of gas bubbles popping and escaping and some of the environmental conditions above ground. The recordings have been split into different frequency bands and layered on top of each other in order to introduce the listener to the work and enable them to appreciate the complexity of the soundscape.²⁸ A technology still in the making²⁹ has enabled my work to give a voice to the soil.

At this point, I also invite you to open out the included posters to view as you listen.

28 It was important to me not to artificially manipulate these recordings in a way which isolated certain sounds, but to preserve the origins of the combination of sounds. This has meant there are periods of silence and repetition and periods where 'nothing' happens. I have chosen this approach as a deliberate contrast to highly manipulated soundscapes which frequently pander to our notions of beauty and 'traditional' understandings of nature.
29 By enrolling in Marcus Maeder's Sound & Environment course at Zurich University of the Arts I have been able to continue to develop the recording and mastering techniques. Maeder was a core part of the original team who developed and used the microphone.



The Sounding Soil kit, plus my own recorder. Using my own recorder with a line in/line out cable enabled me to record directly onto my own machine for any amount of time. The probe for the microphone is present in this photo, it was extremely delicate and I broke the first one I borrowed.



Listening and recording in a grassland during the Listening Academy Basel. August 2023.

The recordings shared were primarily made during the summer months in Geneva and Basel when there was much more soil activity. I started the fieldwork by experimenting with the recorder to understand which times of day and which soils had the most activity. After a series of experiments in Geneva I undertook a 2 day field trip to *Col De Jaman* in the Western Swiss Alps. I made around 30, 5-minute recordings from the top of the mountain to Lac Lemman. Due to a technical failure of the Sounding Soils recorder, every single recording was silent and could not be recovered. Later on, I learnt that the recorders were highly prone to failure.

Although a frustrating experience, the processes led me to reflect upon the value of listening. I had still listened to the subterranean sonics of the mountain for 150 minutes which was a completely different experience of the mountain. The memories I had formed of the space were different and the relationship to the mountain included a new dimension. There is a tenderness and depth to these memories of sitting in the forest, which include the way it smelt and the texture of the forest. In retrospect, there was a real value in losing all my recordings. I was able to reflect on the holes in my memory of the mountain - and the way I had outsourced memory to the digital recordings, which were now lost. I had listened to the mountain, but it wasn't immediately obvious that I had *remembered* in detail what I had heard. Someone asked me how the sounds differed from the top of the mountain to the bottom, and I found myself describing a feeling, rather than specific sonic items in the recordings.

Although these recorders are loaned out to the public they are primarily a *listening* object, and not a *recording* one. Despite describing themselves as 'an inter- and transdisciplinary research, awareness and art project that investigates the acoustics of soil ecosystems.'³⁰ the Sounding Soils team was reluctant to share existing recordings with me. They released the samples when I told them I was developing a new vocabulary, but the exchange brings into question what is considered 'art' and

also questions of ownership whilst further highlighting the emergent nature of this practice and the tension between recording and listening.³¹

³⁰ 'Inform', Sounding Soil - healthy soil makes noise. [accessed December 4, 2023], <https://www.soundingsoil.ch/en/inform/>.

³¹ The recordings they sent me have not been used in the pieces presented.

Despite the necessary use of technology, the obfuscation of the sound source and the use of sounds to create work, I do not consider this work to be following the tradition of *musique concrète*.³² This is primarily because of the way I have tried to preserve the entire soundscape and contextualise what the listener is hearing without isolating or amplifying specific sounds. LaBelle argues that *musique concrète* necessarily suppresses context.³³ Although these sounds are of an *unfamiliar* context, by introducing each frequency band I hope to provide an enhanced understanding of context. It is also why certain sounds have not been isolated, and why the sounds have not been combined with music. Although these techniques could have been used to create a more recognisably engaging piece it was important to me to preserve the non-human life and the context in which it existed. Given the highly subjective nature of *Umwelt*, it felt important to present raw works and let others use their imagination to expand their knowledge of the soils. The addition and manipulation of other sonic elements would have brought even more of my voice into the process which felt counter to my goal of amplifying the voice of the soil.

³² Pierre Schaeffer pioneered *musique concrète* (concrete music) and wrote extensively about the topic. It is a form of musical composition that isolates and decontextualises recorded sounds and utilises them as raw material. (Schaeffer, 2012).

³³ Brandon LaBelle, *Background Noise: Perspectives on Sound Art* (London, England: Bloomsbury Academic, an imprint of Bloomsbury Publishing Inc, 2020), 31.



Experiments with hydrophones in partially submerged vessels of water. *Bois de Fargout*, Geneva, June 2023.



Presenting work as part of the *Listening Academy Basel*, where I was grateful to receive the guidance of Brandon Labelle and Budhaditya Chattopadhyay. The work I developed, *UnderOver* was then presented as part of the global Listening Biennale and can be listened to here; <https://listeningbiennial.net/listen/wild-listening-audio>



The Sounding Soil Microphone and recorder. The recorder only records for 5 minutes - not more or less. It forced me to crouch perfectly still for exactly 5 minutes and just listen. It is through this practice that I was able to reflect on our lack of connection with the world that is under our feet, and how frequently we ignore worlds, connections, sounds and non-human life simply because it's not very convenient to observe or investigate it. *CoI De Jaman*, August 2023.





Sounding Soil

REC MON BT

Listening; sonic observations in soil.

Why soil?

BODENLOS (DE)

['bo:dno:s]

Related terms: BEDROCK, BODENLOSIGKEIT, DETERRITORIAL, EARTHBOUND, FOUNDATION, GHOST ACREAGE, GROUND, HEIMAT, ROOTEDNESS, SITUATEDNESS, SOIL, TERRESTRIAL

In a very basic understanding of commonality between human beings, the ground becomes an important metaphor: the common ground on which we stand describes a connection to a fundamental place that we all rely on. But what does it mean if this common ground is shaking - if we, slowly but surely, seem to be losing this ground? [...] We need to develop a new relation to the ground, to understand it as the thin skin of the Earth [...] that we inhabit, and at the same time affect, and are affected by.³⁴

Broadening our understanding of soil, however we can, is crucial as most of the life processes that sustain life on the planet (i.e the processes that stand between us and extinction) happen in the 6 inches of topsoil that coats the earth.³⁵ Yet ecologists and other scientists often neglect soil landscape,³⁶ prioritising management history, fertility, and increasing crop yields over water quality, the importance of soil microorganisms, and the long-term effects of cultivation and draining systems and

34 Bettina Korintenberg, Rachel Libeskind, Robert Preusse and Stefanie Rau, "Glossolalia: Tidings from Terrestrial Tongues", essay, in *Critical zones: The science and Politics of Landing on Earth*. (eds Latour and Weibel) 318-326, 318.

35 Dr Anna Krzywoszynska, 'It's time we stopped treating soil like dirt', video, 7:53 in The Guardian [accessed 08 November 2023]. <https://www.theguardian.com/environment/video/2019/jul/11/its-time-we-stopped-treating-soil-like-dirt-video>

36 David Hammer, "Space and Time in the Soil Landscape" in *Ecological scale: Theory and applications*, eds David L. Peterson and Thomas Parker, 105-141 (New York: Columbia University Press, 1998), 106.

37 *ibid*, 107.

Left; This microphone was developed as part of the Sounding Soils project in Switzerland. The sensors consist of a simple piezo diaphragm (15 mm diameter), on which a gilded copper needle (1 mm thickness and 10 cm length) was soldered on. It is available to borrow to anyone in Switzerland. It is far more sensitive than a geophone, which was initially designed to detect seismic activity and is now used by artists and designers to capture sounds that exist underground. Detailed technical information can be found in (Marcus Maeder et al, 2022).

microclimate.³⁷ This deeply anthropocentric focus overlooks the deeply complex lives and histories in soil.³⁸
³⁹ In just a gram of ordinary soil, you're holding a clump of quartz grains laced with decaying organic matter and free nutrients, and about ten billion bacteria.⁴⁰ By treating soil like dirt, as something literally and figuratively beneath us, we are missing out on an incredible richness. We are in a state of deep disconnect with the soil. In part, this is because we are usually observing a 2D plane of what is really a 3D world. The ground beneath our feet is just the surface of the rich life below.

Vernadsky argued that 'behind, beneath, and between the scenes, at a level imperceptible to the unaided eye, there are microbial layers of activity, biological and chemical transformations that are crucial to the metabolic and physiological process of the entire planet.'⁴¹ By observing only the 2D 'top' of soil, we are blind to this complex activity and how it can begin to help us understand the world differently. One way in which we can begin to understand some of these processes is by listening to the sounds made in soil. As part of the Sounding Soils project in Switzerland, a research paper was produced that proved that biodiversity in soil could also be accurately measured and observed acoustically.⁴² Acoustic samples of soil were used by Karine Bonneval in her work *Listen to the Earth* in which different samples were played from large ceramic sculptures to enable visitors to hear these sounds that we are usually not able to hear.⁴³

38 Feminist theorist such as Braidotti highlight that the global economy unifies all species under the imperative of the market (Braidotti, 2017,49). It thus comes as no surprise that for so long soil has been considered only in terms of its capacity to serve human agriculture needs, rather than as a complex, precious, non-human area for life.

39 A key part of this complexity is the relational aspects and context of what is happening underneath our feet. In contrast with scientific approaches that seek to isolate subjects to study, observation of soils must necessarily consider the interconnected nature of space. Hammer writes; 'Soil is held in place by plants, whose lives depend on both the soil and the waters that constantly seek to move soils to the seas. Synergisms among biota, soils, and terrestrial waters are ancient, complex and so intertwined that distributions and processes of one can be understood in context with others.' (Hammer,1998). Indeed in discussion with Marcus Maeder he explained that when his research group separated animals found in soil samples into single species buckets, the soils went quiet. Without the mix of species, they all went silent.

40 Mitchell Thomashow, *Bringing the Biosphere Home: Learning to Perceive Global Environmental Change* (Cambridge, MA: The MIT Press, 2001), 48.

41 *ibid*, 109.

42 Marcus Maeder, Xianda Guo, Felix Neff, Doris Schneider Mathis and Martin M. Gossner,

43 Temporal and spatial dynamics in soil acoustics and their relation to soil animal diversity', *PLoS ONE* 17, no.3 (2022): 1-22 (15). <https://doi.org/10.1371/journal.pone.0263618>.

43 Bonneval developed the work in collaboration with the Freie Universität Berlin in order to explore ideas of how we might understand our environment differently; '...we walk on a complete universe that it seems important today to give voice to in order to understand the world around us differently.' Bonneval, Karine, 'Ecouter La Terre.' in Karine Bonneval. [accessed December 3 2023]. <https://www.karinebonneval.com/projets/ecouter-la-terre-10>.

Swell Studio created award-winning work that converted the electrical signals found in mycelium networks into music.⁴⁴ These projects all work to expose what is normally obscured from human perception. Scientists, artists and designers are only just beginning to understand the importance of the sonics of the soil.^{45 46} What unites these projects is a desire to bring that which we cannot perceive to those who are curious about it.



Karine Bonneval, Sculptures in *Listen to the Soil*, 2016

44 This project was part of the 'Balance Garden' which won a Silver Medal prize at Chelsea Flower Show. The work was also installed at Glastonbury Festival and All Things Fungi festival. Although not strictly sounds of the soil, this work shares the same purpose - that of engaging audiences in new ideas of how to interpret the world.

45 Marcus Maeder, Xianda Guo, Felix Neff, Doris Schneider Mathis and Martin M. Gossner, 'Temporal and spatial dynamics in soil acoustics and their relation to soil animal diversity', *PLoS ONE* 17, no.3 (2022): 1-22. <https://doi.org/10.1371/journal.pone.0263618>.

46 Matthias Rillig, Karine Bonneval and Johannes Lehmann, 'Sounds of Soil: A New World of Interactions under Our Feet?' *Soil Systems* 45, no. 3 (2019).

Listening Handle

The *Listening Handle* is a conceptual object, designed to bridge our current, limited understanding of the world of soil and a future ideal, where we're more in tune with the ecosystems around us. An easily portable and tough object, it's designed to make listening to the soil straightforward, desirable and maybe even normal.

The *Listening Handle* encapsulates a soil microphone, amplifier, power unit and headphone jack into a hand-carved wooden handle. To listen to the soil, sustained contact between the microphone and the soil must be made whilst remaining still.

The shape of the *Listening Handle* suggests some visual similarities with the telescope as a tribute to one of the first significant objects which enabled humans to change their perception by amplifying an existing sense. Like a stethoscope, it has no ability to record findings; this is deliberately an object for *listening* thereby emphasising the importance of the soil and its processes, rather than *taking* recordings from the soil. It is an object designed for reflection and noticing which are critical components for learning about the fragile ecologies in which we reside.

47 Anna Lowenhaupt Tsing, *The Mushroom at the End of the World: On the Possibility of Life in Capitalist Ruins* (Princeton, NJ: Princeton University Press, 2021), 160.

It was partly inspired by Tsing when talking about human-disturbed

landscapes; 'We need to know the histories humans have made in these places and the histories of nonhuman participants.'⁴⁷ Furthermore, the act of crouching or sitting still brings a person closer to the ground and brings an engaged physicality to the act of listening to the soil.

Opposite The *Listening Handle* in use. Bois de Fargout Geneva, September 2023.









124528, Basel 2023

Listen, listen, what is it that you hear? A reflection on the power of sound.

The listener is almost certain to simultaneously create imagined gestures or link a sound to its illusory myriad of sources, evoking some kind of contemplative and thoughtful imagery in this process of mental resonance and mindful personalisation of sounds into various listening states.⁴⁸

Sound is continuous, omnipresent and dynamic. John Cage declared that there was no such thing as silence⁴⁹ and his piece 4'33 was a direct attempt to share this observation. Dyson highlights that Cage's experience in the anechoic chamber led him to believe that noise exists as an essential part of (human) being, and its continuous hum penetrates the universe of sound, even when it can't be physically heard.⁵⁰

Sound is a powerful force, providing a means to activate perception, spatial boundaries, bodies and voices.⁵¹ Furthermore our ears, unlike our eyes, don't blink. We are constantly immersed in sound. As a species, we fight back with noise-cancelling headphones, soundproofing and simply filtering unwanted sound - noise - out with our brains. Technology has also enabled what Dyson defines as 'individualised hearing - the ability to personalise our sonic experience of the everyday.'⁵² The ability to control and personalise the sonic is a luxury unavailable to other species. Yet no matter the technology used or our approach to the world; sound continues to exist, to resonate over,

48 Budhaditya Chattopadhyay, 'Object-Disoriented Sound: Listening In The Post-Digital Condition.' *APRJA* 3, no.1, (2014): 132-141. <https://doi.org/10.7146/aprja.v3i1.116093>.

49 Frances Dyson, *The Tone of Our Times: Sound, Sense, Economy, and Ecology* (Cambridge, MA: MIT Press, 2014), 117.
50 *ibid*, 118.

51 Brandon LaBelle, *Background Noise: Perspectives on Sound Art* (London, England: Bloomsbury Academic, 2020), xiv.

52 Frances Dyson, *The Tone of Our Times: Sound, Sense, Economy, and Ecology* (Cambridge, MA: MIT Press, 2014), 39.

through and within our bodies.

Haskell writes about the power of sensory connections; “we understand in our bodies what the mind acting alone finds hard to apprehend.”⁵³ The connection to the body is especially important as so often we characterise sound that is something that only the ears deal with. Our hearing is closely related to our sense of touch; both hearing and touch are mechanical senses, which detect movements in the outside world using receptors that send electrical signals. In touch, those movements occur when fingertips are pressed or stroked against a surface. In hearing, the movements occur when sound waves reach the ear and deflect small hair cells within it.”⁵⁴ Sound waves also impact our physical bodies far beyond our ears and sonic vibrations are used medicinally to treat a wide range of conditions.⁵⁵ Other animals *Umwelt*'s⁵⁶ are far more directly sensitive to sound and surface vibration.⁵⁷ Indeed many insects ‘hear’ through other organs such as skin or joints, but an exploration of this topic is outside the scope of this essay.

53 David George Haskell, *Sounds Wild and Broken* (London: Faber & Faber, 2022), 360.

54 Ed Yong, *An Immense World: How Animal Senses Reveal the Hidden Realms around Us* (London, England: Vintage, 2023), 213.

55 Lee Bartel, and Mosabbir, A., ‘Possible Mechanisms for the Effects of Sound Vibration on Human Health.’ *Healthcare* 9, no.5 (2021): 597. <https://doi.org/10.3390/healthcare9050597>.

56 *Umwelt* is defined by Bettina Korintenberg, Rachel Libeskind, Robert Preusse, Stefanie Rau in their chapter ‘Glossolalia: Tidings from Terrestrial Tongues’ “‘In der Welt des Regenwurms gibt es nur Regenwurmdinge, in der Welt der Libellen gibt es nur Libellendinge usw’ (In the world of earthworms there are only earthworm things, in the world of dragonflies there are only dragonfly things, etc.). In this understanding of *Umwelt*, every life form has its subjective world view. Living in the terrestrial condition, we need to abandon isolated world views and open up to an understanding of the permeable and process-driven ex-istence we all live. There is no *Umwelt* (the world that sur-rounds us and no *Innenwelt* (the world that is inside us), but an encounter of earthworm things and dragonfly things.” (edt Latour and Weibel, 2020, 320).

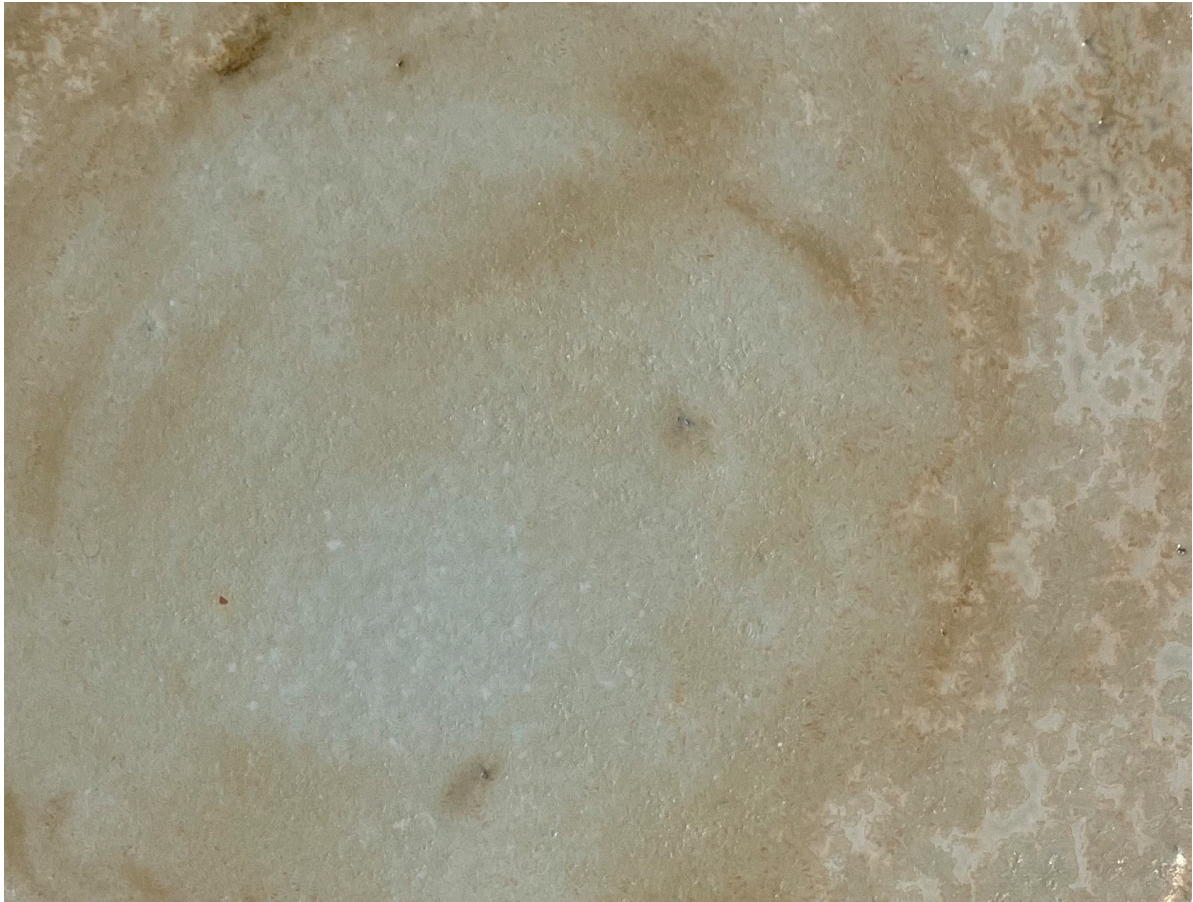
57 It is worth drawing a distinction here between airborne sounds (which is what we usually describe as sounds we can ‘hear’) and surface vibrations which enables communication by animals by sending vibrations across the solid ground. Ed Yong points out that throwing a rock in a pond generates very visible surface waves, and that throwing a rock on the ground does the same thing - the human eye just struggles to perceive it. (Yong, 2023, 191.)

Lean Me, Hear Me

Lean Me, Hear Me is a low table specifically designed to connect sonic vibrations through the body whilst centering and disrupting the listening experience. It is a domestic conceptual object which enhances the understanding of the connection between sound and body. Advancing our limited vocabulary of sonic experience, it highlights the importance of moving towards a world in which the design of everyday objects seriously takes into account the impact of sound on both the human and nonhuman bodies, leading to a strengthened integration of lives and objects.

Placed in the home, it acts as an everyday object that reminds us that sounds are always present, even if we cannot hear them using just our ears. Its legs are hand-carved in the same style as the *Listening Handle*, again with a small nod to the shape of a telescope. The ceramic on top is designed in such a way to intrigue anyone who comes across the table but is also subtle enough not to dominate a room.

It is designed to play recordings from under the soil, although it could be used to play any sound which humans cannot usually hear unaided. It is created in such a way that it is not possible to hear the recordings playing with just the ear. In order to hear the recording, you must physically connect your body to the table, with a gesture that is not normally carried out in everyday life. This can be done either by resting the head directly on the table, or by placing an elbow onto the ceramic dish and using the same hand to touch the head. The sound is transferred via bone and therefore directly into the inner ear without the use of the eardrum. The of physically connection with the table helps to focus the attention on the act of listening whilst reminding us that we too can 'hear' using vibrations, not just soundwaves.







Previous page (left) ceramic and wood textures and (right) leg details
Above using the lathe to shape one of the legs

Conclusion; beyond the topsoil

Imagine the possibilities of biospheric perception. Next to your daily calendar is a chart of the geological time scale. Next to the recycling rules is a chart of the geological timescale. Adjacent to your family photographs is a five kingdoms taxonomic chart. You begin to perceive patterns of change that stretch from soil microorganisms to global energy budgets.⁵⁸

Before the 20th century, ignorance of the nature local to you was an anomaly, posing a serious threat to human survival throughout most of history. The pursuit of modern progress led us to believe that this practical knowledge of local ecology was archaic. However, the absence of this knowledge has become a perilous aspect of The Anthropocene, fostering a one-way, extractive relationship with what we perceive as the natural world. Amid calls for radical change, perhaps the realisation that should dawn is that the absence of practical, local knowledge *still* jeopardises the survival of most people.

This essay has explored ways in which the urgent need for a paradigm shift in our understanding of nature and our position within it may be realised. Direct observation of the local environment emerges as a potential countermeasure to the seeming inevitability of The Anthropocene, fostering a deep connection with the biosphere and non-human life.

I have explored through my fieldwork the idea that listening to soils can serve as a gateway to expanding our comprehension of the world. From the conceptualization of *Sounds Local*, a domestic object mimicking subterranean sounds, to the creation of the *Listening Handle*, a portable tool for soil listening, my fieldwork has allowed me to unfold a narrative of tactile engagement with the environment. I have also tried to illustrate with conceptual prototypes, particularly in the form of the *Listening Handle* and the recordings *Listen Listen* I have shared, how expanding *Umwelt* can provide

58 Mitchell Thomashow, *Bringing the Biosphere Home: Learning to Perceive Global Environmental Change* (Cambridge, MA: The MIT Press, 2001), 6.

a bridge to the intricate world beneath our feet. The work seeks to open new avenues for understanding and appreciating the complex life that thrives beneath the surface.

In a world where sound is omnipresent but often overlooked, the essay argues for the power of sonic observation as a means to activate perception, spatial boundaries, and connections between bodies and voices. *Lean Me, Hear Me*, a low table designed to convey sonic vibrations through the body, encapsulates the essence of this argument, urging us to reconsider our relationship with sound and the hidden life within the soil.

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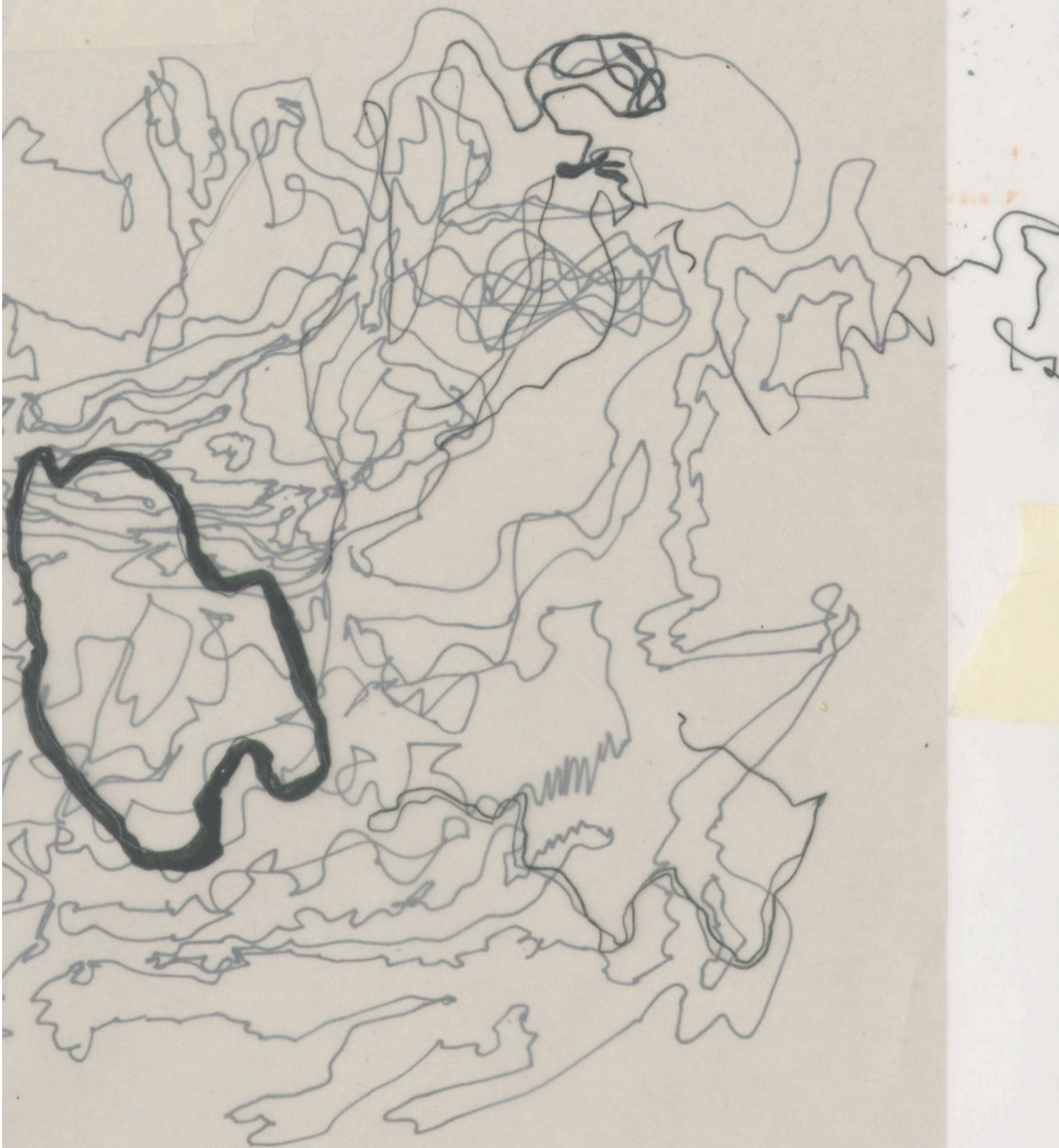
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