THINKING-WITH SOUNDS | Re-collection of an attempt

0. Building a loop – a quick note

This fifth and last chapter is composed of two distinct but interconnected parts. The first part, which starts below, is a continuation of the thesis. It presents some of the sonic experiments performed over the last few years in written form, to which a few images are appended. The second part however, a chapter 5' or 5[1], can be thought of as an »audio chapter«. Partly following the model of the *audio paper*, by Groth and Samson (2019, 2016, 2021) introduced earlier, it will expand on the descriptions below and render the experiments in audio format. A narration will guide through it, loosely mirroring the written chapter, either through an alternative storytelling, or through the repetition of some arguments presented in what follows. The audio chapter can of course be used in combination with the present one, but can also exist as a »standalone« version. In this, the audio chapter is not merely a companion for the written thesis, but works as a feedback loop, intending to expand (at least to some extent) on the flatness reduction of a written description of sound. Moreover, it is not only a presentation of audio. On the one hand, it actively takes part in the thesis, in the *doing sociology* and *making-of theory*. On the other hand, through its construction, it proposes interactions, encounters, *thinking-with*[1]. As it

1 More details on the construction and use of the following audio chapter will be presented as an introductory notice.

will hopefully become clear during this chapter, its audio »counterpart« is an integral part of the iterative process of thinking|doing that I wish to experiment with in a *thinking-with sounds*.

1. Gathering a thinking | doing

Throughout this work, my intention was to explore to which extent other modes of knowledge production could be pursued within sociology, showing that it is also a political and ethical question. Through *sonic thinking* and a new materialist understanding of sound, as well as through the generative quality of techno-aesthetic/ethico-aesthetic thinking, I hope to have shown that it is not only a methodological possibility, but that this possibility also implies to (re-)think practices and situations. In academia, surely, but in a very much bifurcated world altogether as well. *Staying with the trouble*, as Haraway puts it. Not intended as a manual, I see this work as a walking through, a thinking-with, an experiment not conducted in the (actually non-existing) void of a laboratory (Latour & Woolgar, 1986), but which accompanied me for several years, changing me and changing with me. The preceding chapters were quite theoretical, but conceived in a way that shows an evolution in my thinking process leading to a *thinking-with sounds*. In a classical manner, it (hopefully) demonstrates a logical argumentation, which in that fashion, appears artificially seamless, as if writing reflected thinking in an uninterrupted flow, delivered in a certain unity. The hesitations, the doubts, the drafts, typing, erasing, typing again, all of that disappears in what is now the printed »final product«. A product from which the *doing* seems quite absent.

Therefore, in this chapter, I want to look in greater detail at the process underlying the written thesis, or better said, present the *doing* entangled with the *thinking*. It asks how the practices of sounding and listening are linked to the practices of thinking. Hearing itself might

lead to thought[2]. But does thinking make you sound? Does it make you listen? I will introduce some experiments in *thinking-with sounds* which I conducted over the last few years, and how they fit together with further reflections on particular theoretical elements. Considering the gained experience, I will also need to confront what could have been failures in proposing that *thinking-with sounds*. Failures are important[3]. A few precisions though. This should not be considered as the empirical application of what has been discussed earlier, from which I would now display the results. Similarly, the sound experiments do not constitute the empirical ground from which the theoretical discussion emerged. Following the thinking-doing combination proposed by Manning and Massumi (2014), both the processes of sounding and listening (the experiments), thinking, reading, writing etc. are deeply entangled and not divisible in a before/after, theory/practice (or the other way around). I am aware that presenting them in the fifth chapter could however indicate otherwise. It is a narrative choice, made (for the sake of the argument) to insist on those thinking|doing entanglements rendered more visible[4]. It is a particular gathering, a particular combination.

Moreover, beyond presenting the sound experiments I will attempt to organise them within propositions — as sorts of lure for feelings (Whitehead, 1978) — which will branch out to particular concepts, ideas, experiences, either implied or more fully developed throughout this work. Some will appear familiar, directly linked to specific parts, some others will need more »unfolding«, bringing new ideas. The propositions — within which the experiments will pop up — are not separated from each other but also communicating with, depending on, co-creating each other. They could have been integrated in earlier chapters

2 »Heard things are first and often a strangeness that makes you think.« (Paulus, 2020, p. 172).

3 On the importance of failures in research-creation, see Manning and Massumi (2014).

4 An alternative narration following the temporal evolution of the research would be possible.

but were more impactful when engaging more directly with said experiments. Again, a narrative choice. Not something forgotten, included in haste, but another way of showing the evolution of thinking, as repetition and difference. The intent behind this organisation is thus on the one hand to reflect on the process of *thinking-with sounds*, as already argued, but also on the other hand to include a certain openness that emerged through those experiments. They should not be considered as discrete fields of application, but again, as propositions, as possibles. It comes close to what Manning describes as *anarchiving* in relation to the project *Immediations*: »a *repertory of traces*« (Rasmi, 2018). The anarchive is not limited to the *archive* — i.e. the documentation of past events — even if it needs it. It is a »*feed-forward mechanism* for lines of creative process, under continuing variations.«[5]. The anarchive can be seen as part of an unfixed and vibrating magma, between archive and speculative thinking, a gathering of a multiple of impacts itself becoming generative, feeding into new individuations. The anarchive thus becomes a variation on van Loon's socio-logy as *Empiraterei* (2017) described at the end of the third chapter.

2. Échos de la pierre – experiencing sound formations

The premises

The project *Échos de la pierre* is an experiment I developed as an art installation, performed in three iterations. Its first rendition was part of an afternoon of performances and installations called *ResonanzRaum*, which took place at the University of Eichstätt-Ingolstadt in June 2019[6]. It was then proposed as a particular installation in the St-Willibrord

5 For a more complete definition of the anarchive, see: http://senselab.ca/wp2/immediations/anarchiving/anarchive-concise-definition/.

6 It was composed of *Écho de la pierre*, a MIDI Sprout workshop, which will be described in more details later in this chapter, as well as an interpretation of Alvin Lucier's *I am sitting in a room* (1969).

church in Gravelines, France, in September 2019. As I will explain in the next part, each iteration is not an exact reproduction of earlier occurrences, but a variation. They share some characteristics and differ in others. The main idea for this project came from a documentary seen on the French-German television channel Arte (Jampolsky, 2017). In this short documentary, researchers were measuring and analysing the acoustic particularities of the Mont-Saint-Michel, mainly focusing on one of the churches as well as a crypt[7]. Doing so, they were intending to demonstrate how, already from the Middle Age on, monks and architects were aware of the relationship between sound and construction. In the crypt for instance, the researchers discovered that a subject singing from a certain point could perceive natural binaural beatings. In a nutshell, this phenomenon means that both ears perceive slightly different frequencies, too much apart to be the same, but too close to one another for the brain to distinguish two pitches. This closeness in the frequency spectrum causes them to go in and out of phase. This produces a beating effect, a come and go of the sound. If the difference between both frequencies increases, the beating becomes quicker. If both frequencies come closer to one another, the beatings slow down[8]. The main church presented other qualities: through its resonating and reverberating qualities, the sound of a choir singing could be heard at a higher pitch. This was described by one of the researcher as the »choir of angels« because of the feeling that other voices were singing the same part on a higher pitched harmonic and because the reverberation, by smoothing out the edges of the sound, rendered a sound perceived as more beautiful than the »original source«. Both examples, added to historical documentation, showed that those buildings were conceived with sound in mind. The dimensions of the rooms allowing reverber-

7 They reproduced the same research in other locations in France as well, trying to build a sort of acoustic archeology (Manaud, 2016).

8 This phenomenon, which I will present later in my own renderings, does not need to be »binaural«. In that case, the beatings still work, again as a slight coming in and out of phase between two signals.

ations or echo to happen, but also the materials used were known for their acoustic properties.

Without needing to share the religious ground that even somewhat transpired through the documentary, the striking element about those constructions was the acknowledgement that sound was playing an active part in the gathering of the community, in what one could understand as the production of the »social«. In their dictionary of sound effects, Augoyard and Torgue describe reverberation as follows:

> »Reverberation is socially perceived as an indication of solemnity and monumentality. It signifies volume and large size. This monumentality can be sensed as functional and inherent to the use of some locations (cathedrals, concert halls) or as unpleasant and residual for others (train station halls, concrete underground parking garages). Reverberation is also perceived in terms of ›resonance‹, a term referring, in everyday speech, to reverberation in general. Through its architectural representation, reverberation is easily associated with various functions of power (religion, justice).« (Augoyard et al., 2006, p. 116).

Those various functions of power are already sensible in the silence reigning over the ones who will dare speak or move. However, its expression is even more palpable in the time silence needs to take back its throne. It is the power of the institution directly tangible through sound. The monumentality — of the Church, of the administration, of the court — unfolds in the detention of knowledge and information. The silence becomes the forbidden, the inaccessible for the common mortal — retained by God, by the Executive, by Justice. The materiality of knowledge, retained, detained by the few, expressed in a silence kept until the hammer falling down breaks it. But then, sound, when emerging, is not only the judge, it also becomes the gatherer of the community. Reverberation as power is inscribed in particular gatherings, contributing to a form of discipline, the making of subjects, to which liturgy and singing also take part in. However, it is not only the meaning of the text sung that acts as discipline or gathering, but also the practice of sounding itself, in its materiality. By singing together in a

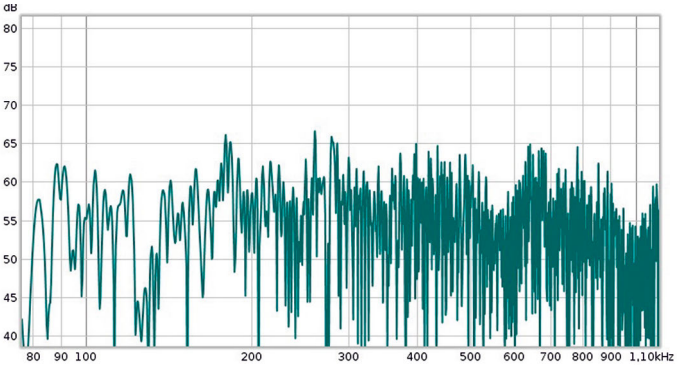
very resonant room, even more so where reverberation plays a supporting role (smoothing out the edges, gluing together the parts), a moment of communion in sound, through sound can happen. In this situation, a network made of stones, glass, wood, humans and of course sound — standing waves, echoes, reverberations, resonating frequencies — is being created. The sound becomes »social«, or rather part of it, producing it, because of the associations it creates. It is at the crossroads of various »intéressements«, as Callon would argue, not so much in the classical meaning of the word, but more through its Latin etymology, *inter-esse*, which literally means »in-between-being« (van Loon, 2014).

The installation

The concept behind the two occurrences of *Échos de la pierre* was therefore to emphasise the relation between sound and »the room«, and how they build a network that might produce what one could call »the social«, taking the quoted documentary as a starting point. How does this communion, gathering, can be understood, experienced, felt, when one does not start from the text, but from the sound? Is it possible to think-with the room, through sound? To produce a knowledge-generating and aesthetic experience of the room through sound? To engage with their materiality? Every room reacts differently to sound. Its dimensions, the materials composing walls, ceiling and floor, the absence/presence and dimensions of windows, furniture, people, animals, plants etc. All those elements have an incidence on the »frequency profile« of a room. Some frequencies will be absorbed, other will be amplified: the latter are the main frequencies of resonance. The intent was thus to detect the frequencies of resonance of a given room and play them back into it. The installation can be seen as the inverse process of what is pursued in building a recording studio. The studio is often thought of as a blank canvas where the engineer/producer can listen to the music undisturbed. Nothing should come between the speaker and the ear, not even the room itself as it would »denature« the sound, falsify the listening experience and lead the engineer/producer to decisions directly influenced by how the room made the sound sound. To produce a

generic recording studio, several techniques are used to soften the impact of the room, to reduce its resonant frequencies, to let the sound come to the engineer/producer »as it should be«. The spatiality of sound is being erased from the event. On the contrary, the installation intents to magnify and use those frequencies as its main instrument and bring the room to »express itself«, to be activated through sound. In doing so, it wishes to ask how the room and sound are co-constituting the experience one is »thrown into«.

Figure 1: Example of a frequency response measurement in RoomEq Wizard



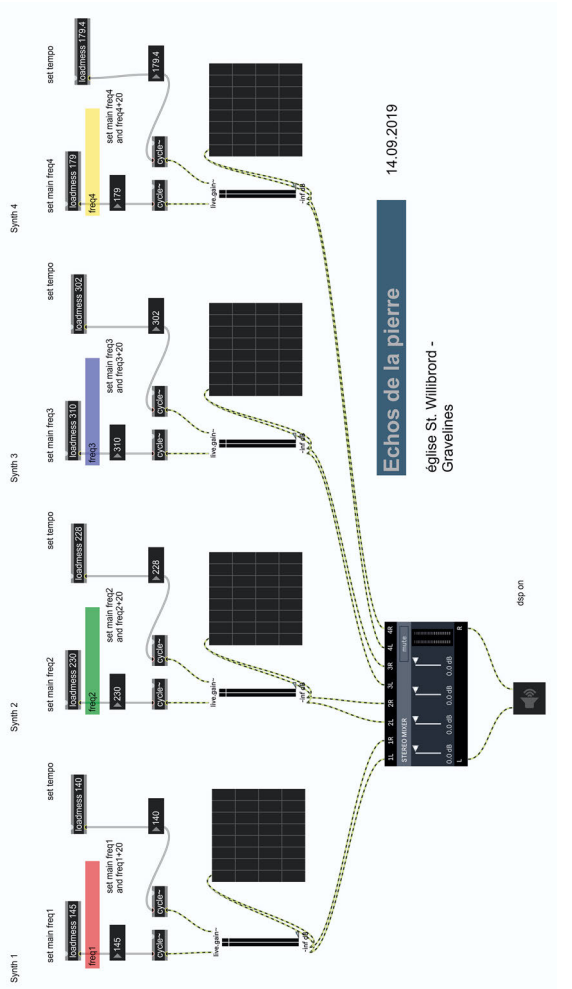
Source: Room EQ-Wizard, screenshot by author

To distinguish the resonating frequencies of a room, several measurements were made coupling the software RoomEQ Wizard[9] to a microphone with a »flat frequency response« — which means that it restores the sound »exactly« as it received it[10] — at different spots. In

9 This software is especially designed for this kind of measurements, mostly in the case of room isolation (i.e. recording studio preparation) and data analysis.

10 Those microphones, made specifically for measuring the acoustic profile of a room differ from other types of microphones like singing microphones, which are designed to support the frequency range of the human voice.

Figure 2: Max/MSP patch used in one of the performances



Source: Max/MSP, screenshot by author

each spot, the software generated a swipe of sound, from very low frequencies (15 Hz) to very high (20 kHz), which was played back through a couple of speakers. Still with the same software, the recorded data could then be visualised as a graph (fig. 1) as well as exported into various formats[11]. Because the microphone, calibrated to the speakers, has a flat profile and the room has not, the variations in the rendered spectrum can be interpreted as coming from the room itself. The most distinct values (»most resonating frequencies«) were then used to calibrate a set of digital synthesizers within the software Max/MSP using sinusoid oscillators (sine wave synths, giving a relative pure and smooth sound) which would be playing at those fixed frequencies during the length of the installation/performance (fig. 2)[12]. For greater clarity, each synthesizer's oscillator was doubled and detuned a few Hz, in order to simulate a beating as described above. Because each beating was set at a different frequency, each tone would »vibrate« at a different speed[13]. After this

11 The graph displays the frequency profile measured at a particular spot in the church. It displays the loudness (in decibels, on the Y-axis) for each frequency between 15 Hz and 20 kHz (X-axis, here only the chunk 80 Hz to 1,10 kHz is visible). Because of the microphone used (flat-response), and the sweep of sound at constant amplitude, it can be deduced that the fluctuations in loudness are a result of the room absorbing or reinforcing frequencies (depending of the materials, distance and orientations of the walls, etc). The most notable peaks (here around 160 – 180 Hz and 260 – 280 Hz for instance) can be considered as resonant frequencies at that particular spot. The harmonic content of the spectrum — i.e the relation between particular frequencies — is here not directly taken into account.

12 Another possible installation would be to have a synthesizer with a much broader frequency spectrum including each »most resonating frequency« of each position. Finer differences could be experienced between each position. The main drawback could be that including »too much« of those frequencies would produce a very full and almost noisy sound, which would make those fine differences also harder to hear. However, this has not been experimented with yet in the actual church.

13 In later experimentations, using around 20 partials of the same sound signals, the closeness between some of them produced a »natural« beating without having to implement it into the program and still retaining enough clarity.

setup, the installation can begin. The synthesizers will be playing nonstop in the room, producing a full harmonic drone haloing the participants who could move freely within it (and also to get out of the room if the constant sound signal was getting to difficult to bare).

The performances

The installation was proposed and performed the first time at my home university in Eichstätt, in the basement of one of the buildings, usually serving as a small theatre stage and rehearsing space. More a first try than anything else, it is a transposition of the thought experiment (experience the room through sound) in what one could consider as a »simple room«[14]. As explained above, it was part of a set of workshops/installation/performances, called *ResonanzRaum*, which took place in June 2019. In that case, the room was a rather »easy one«, almost a parallelepiped rectangle (excepted the inclinations of the ceiling at some places). It had a few windows and doors, some furniture (I only reorganised the chairs), a small stage, a ladder left in one corner, even a painting as some sort of screen on rolls (fig. 3). Soon after the drone started, the participants (colleagues and friends, quite familiar with each other) started moving around the room, feeling how the room reacted to sound. Some frequencies were amplified at certain positions, some beatings were getting out of synchronisation in other places. The participants stood up on chairs, went under tables, put their ears to the walls, touched them, touched the ground, closed their eyes, moved their heads. They were discovering, or rather re-discovering the room through sound. A sense of curiosity could be felt, the room was responding, through the resonance. Almost all stayed until the end.

14 Of course, no room is a simple room. I did not choose this one considering its history as a cloister however, but only as what I could »use« to try the installation in. The decision was therefore merely practical.

Figure 3: ResonanzRaum in Eichstätt

Source: Photograph taken by the author

The second iteration of the project was performed at a church in Gravelines in September 2019[15], a small coastal city near Dunkerque in France (fig. 4). The same methods were used for the measurements, spreading them over a few days, as I had to navigate between official services. The same synths were used, calibrated at different frequencies (following the measurements). Several main differences could be observed, in comparison to the first iteration. First of all, obviously, the room itself. Setting up the installation in an actual church with a reverberation time over two seconds (which means that a sound, be

15 I would like to thank the mayor Bertrand Ringot, the city's cultural department as well as the local parish, for lending me the equipment, promoting the event and giving me access to the church.

it loud enough, takes two seconds to decay completely) meant to be able to adapt the process, in terms of equipment used. The loudspeakers had to be powerful enough for usable measurements even in the most remote spot of the church. Because I only tried this installation type in one other room with much smaller dimensions, I had no idea if anything would even work, if the differences in resonance, due to the room, would manifest themselves, or even if the program designed for the first iteration would work properly in that new situation. Also, because the installation was being presented in a »working church«, I was unfortunately not given access to the altar for the measurements or the setup of the loudspeakers, where probably very interesting resonance phenomena could have been experienced, being right under a keystone[16]. The program had to be tweaked and rebuilt to respond correctly to the speakers, mixer and amplifier. The impact of the installation was greater than expected, at least in terms of the resonating effects, »moving around« the church. The resonating synth waves in a building with such reverberation also reinforced the idea of monumentality, as evoked above when quoting Agoyard and Torgue. The church was itself pulsating, very much responding to the drones, fluctuating at various speeds. A few spots were particularly surprising.

For instance behind a pillar, only one specific tone could be heard. One step further, the full drone came back again. Finally, the participants were not academics anymore but a broader audience, some of them even part of the church community. The openness towards the project and the willingness to discuss it beyond sociological theorizing was an important part of the installation. The participants themselves, just as during *ResonanzRaum*, but following different interests,

16 The assumption regarding the particular resonating properties of the altar's position could be verified later on the same year, during the attendance of a mass. At that particular position, under the keystone, the priest did not need a microphone to be loud enough, which he employed at several other spots of the church, he did not even have to raise his voice more than usual. His voice seemed transported, reinforced at a distinct frequency range. The importance of that very spot for Catholic religion has thus been translated into sound as well, by giving the altar strong resonance properties.

Figure 4: St-Willibrord church in Gravelines, France

Source: Photograph taken by the author

were moving, experiencing the church, »their church«, anew. They were co-building the event and the making of theory in that sense, through their own experience of the event, but also through the resulting exchanges of impressions.

The recording

There is no actual recording of the installation. However, wondering about the relation between sound and space, and how space is being induced in a sound recording, I began to think about the possibility to make a sort of »dematerialised« rendering of what had been presented in the church. The idea was to take the same resonant frequencies, and by further analysis to replicate the particular resonating characteristics of the church. The same sine wave oscillators could be used and recorded in a digital audio workstation (or DAW) and be processed afterwards to »re-create« the church in Gravelines. This is a very common process in music and sound recording. To give the illusion of a partic-

ular room, of liveliness, of realness, to give the music more depth and movement, reverberation is added as an effect to the instruments and voices. The process, originally made in actual reverberation chambers, is now mostly done using digital tools, either as external units or so-called effect plugins in music software. Through those effects, it is possible to re-create a room or create a room that was never there in the first place[17].

I experimented with two distinct approaches[18]. The first one had all sine waves recorded in a stereo signal, without any processing. Afterwards, an array of »EQ« effects were applied on the recording, i.e. filters sculpting the sound, either taming or reinforcing particular frequencies. The EQs were then calibrated to follow the measurements. For instance, where the measurements showed a high resonance at 180 Hz, the EQ was »boosted« at the same frequency. Each measurement position was then processed one after the other to give the impression of walking through the different positions, as if walking around in the church. A global reverberation effect was then added to give the signal more width. This approach was discarded after a while however. Both the process itself and the result were too artificial, and the link to the actual performance had been somehow lost. Moreover, the process was very impractical and not precise enough, having to drag and draw lines with the mouse on the graphical interface for each setting, which meant hours of »point, click and drag«.

17 One of the best examples for a room that never was can be found in the recording of Joy Division's *Unknown Pleasures*. The drums were recorded on the roof, therefore sounding very »dry« (no walls for the sound to bounce back), and were heavily processed afterwards to create an artificial room through reverb effects. See this interview of Martin Hannett, producer of *Unkown Pleasures*: https://www.youtube.com/watch?v=XI-w7LjSNi4.

18 Needless to say that I am neither a sound engineer nor a programmer. The process is very much trial and error based and only represents the extent of my knowledge on the subject. There are without doubt better approaches, using better tools. However, due to my personal interests, and on the basis of experimenting with a *thinking-with sounds*, a more »do-it-yourself« orientation seemed preferable to me.

The second approach was made possible through a feature in the RoomEq Wizard software, already presented above. Not only is it possible to export the measurements as text files, but as Impulse Responses as well. Without going too much into technical detail, Impulse Responses files can be understood as renderings of the acoustic characteristics of a room. It is a modelling of how sound behaves in a room, according to the acoustic measurements of that said room. A particular reverb effect — called a convolution reverb — can be used to load those files and then process the incoming sound »through« the room modelling. The result is a quite »realistic« reverberation. Those convolution effect plugins can be found in every DAW software. However, I decided to use the programming language and infrastructure SuperCollider, dedicated to music composition and sound synthesis. One of the advantages of SuperCollider, which nevertheless has a steep learning curve, was the ability to process quite a lot of information without much CPU usage (IR convolution reverbs can be very demanding) and to automate some actions (for instance reading the measurements directly from a text file rather than typing them one by one). In one »simple« program, the sine wave synths could be generated and played, the IR loaded and tweaked, the result recorded to a stereo audio file in one »homogeneous« performance. In total, more than 30 impulse responses were used, around 10 for each »aisle« of the church, corresponding to each measurement position. To reinforce the »re-creation« of the room, not only the measured frequencies were used, but the amplitude ratios as well. The sound processed through the IRs was then sequenced in a fictional »walkthrough« of the church, smoothly transitioning from one position to another, in a cross-fade following a linear curve, which although quite artificial, would indicate a constant and steady walk without footsteps, somehow reinforcing the uncanny ethereal floating of the sound, the eerie feeling of a church pulsating along, through which the listener as ghostly presence is navigating.

3. Thinking-with sound in iterations: repetition and rhythm

As already mentioned, the present work can be thought of as an array, an ensemble of iterations, each in its own fashion linked to *sound formation* and *thinking-with sounds*. It includes the two performances and the recording related above, but also the other experiments, the written work, the next chapter. The term *iteration*, borrowed from Manning and Massumi who use it in *Thought in the Act* to describe particular instances of their research-creation process (Manning, 2013; Manning & Massumi, 2014), can be understood as the repetition of a particular event in the sense of Deleuze[19]. Different from generality within which the terms are interchangeable, the repetition implies difference. It is a sequence of singularities (Deleuze, 1981). In the case of the sound experiments, conducted over the span of three years (when including the stumble and fumble), similarities can be traced between some of them, without however making them interchangeable terms. They are never the simple reproduction of the former occurrence, but imply a variation within the experiment itself.

For example, between the two first instances of *Échos de la pierre*, the performances in Eichstätt and in Gravelines, I used the same program (made in Max/MSP), the same sound generators (three or four digital sine wave oscillators). One could argue that they were re-presentations of the same piece. Although distinct, they retained the same global organisation, as if following a »score« (there actually never was a score per se). Nevertheless, they still are singular events. And even if there had been a score, two interpretations of a particular one do not produce identical representations. The score might appear to be a stable object, but it is not a generality rendering each representation inter-

19 It is also a process implemented in most programming languages. In those cases, it simply means repeating a particular instruction, function, over time. Even if the temporal separation is not felt as much due to the processing capabilities of modern computers, the iterations are still sequenced and indexed, one after the other.

changeable[20]. Difference, then, can be expressed in many ways. From the participants to the room itself (one being a university drama rehearsing room in the basement of a former Capuchin monastery, the other one being a 16th century church), their walls, their floors, the height of the ceiling etc. As if different instruments were played in different keys. From the knowledge gained after the first representation to the new challenges I faced during the second. In the duration of the performance itself, even. But also due to their temporal sequencing. After *ResonanzRaum*, I resumed writing what is now an aborted second draft. After *Échos de la pierre*, I started to re-think the whole organisation of the thesis. The recording was made in two distinct and very different approaches, separated by several months, reflecting my own change in which tools to use. Knowledge had been gained in the meantime. For instance, I started to learn the programming languages Supercollider and Csound, I drifted away from Max/MSP to prefer open source alternatives (such as Pure Data) and text based programs (such as SuperCollider).

I am not saying that there is a direct causal link but that the sequencing of the events matters as much as the event themselves to understand their singularity, as particular samplings of the sonic flux. The event as iteration therefore allows to think difference even in similarity, and it is precisely in that difference that knowledge can be generated. It is evolutive, depending on the milieu in which it emerges, a difference actively »made« (Deleuze, 1981). If Walter Benjamin saw a loss of a medium's aura after technical reproduction in the industrial age, the experiment as performance, as simulacrum, as particular iteration generates it anew each time. It is not a mere copy, but adds momentum, a possibility for further reflection.

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20 This seems to be true even in the representation of classical music, as the conductor Seiji Ozawa shows in his conversations with the author Haruki Murakami (Murakami et al., 2017). However, one could still note that it has been of one the great illusion of Western musical traditions to believe that the »score as music« — as written and visual representation — could render an immutability and perfect reproducibility of the music as event (Sha, 2013; Solomos, 2013).

> »Il ne suffit pas de multiplier les perspectives pour faire du perspectivisme. Il faut qu'à chaque perspective ou point de vue corresponde une oeuvre autonome, ayant un sens suffisant : ce qui compte est la divergence des séries, le décentrement des cercles, le ›monstre‹. L'ensemble des cercles et des séries est donc un chaos informel, *effondé*, qui n'a pas d'autre ›loi‹ que sa propre répétition, sa reproduction dans le développement qui diverge et décentre.« (Deleuze, 1981, p. 95).

One could even argue that each iteration becomes that simulacrum, refuting a distinction between original and copy, but affirming a difference, beyond representation, or rather »underneath« it, which for Deleuze, leads to the »real experience«, as encountered in the first chapter. The simulacrum, as difference, generates knowledge. In relation to my own practice, each iteration is an engagement with the process of thinking-with sounds, not as application, but altering it, constituting it. Thinking|doing. This is true of the experiments described above, as well as the ones following, but this is true of the written thesis as well, itself becoming a particular iteration, another individuation, another expression of a *thinking-with sounds*. Understanding the iteration as *simulacrum* can however only be helpful through what it sets into movement, as proposition, not as methods following a principle. And this is probably why *thinking-with sounds* as whole, even if multiple, even if moving, does not entirely fit the description, though one could argue that thinking in iterations »flirts« with the idea: it probably contains a too strong principle but are not copy of a model, rather variations based on the difference. However, through the relation between simulacrum and chaos, Deleuze's understanding of the concept allows to think in multiplicities and thus, in the multiplicity of modes of knowledge production:

> »Le système du simulacre affirme la divergence et le décentrement ; la seule unité, la seule convergence de toutes les séries est un chaos informel qui les comprend toutes. Aucune série ne jouit d'un privilège sur l'autre, aucune ne possède l'identité d'un modèle, aucune, la ressemblance d'une copie. Aucune ne s'oppose à une autre, ni ne lui est analogue. Chacune est constituée de différences, et communique avec les autres par des différences de différences. Les anarchies

> couronnées se substituent aux hiérarchies de la représentation; les distributions nomades, aux distributions sédentaires de la représentation.« (Deleuze, 1981, p. 356).

4. A rhythmic thinking

Beyond the simulacrum however, thinking in terms of difference and repetition and the resulting importance of sequencing leads to another concept developed by Deleuze, with Guattari this time, namely the concept of *rhythm*. Because the sequencing of events matters that much, and because a thinking in iterations is not a mere reproduction of past events, but a repetition bringing difference, a *thinking-with sounds* is also a *rhythmic thinking*. For both authors, the rhythm is what drives the process, it is what introduces the difference. It is fundamentally different from the »meter« or measure, which is considered as a rather static return of the identical, either following equal units of time or repeating itself the same element or event (Deleuze & Guattari, 1980). The meter is seen as »non-productive (or only reproductive) and thus empty periodicity, a static repetition that does not produce difference (Herzogenrath, 2017a, p. 111). On the contrary, rhythm is productive because of the difference it implies in the repetition:

> »C'est qu'une mesure, régulière ou non, suppose une forme codée dont l'unité mesurante peut varier, mais dans un milieu non communiquant, tandis que le rythme est l'Inégal ou l'Incommensurable, toujours en transcodage. La mesure est dogmatique, mais le rythme est critique, il noue des instants critiques, ou se noue au passage d'un milieu dans un autre. Il n'opère pas dans un espace-temps homogène, mais avec des blocs hétérogènes.« (Deleuze & Guattari, 1980, p. 385).

Ritournelles

In the relation between rhythm and milieu operated here, and through the ever-going transcoding characteristics of rhythm, one could under-

stand it in terms of individuation as transductive. It is transductive because it »grows out of the edges«: it is an operation producing a milieu and separating itself from it, evolving within it and further structuring it, »de proche en proche«, »from one place to the next«[21]. This transductive quality of rhythm can be expressed through Deleuze and Guattari's use of the *ritournelle* in *Mille Plateaux*. The *ritournelle* or *refrain* is itself repetition and difference, a multiplicity gathering and fixating (it is for instance the *logos* of the refrain, the child singing in the dark to gather strength), but also »impacting« individuations as new iterations, an opening, an improvisation. The ritournelle is therefore itself a movement of transduction. Each individuation co-produces its own milieu in distinguishing itself from it, remaining bound to it, which means, that it changes it as well. It is at the same time an ordering, an »agencement« of chaos, into a territory (more on the territory later), which is already a gathering, but also a »departure«, a re-configuration of that territory and its exceeding towards other »agencements« (Deleuze & Guattari, 1980).

In looking closer at the *ritournelle* and its relation to rhythm, this might explain why Deleuze and Guattari propose that the rhythm and the »rythmé« are on different planes. The »rythmé« as a particular individuation, bound to a milieu, the rhythm, as what cadences, sequences, and co-produces the individuation, is an in-between, always a becoming, driving the individuation[22]. A *thinking-with sounds* in iterations can thus be understood as a rhythmic thinking. It becomes a thinking in *ritournelles*, which are generative, engaging with the multiplicity of modes of knowledge production, intensifying experience, which reminds of

21 »[…] a physical, biological, mental, social operation through which an activity propagates within a domain, by founding this propagation on a structuration of the domain that is realized from one place to the next.« (Simondon, 2005, p. 32; English translation quoted from: Barthélémy, 2013, p. 230).

22 One could argue that the rhythmic component of the iteration ends the comparison with the programming language, which more often than not, is enclosed in its idiosyncrasies and language limitations and remains bound to the meter as the logic of code. However, this would not entirely be true, as »transcoding« between different languages is possible.

Guattari's own ethico-aesthetic paradigm, described in the fourth chapter (Guattari, 1992). The iterations themselves become what is »rythmé«, what is individuated. It has been shown in the third chapter, that for Simondon, operations of individuation are not only found in beings only, but also in thought and knowledge production (Combes, 2013; Simondon, 2005). The performances in Eichstätt and Gravelines are therefore particular individuations, not only of the *sonic flux* but also of a *thinking-with sounds* as well. The different bodies, »rythmés«, another pulsation, giving rhythm. Furthermore, when arguing that the written thesis can also be thought of as an iteration, it is precisely in that sense. As gathering, it is a particular individuation, a particular »actualisation« of the rhythm into the »rythmé«.

Moreover, those rhythmic practices can be understood as so much *ritournelles*, because of the processes of territorialisation and deterritorisation they operate on what's being »rythmé«. The *ritournelle* as territorial assemblage can fixate, but it can displace, it can move and reconfigure as well as mark a territory, a boundary. Christoph Cox explains how the evolution of music, from being conserved as score, to its recording to physical media and later on »dematerialised« into MP3 files are particular expressions, particular *ritournelles*, in turn territorialising, deterritorialising and/or reterritorialising the sonic flux (Cox, 2018). The rhythmic component of a *thinking-with sounds* also presents traces of the *ritournelle* in the particular performances and experiments described above.

As Deleuze and Guattari note, those processes are not only spatial processes, not only topological mappings and geographical boundaries, but »existential territories«, more or less fixating rituals and subjectivities. The *ritournelle* is a territorial assemblage, which itself is a gathering, a collection (Deleuze & Guattari, 1980). A *thinking-with sounds* as *ritournelle* is territorialisation in its situation and the acknowledgement of its situation. It is also a gathering of everything that is *thought-with*, not only sounds, but theories, concepts, sensations as well. In that sense, it is a »theoretical ritournelle«, as Guattari would put it (Guattari, 1992). However, through the aesthetic practices of sounding, listening, of the doing entangled in the thinking, the *ritournelle* is not only theoretical,

but it also locates through sound, it actualises the sonic flux into a particular place: »Le territoire serait l'effet de l'art…« (Deleuze & Guattari, 1980, p. 388). An art that is however not the privilege of human beings[23]. The question which follows is then if and to which extent the territory, as place of emergence of expressive qualities, is also where knowledge production happens? Or, in the case of *thinking-with sounds* if indeed it shows the multiplicity of possibles, of modes of knowledge production, being a *ritournelle*, a gathering?

> »La ritournelle, c'est le rythme et la mélodie territorialisés, parce que devenus expressifs, — et devenus expressifs parce que territorialisants. Nous ne tournons pas en rond. Nous voulons dire qu'il y a un auto-mouvement des qualités expressives.« (Deleuze & Guattari, 1980, p. 389).

Dissolving meaning

As already mentioned, the inspiration for *Échos de la pierre* was the work of Olivier Manaud, showcased in an Arte documentary on the Mont-Saint-Michel. Beyond this example, Manaud focuses on Roman abbey churches built between the 11th and 13th centuries (Manaud, 2016). The core argument is that in the medieval era, abbeys and churches were built as music instruments rather than only »functional« buildings. According to this premise, Manaud argues that there is an analogy between the resonance of a church as a building and what he calls the »inner and spiritual resonance in the heart of the believers, members of the Church as a gathering.« (Manaud, 2016, p. 55, transl. by the author). This particular relation, between the community and the place itself, is based on sound. It even requires a reciprocal acceptance through sound. It becomes a sort of tuning between the church — as a building — and the community, to which Manaud refers to as the »hospitality« of the church. In other words, the ones willing to »sound« in that

23 They quote here Olivier Messiaen's work on birds. I would add the work of Vinciane Despret in *Habiter en oiseau* (2019) and of Baptiste Morizot in *Manières d'être vivant* (2020).

building should learn its language first, in order to be fully welcomed by the place, just like a musician learning to play her instrument. Music or sound which would not respect the acoustic particularities of the church would only »transform this hospitable place in a place of gruelling combat.« (Manaud, 2016, p. 63, transl. by the author). What is interesting here is the »how to use« manual of a church as an instrument that Manaud is giving, or at least referring to. By understanding the resonant frequencies, and the harmonic relations between them, singing is magnified through the church. Neglecting them, for instance having a lot of people speaking at the same time, the magnifying reverberation turns sound into an indiscernible mush. Hospitality can therefore be understood as the capacity of the church to »sound good«. The church is welcoming because it sounds welcoming.

What remains unclear is to which extent the church as building and the Church as gathering are indiscernable in the notion of hospitality, i.e. to which extent Manaud's writings do bear the trace of transcendental aesthetics, as one could argue with Cox (2018). It is built as an analogy, but is it also meant as a prerequisite? A combination of resonances (acoustic resonance of the building and the community singing, spiritual resonance of the community of believers with the ethos of the Church) in order to access the »Divine«? Moreover, and remaining within the church as building and the hospitality as an acoustic welcoming, one could still argue that just like any other instruments, practices of improvisation and »alternative techniques« could be employed. It is already a strong aesthetic judgement to consider the possible sonic mush as »gruelling«, thus limiting the sonic potential of a place to what is deemed beautiful by a very particular and situated canon. Still, it reminds of Simondon's aesthetics, which are not simply considering the church as a tool and its function to fulfil, but an aesthetic *with* the tool, with the church itself.

In any case, and outside the religious meaning of the church's »hospitality«, there is a respect towards the place, a sonic materialist encounter with the church, as an instrument, as an actor, or rather, a network of actors, sounding and listening. It is a composition, in the sense of Latour (2010a), towards sounding, a composition with the room, with

the wood, the glass, the stone, with the bodies inhabiting it. A comeback of the magical through the aesthetic? An encounter extending beyond western traditional music. Indeed, churches are becoming more and more sought after locations for concerts and sonic experimentations, which go far beyond liturgical and classical music. Composers like Kali Malone, Maria W. Horn and others engage not only with a given church, but with the church organ as well, mixed with electronics, working and »sculpting« sound, and how the church responds to it. The sonic experience is indistinguishable from an experience of space itself. *Échos de la pierre*, working with digital synthesizers also follows this path. Spirituality can be part of it, but unlike what Manaud thinks, it is not a prerequisite or could become quite critical as well. However, he is right by stating that: »The fact of inhabiting a place, including and mostly in a sonic way, makes this place a living reality and thus in perpetual mutation.« (Manaud, 2016, p. 63).

Coming back to Deleuze and Guattari, *Échos de la pierre*, and beyond that, concerts and installations, in a church or in other places, are indeed practices both of (re-)territorialisation and of de-territorialisation, as proposed earlier when introducing the *ritournelles*. They engage with the materiality of the place, of sound itself. As art practices, they locate, delimit, they place a boundary (Deleuze & Guattari, 1980). They situate, build and inhabit a territory in mutation, through the actualisation of the sonic flux as individual sounds and their production as »music«, their engagement with the church as building. With raw sonic material however, as well as through experimental and modern uses of a church organ, or through »alternative techniques« not belonging to the classical canon of »church-acceptable« music, and also beyond the twelve-tone equal temperaments tuning system[24], meaning, sig-

24 See the work of composer and oud player Khyam Allami: https://isartum.net/. He developed a browser-based application in cooperation with the CTM Berlin to experiment with tunings outside the classical Western systems. His approach is a great reflection on power relations within musical notation and tuning systems, but also branches out to the implications such power relations had and still has on the conception of instruments and digital tools for music production. For instance, the fact that out of convention and habit, most

nifications, representations shift gears, and become multiple, through the experience in sound. Questioning of biases, relations of power and alienation are becoming possible, in how territories are being produced and reproduced, through sound. In this, it is also de-territorialisation, because it exceeds the original hospitality of the church as described by Manaud, without however taking anything from the resonant characteristics of the church as building. Through its sonic expression beyond »welcoming sounds«, the territory of the church is re-modelled. If »church music« is already a *ritournelle* territorialising through liturgy but also through the expressive quality of sound, the installation at once de-territorialises (»extracts« the church as building from the Church as ethos) and re-territorialises it, creating a new territory within the church as building. Those dynamics are of course not the prerogative of the mentioned installations. To remain within the church, one could argue that Black gospel music, through its history, is itself already a particular and very powerful *ritournelle* at the crossroads of processes of territorialisation and deterritorialisation. In all cases however, in the focus on sound, as *thinking-with sounds*, the practices are co-prehension, co-constitution of the situation through the aesthetic, particular individuations of the sonic flux: »Meaning and sense dissolve into rhythm; identity and self are absorbed into space.« (Cox, 2018, p. 101). The following quote by Deleuze and Guattari expresses well this movement of territorialisation and deterritorialisation through sound, a sonic flux

tools communicate via MIDI, a protocol based on the 12-tone equal temperament system (other protocols bypass this cultural bias however, for instance with the Open Sound Control protocol), or the predominance of the Western piano keyboard layout in composition and in the production of synthesizers (Wilde, 2019). In short, Allami and others challenge the inherent biases and sonic colonialism present at the heart of software and hardware used in music production and education. As they expose in a discussion panel for the CTM festival, the designs and functions of musical tools contain music theories and conventions. The question they ask is which ones, why those in particular and why not others. See the discussion at https://www.youtube.com/watch?v=lwvVj2mPY0Q.

»avant la lettre«, a sonic materiality reinforcing the importance of experience:

> »Il semble que le son, en se déterritorialisant, s'affine de plus en plus, se spécifie et devienne autonome. […] Cette puissance, le son ne la doit pas à des valeurs signifiantes ou de ›communication‹ (qui la supposent, au contraire), ni à des propriétés physiques (qui donneraient plutôt le privilège à la lumière). C'est une ligne phylogénique, un phylum machinique, qui passe par le son, et en fait une pointe de déterritorialisation. Et cela ne va pas sans de grandes ambiguïtés : le son nous envahit, nous pousse, nous entraîne, nous traverse. Il quitte la terre, mais aussi bien pour nous faire tomber dans un trou noir que pour nous ouvrir au cosmos.« (Deleuze & Guattari, 1980, p. 429).

Re-creating a room

As explained above, the »recording« of *Échos de la pierre* could be considered as a »dematerialised« rendering of the performance that never was. This might strike as paradoxical, having underlined heavily the materiality of sound in the previous chapters. It is indeed a slight but nonetheless determining misuse of language. Even though the performance is being confined in a digital audio file, produced from a purely digital program, it does not mean that it has lost its materiality. As Cox notes, even digital sound is very much material, the data must exist somewhere (Cox, 2018). It is rather a reterritorialisation, from the church to the storage medium. Cox appends another Deleuzian — or rather Guattarian (Shields, 2003) — duality to territorialisation/deterritorialisation processes, which is that of »actualisation«/»virtualisation«. For Cox, and following Pierre Lévy, this duality can be defined as follows: »Virtualization is a process that involves detachment from the present (the here and now) and movement towards a general problematic field from which new actual entities are generated as solutions.« (Cox, 2018, p. 50). Referring to this definition, it is easy to understand the sound files for *Échos de la pierre* sitting on my hard drive as virtualisation. They detach the performance from the present. They are easily

moveable to another drive, to a network, to a remote place, an undefined somewhere sometime. Real but not actual (Shields, 2003). In that manner, according to Cox, the virtual sound file is deepening the fluidity of sound. It »accelerates the circulation and replication of audio recording, dereifying it, rendering it as pure information that confounds the logic of scarcity on which commodification depends. All these modes mark out various ways in which the sonic flux is interrupted, cut, sampled, captured, diverted.« (Cox, 2018, p. 75). Those processes gain in depth and movement however, when read through another understanding, closer to Actor-Network Theory, also encountered earlier:

> »A subjective mode of engagement is oriented towards *virtualisation*; it is the creation of multiple possibilities between the no-longer and the not-yet, a zone of potentiality in which ›things could take place‹. An objective mode of engagement is geared toward *actualisation*, the limitation of possibilities that we can associate with a ›becoming‹ real; subjectivation is the enablement of action, of inaugurating possibilities and thereby, for example but not exclusively, the need for decision.« (van Loon, 2012, p. 199).

In the case of sound recording, there is indeed a movement of *virtualisation*, but as Cox notes, it is a deterritorialisation of memory, of storage, although only to the extent where computer hard drives and servers work flawlessly, to the extent that programs and devices able to decode the files still exist[25]. Nevertheless, each time the file is being played, following a process of conversion, from data to physical movement, there is an actualisation. A movement of objectivation. As Cox writes, »a cut« in the sonic flux. At the same time however, the sound itself, the recording, moves, allowing for an encounter, it could become »ethical« in van Loon's sense, which means that it does not remain »indifferent« but cre-

25 Schrödinger's music and compatibility: what does a file become when no computer can read it? An extreme actuality? Dead, unusable, fixated? Or extreme virtuality, a quantic object existing in several states at the same time? Not having any means to read it: how does one know if the file is damaged or not?

ate new potentialities, new associations[26]. In other words, the cut in the sonic flux is also what propels it forward. In that case, the recording becoming »anarchive«, enabling new iterations, contributing to the rhythm. The deterritorialisation of *Échos de la pierre* works in a similar way: it is archive, anarchive as virtualisation of memory (in relation to the event that never was). It is also presenting a virtual room, based on the actual, but exceeding it. It is the construction of a room with potentialities not yet or no longer actualised.

5. Thinking-with space

Thinking-with sounds is inherently a spatial thinking: »a place is generated by the temporality of the auditory« (LaBelle, 2010, p. xvii). This has been introduced in the third chapter, when describing Schulze's sonic thinking. This has been amplified here through the driving rhythms of territorialisation and deterritorialisation. Rhythms and their expression in *ritournelles* are at once bound to a territory — which is not a milieu, rather an »act« territorialising rhythms and milieux (Deleuze & Guattari, 1980) — as well as to »the forces of deterritorialisation, and of becoming.« (Herzogenrath, 2017a, p. 112). Rhythm carries multiple foldings and unfoldings, at the same time a physical localisation, due to the very nature of sound and a situation in the sense of Haraway (1988). What a *thinking-with sounds* allows however, is not so much a thinking *about* space. The processes of (de-/re-)territorialisation are not bound to a location, like filling an empty container, nor are they considering space itself as an inert and already constituted object. Instead, it can be thought of as a *thinking-with space* itself, or as Dereck McCormack (2008) puts it, a *thinking-space*:

26 It could, but it is not necessarily the case. The distribution of music through streaming services in computer generated playlists as »wallpaper« music could be a limit bordering »indifference«. See the work of Liz Pelly (2019) on the subject.

> »In contrast [to a thinking about space], *thinking-space* might be better understood as the co-intensive sensing, in affective-dynamic terms, of the creative processuality of something in the world forcing us to think: that which, as Deleuze puts it, ›is fundamentally an object of encounter rather than recognition‹« (McCormack, 2008, p. 3).

In attempting to challenge the field of geography through research-creation practices close to Manning's description, McCormack therefore shifts how space is to be understood and »used«. To do so, he combines Deleuze and Guattari's *ritournelles* (mostly focusing on Guattari's particular contribution and experiments) and Henri Lefebvre's own understanding of rhythm and rhythmanalysis (2000; 1992). *Thinking-space* or *thinking-with space* thus engage with multiplicity and the intensity of experience. It proposes another geographic practice that becomes an experiment opening into other modes of knowledge production:

> »The key point is that despite some differences in their theoretical orientation, both Lefebvre and Guattari point to the importance of the refrain of thinking-space as both process and noun: with respect to process it is about inflecting thinking through affective encounters of different degrees of intensity; and with respect to the latter it is about producing facilitating contexts — sites of experience and experiment for thinking relations between bodies, concepts, and materials of various kinds.« (McCormack, 2008, p. 7).

Following McCormack, one could again repeat the argument above and initiated in the third chapter that a *thinking-with sounds* is necessarily a *thinking-space*, even in its »deterritorialised« digital setting, creating, re-creating the room. There is however another particular *thinking-space* happening, in the relation between sound, its propagation, and its encounters with other actors, bodies, materials, that can be best described through Alvin Lucier's 1969 piece *I am sitting in a room*. In this piece, Lucier is reading a text out loud, recording and playing it back into the room. The playback is itself recorded, played back, and so on, repeating the cycle of playback and recording. Because the recording is

also picking up the resonance of the particular room in which the signal is played back, the particular resonant frequencies are being amplified in each instance so that after a while, those frequencies are »taking over«. Repeating the process always brings a bit more of the room. The spoken words are progressively disrupted, becoming a homogeneous drone. The text read by Lucier is a description of the piece and of the process happening:

> »I am sitting in a room different from the one you are in now. I am recording the sound of my speaking voice and I am going to play it back into the room again and again until the resonant frequencies of the room reinforce themselves so that any semblance of my speech, with perhaps the exception of rhythm, is destroyed. What you will hear, then, are the natural resonant frequencies of the room articulated by speech. I regard this activity not so much as a demonstration of a physical fact, but more as a way to smooth out any irregularities my speech might have.« (Lucier & Simon, 1980, p. 30).

By describing exactly what he intends to do, Lucier actually takes away the importance of the text itself and in a (possibly unintentional) wink to McLuhan, re-invests the acoustic space. Indeed, the words describing a process are repeated over and over. This repetition, as an aesthetic choice, already empties the text from meaning, or rather, gives a new dimension to the description it contains, escaping linearity. Its endless repetition underlines the absurdity and lets the listener wonder if any text is the same. It mirrors the repetitive nature of sound itself (as repetition of cycles of a waveform over time). However, even more than that, the very action of sound which through resonance destroys the text, actually destroys the word and thus the meaning of that word. The linearity of the text is being swallowed by the all-encompassing sounding room. Through speech, microphones, loudspeakers, and a room, a thinking-with sound became a thinking-space, as it shows the possibility but also the fragility of speech and thus of sound. But even further than that, the dislocation of speech becomes the dislocation of the performer's identity (Cox, 2018), leaving no place for a constituted and fixed subject. There is a co-creation of a particular sampling of the sonic flux,

an encounter, a co-prehension reinforcing the materiality of sound and of the room, another individuation.

The process underlying *Échos de la pierre* is similar[27], even if it loses the meaningful/meaningless aspect of the text. By flooding the room with sound, according to its resonating characteristics, another movement is taking place. Not from the text to the drone, but between each position, each corner, each encounter with the sound source. If *I am sitting in a room* is a storytelling, *Échos de la pierre* almost appears as a sonic mapping. In both cases however, resonance and reverberation are the acoustic phenomena at the core of *thinking-space*. They underline the repetition, the anarchive, the multiple. As expressed in the anthology *Spectres II*:

> »To resonate: *re-sonare*. To sound again — with the immediate implication of a doubling. Sound and its double: sent back to us, reflected by surfaces, diffracted by edges and cornes. Sound amplified, swathed in an acoustics that transforms it. Sound enhanced by its passing through a certain site, a certain milieu. Sound propagated, reaching out into the distance. But to resonate is also to vibrate with sound, in unison, in synchronous oscillation. To marry with its shape, amplifying a common destiny. To join forces with it. And then again, to resonate is to remember, to evoke the past and bring it back. Or to plunge into the spectrum of sound, to shape it around a certain frequency, to bring out sonic or electric peaks from the becomings of signals.« (Bonnet & Sanson, 2020, p. 9).

Without relying too much on the metaphorical power entailed in resonance, the quote nonetheless »resonates« with how I experimented with *Échos de la pierre*. The materiality taken seriously, the rhythm of the work itself pulsating forward. *Échos de la pierre*, just like *I am sitting in a room* and many other similar experimentations are engaging with space in a very generative way. To come back to what I described in the third chapter, as *thinking-space*, they not only are *in* space, but they *activate* space. Between fleeting heterotopias (Foucault & Defert, 1999), new

27 It is also inspired by Lucier's work.

possibles, new purposes, co-production and co-creation. In that sense, a *thinking-with sounds* becomes topographical (LaBelle, 2010), or rather, it becomes topological: a pursuit of multiplicity, an acknowledgement of complexity (Shields, 2013). The territories becoming a »partition« as Despret notes, drawing networks of sonic territorialities (Despret, 2019).

6. The event as theory-building

Ethical_machines

Also part of *ResonanzRaum* was another smaller workshop, quite different from *Échos de la pierre*, but still one amongst multiple iterations. A repetition with difference that started back in 2017 in another workshop at the University of Alberta in Edmonton, Canada. A life-changing moment that set my research on a new track. The workshop, which was led by Ipek Oskay, was a first introduction to the MIDI Sprout, with which the participants could then experiment themselves. As already explained in the introduction, this first encounter could probably be considered as one of the first impacts, perhaps even the original iteration of *thinking-with sounds*. Willing to share what was then experienced, I proposed a similar workshop back in Eichstätt, where colleagues and friends took part in[28].

The MIDI Sprout (fig. 5) is a device made by Data Garden which measures »biofeedback«[29], i.e. very small current differences between two poles through a couple of sensors (put for instance on the leaves of a plant, but it also works on human hands), and translates those measurements into MIDI data (both notes and control messages). This data can

28 I will only focus on this particular event. Other iterations also include the experimentation with generative and responsive environments inspired by Sha's work (2013), adding light, temperature and movement sensors to the MIDI Sprout. It is still an ongoing process.

29 The more scientific description for this phenomenon would be »galvanic response«.

be used to trigger musical instruments which understand MIDI data, either through a computer (instruments plug-ins, software synthesizers) or hardware instruments with MIDI capability. In other words, this device makes the plant »sing« or »play music« by itself[30]. Using the MIDI Sprout, I had no particular intent in delivering a scientific account for how to »communicate« with plants. Still, one could argue that communication does happen through play, the plant becoming not an instrument itself, but a co-"performer«, producing »notes«. The idea behind the workshop was therefore to propose this playful environment bringing together humans and non-human actors, and consequently to reflect on distributions of agency. Who is the actor? Who is the subject/object? Why is this important?

After showing how the device worked (i.e how the electrodes could to be placed onto the leaves, the relation between the device and the computer etc.), I first let the few participants free to engage with the situation without too much intrusion from my part. Following a series of technical and rather »reasonable« questions, based either on a genuine interest, politeness and a scientific habitus, another mode of experiencing quickly surfaced and lasted as long as the »workshop« itself lasted: an intense playfulness and curiosity.

Without much indication, they started touching the plants, caressing them, noticing that the pitches went higher, the notes played louder, quicker. The plant was reacting to touch and movement, to warmth and water (we watered one of them). It was a logical reaction, the translation of biodata measured between two poles into a language understood by a computer, itself translated into notes. Still, it was moving. And moved by random pitches, they went on. They started comparing how they touched the plants, they removed the electrodes to put them on other leaves. They discovered for instance how the electrodes needed to be

30 The limitation of this device is the MIDI protocol itself, based on the 12-tone equal temperament tuning system, which as already mentioned unfortunately situates the device in a very westernised music culture. In further renderings of *ethical_machines*, the data has been translated into other scales in order to escape this bias.

Figure 5: MIDI Sprout with a Pilea peperomioides

Source: Photograph taken by the author

»linked« in a closed circuit for it to work: the plants need to share a common root to »close the loop«. They soon removed the electrodes from the plants altogether to put them on their own bodies. They passed the electrodes from body to body, to »see« if one sounded differently than the other, trying to distinguish differences, singularities in the notes being played. They touched each other the way they touched the plants. They put the electrodes on different bodies and built a chain, holding hands, each electrode being placed on the extremities and noticed it worked,

noticed that the holding of hands was not much different than for the leaves to share the same root: it closes a loop, a circuit. They played and laughed and took the plant in the »circle« and thus closed a bigger circuit. They included the plant and built an interspecies network of play, letting their bodies generating sound together. They talked to, with and about the plant and its reactions, they sang to and with the plant. *They*, of course, is actually *we*, as I was not standing outside as a mute observer, but also part of the plant/human/computer group. A very touching moment that built a new network, a new bodily experience which went beyond the separation human/non-human, simply through the work of translation made by the device. It also brought other feelings and memories, in my case, it transported back a few years, to my first encounter with the device. But most of all, it carried a sense of play, that remained throughout the workshop.

There was a co-prehension, the co-creation of a situation where human bodies, plant bodies and technological bodies formed associations translated into sound. In this very particular situation, there was no attempt to make sense of what happened, to try to understand »what« the plant was trying to communicate (which would only lead to mere projection of human intentions). It was only about the experience, the feeling of bodies and sound co-constructing. In a nutshell, *ethical_machines* proposes to experiment with an active reconfiguration, redistribution of agency and show how the »social« is being constantly reshaped, a result of encounters rather than a principle guiding actions (Latour, 2005). Through the device, the plant becomes subjectified, like a musician in free improvisation, reacting to the milieu, with a multiplicity of potentialities opened up. At the same time, through the range limitation due to the MIDI protocol, but also at the moment a note is being expressed, depending on which instrument plays that note, there is an actualisation, a fixation. The human actor, in its interaction with the plant and the device also becomes more or less objectified: the plant, through sound, invites to engage, to react, to interact. Again, it calls for actualisation. The definition of a new territory, the playing of a new *ritournelle*.

Generative practices

In each case, each example, processes of thinking and sensing, of prehending, experiencing were intertwined, interwoven. The activity of thinking was co-created by the experience, and vice versa. There was a magma of thinking-feeling which was immanent to the present situation but also transported (through memories or mind wandering for instance) beyond this one simple moment. The thinking-with sound as practices of research-creation in *Échos de la pierre* co-produced a thinking-space. It gave it new intensities, or rather, it reinforced other modalities of experience and knowledge production but also abstracted the relation to space, through sound. It activated an already codified, an already produced space. It reactivated it on new terms even. It produced it anew (Lefebvre, 2000). One could even argue that those practices constructed a new heterotopia (Foucault & Defert, 1999), an *other space* where sounding was being put forward and existing at the intersection of human/non-human associations, where sounding was the defining moment in the production of space. The rules of entering/exiting the space, the times applied were particular to the installation, to the situation. A *ritournelle*.

Both with *Échos de la pierre*, which was a bigger »project«, as with *ethical_machines*, the event was itself, as thinking-with sound, *theory-building*. They are not ethnographic observations that need to be codified, understood and explained as data. The processes themselves were the methods, an ensemble of iterations of a project of research-creation, and constitute a part of the theory building. The text-oriented description of those works can only remain that: a description, and fatally, a reduction. But a narration that at the same time »adds« to reality rather than taking from it. The practices of sounding, sensing and thinking, combined within the installation produced new associations or intensified already existing ones. They were practices of knowledge production, practices of creation. Those practices are not to be explained only from an egological perspective, nor generalized into rationalised rules. They exist in the event, in the moment, in between, encounters always including more than one entity, always in movement, inviting thinking,

writing, inviting new practices of sounding, listening and activating space.

The importance of failing and stepping back

The experiments are themselves not perfect, they are a »work-in-progress« and not a finite object, a process-oriented thinking to which the descriptions are only snapshots. They do inherently present some failures, and biases that can be worked upon. The reflection of my own situatedness was surely not enough, or at least did not go to the extent I was wishing for[31]. Moreover, and probably directly coming from this lack of reflection, I was too present in each experiment. The designs and executions were too unilateral to express and experience with enough finesse and care, even in the playful MIDI Sprout event, which could have had a more dynamic design leaving more room for improvisation. Not that they were absent and that I was the careless triumphant researcher, pseudo-composer. I believe I engaged with enough respect with others, either members of a church community, colleagues, or non-human actors embedded in the experiments. Still, I probably took too much space in the *thinking-with sounds*. Almost an inverse, if I took too much space, I probably did not take enough time, and went too quickly. In the case of the church and its community, or in the case of the plant and the MIDI Sprout, more time could have been spent, probably, to take more differences into account, to account for the multiplicity of modes of existence. It is through Vinciane Despret that this »slowing down« and care is best expressed:

> »Il ne s'agit pas de s'interdire les comparaisons et les analogies, de s'abstenir de chercher les coïncidences ou les convergences d'intérêts, il s'agit d'essayer de le faire avec attention, de prendre soin de ce que l'on crée comme mises en rapport, de savoir que la mauvaise foi est à l'œuvre qui prétend que ce qui insistait à la différence n'insistait pas assez. Bref, de veiller à ce que ce qui éclaire une situation sous un

31 I realised the biased implications of MIDI only after the experiments.

> jour nouveau n'écrase pas tout sous la lumière de l'explication. Qu'on nous donne des loupiotes.« (Despret, 2019, p. 46).

On a more technical note, the experiments, designed as thought-probes »one shots« rather than longer on-going installations, should have been more carefully crafted. Indeed, the responsivity and thus generativity of such environments could have been increased and further reflected upon, as Sha (2013) and Solomos (2013) demonstrate. A set of questions that without doubts calls for further research, and which possibly extended beyond the scope of this particular work and of my own capabilities.

Nevertheless, those failures were necessary. If I take *thinking-with sounds* seriously, I must consider the said failures as as productive and knowledge-generating as the experiments themselves. Not only do they say much about what could be tweaked and better planed, they also teach me much about myself and my own situatedness, about the importance of stepping back, of »letting go«. About how to stay with the trouble, and to embrace it, deal with it, fight within it. About how important the encounter is. As Manning and Massumi argue, thinking back to their own practice:

> »Techniques of relation access their creative potential most when they operate at the edge of what they are preconceived to do. For this to happen, they must embrace the eventuality of their own failure as a creative factor in their process.« (Manning & Massumi, 2014, p. 103).

What does it have to do with sociology?

From the description of those experiments, as well as from the reflections either emerging from or leading to them, one could surely ask to which extent this indeed could be part of a sociological research? Those experiments are not finished products, they are thought probes, as I just mentioned. However, even at this stage, they show, through the encounters they lead to, a variety of possibilities. A multiplicity of modes of producing knowledge, of modes of engaging with space, with

others. This time, it is not a step back, but a step forward, or better said, towards. Towards the situation, the encounter, the trouble. Toward the real, felt, experienced, shared. In its gathering, in its impulses, a *thinking-with sounds* does say much about what we consider to be »the social«. It underlines the importance of materiality within knowledge production. It is indeed a magical, joyful and playful engagement, generating knowledge, adding to reality. It is a topological, sociological thinking|doing leading to a multiplicity of further unfoldings as Empiraterei (van Loon, 2017). In terms of space, it is an activation, a re-activation, re-production. In terms of agency, it is a reflection about how it is being distributed in a situation, and how it evolves. It is a question about how those ethical objects described by van Loon work, not as objects of inquiry, but as sociological tools.

In her recent work *Habiter en oiseau*, Vinciane Despret mentions the *Phonocene*, thinking-with Haraway:

> »C'est ne pas oublier que si la terre gronde et grince, elle chante également. C'est ne pas oublier non plus que ces chants sont en train de disparaître, mais qu'ils disparaîtront d'autant plus si on n'y prête pas attention. Et que disparaîtront avec eux de multiples manières d'habiter la terre, des inventions de vie, des compositions, des partitions mélodiques, des appropriations délicates, des manières d'être et des importances. […] Vivre à notre époque en la nommant ›Phonocène‹, c'est apprendre à prêter attention au silence qu'un chant de merle peut faire exister, c'est vivre dans des territoires chantés, mais c'est également ne pas oublier que le silence pourrait s'imposer.« (Despret, 2019, p. 161).

Thinking-with sounds could be thought of as a sociology within the *Phonocene*. Not only listening to others, humans and non-humans, but through listening, also collecting, or rather, following traces, actors sounding, co-composing and engaging in a magical and playful way. *Thinking-with sounds* is therefore not only a methodological or theoretical posture, which only makes sense in epistemological debates, but ultimately a political and ethical one. It hopefully permits to do

sociology differently, in the *trouble*, slowly and carefully. And not forget that silence could impose itself.