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FEEDBACK: ITERATIVE RESEARCH-CREATION PROCESSES
BETWEEN INSTRUMENT-BUILDING, COMPOSITION AND
PERFORMANCE

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*Thesis submitted in partial fulfillment of the
requirements for the degree of Doctor of Philosophy
School of Music, Humanities and Media
University of Huddersfield*

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“In every domain of art, a work that corresponds to the need of its day carries a message of social and cultural value. It is the artist who crystallizes his age ... who fixes his time in history.” — Edgard Varèse

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SUBMITTED WORKS

On Data USB-keys

New Musical Instrument

- *Acoustic Oscillator* (2012-2013)
1 documentation video file (Atelier), Quicktime H264, 3 minutes
1 folder with photos of the instruments.
- *Tube* (2014)
Tube1 - documentation video file (Atelier), Quicktime H264, 10 minutes
1 folder with photos of the instruments.
- *Analogic Feedback* (2013-2018)
Feed1 - documentation video files (Atelier), Quicktime H264, 15 minutes
1 folder with photos of the instruments and the exhibition space.

Sound Installation

- *Corrosion* (April 14, 2014, sound installation, variable length)
1 live documentation video file (gallery shooting), Quicktime H264, 3 minutes
1 AIF audio file, 16bit 44100 kHz, 14 minutes (same then the musical composition)
1 folder with photos of the instruments and the exhibition space.
[Note: these files are a reduction of the piece that should be experienced live]
- *Qi* (Oct. 16, 2014, sound installation, variable length)
1 documentation file, Quicktime H264, 3 minutes
1 folder with photos of the instruments and the exhibition space.
[Note: these files are a reduction of the piece that should be experienced live]

Comprovisation

1 - RUST duo

- *le chant des machines* (Nov. 15, 2014, musical comprovisation, 22:30 minutes)
1 concert video file, Quicktime H264, 22:30 minutes
1 folder with photos of the concert.
[Note: this video capture of the concert should be experienced live]

2 - Inner Island duo

- *Inner Island* (Oct. 16, 2014, musical comprovisation, 32:35 minutes)
1 concert video file, Quicktime H264, 32:35 minutes
1 folder with photos of the concert.
[Note: this video capture of the concert should be experienced live]

3 - L.B.B. trio

- *Improvisation #2* (Oct. 25, 2015, improvisation, 28 minutes)
1 AIF audio file, 24bit 44100 kHz, 16 minutes excerpt
[Note: this music excerpt of the performance should be experienced live]

Musical works

1 - Suspended Time

- *Suspended Time* (August, 2014, musical composition, 12:34 minutes)
1 AIF audio file, 16bit 44100 kHz, 12:34 minutes
[Note: this composition is made in 2 parts, one is the tape recording made in June 2007. The second is played live over the tape part with my *Analogic Feedback* instruments.]
[Note: this composition should be experienced live]

2 – Jonas dans la baleine

- *Jonas dans la baleine* (March 1, 2015, musical composition, 12:30 minutes)
1 concert video file, Quicktime H264, 9:17 minutes
1 folder with photos of the concert.
[Note: the beginning and ending of the piece are very quiet and have been cut for video purposes (we hear the people more than the sound of the Pipe duo).]
[Note: this video capture of the concert should be experienced live]

3 - corrosion

- *corrosion* (Sep. 10, 2013, musical composition for the Rust duo, 17 minutes)
1 AIF audio file, 16bit 44100 kHz, 14:18 minutes
[Note: the piece starts and ends with one single high frequency at a very low volume. In the mix I cut those two parts because it is not audible. This explains the 3-minute difference between the composition and the recording.]
[Note: this music composition should be experienced live]

4 – Scratch & Feeds

- *Scratch & Feeds* (Nov. 29, 2014, musical composition, 13 minutes)
1 concert video file (Göteborg - Sweden), Quicktime H264, 13:00 minutes
[Note: this video capture of the concert should be experienced live]

ABSTRACT

This text is a commentary on my preoccupations over the course of my doctoral research from 2013 to 2017. It accompanies a portfolio of works realized and submitted as part of this doctoral thesis, which looks more specifically at feedback as an iterative process between myself as instrument-builder, composer and performer. This approach, which puts sound center stage as the primary material, emphasizes the organic and bidirectional internal influences among these three creative poles.

This thesis is devoted to the main subject of my doctoral research: the notion of creative feedback among instrument-builder, composer and performer. It is in five parts: 1. A definition of my principal influences and aesthetic biases; 2. A portrait outlining the connections of influence among the instrument-builder, composer and performer; 3. A discussion of relationships outside the creative process itself, that is to say the influence of other artists (composers, musicians, other instruments) in my approach to research creation; 4. A demonstration of how I use the influences of other composers, other musicians and even other artists whose works speak to and inspire me; and 5. A presentation of three concrete examples from the portfolio realized during my doctoral research.

The body of work submitted includes: three new instruments, two sound installations, four compositions and three improvisations.

ACKNOWLEDGEMENTS

I would like to express my great gratitude to Pierre Alexandre Tremblay who supervised my doctoral thesis. His patience, his knowledge and his generosity in the four years process of this PhD thesis helped me push my reflection further and brought this thesis to another level of accomplishment. His accurate questions and comments help me to understand my own research better and to talk in better words about it. Our exchange over the years was a great source of reflection.

This PhD research was made possible by the financial support of the Fonds de recherche sur la société et la culture (FQRSC) and the University of Huddersfield. I would like to thank them specially for that support.

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Thanks to Terri Hron for the translation of this text from French to English. Thanks also to Noémie Pascal, Ariane Graton-Jacob, Marie-Christine Parent and Clement Topping for their help and their correction of the French version.

INTRODUCTION

This text is a reflection on the nature of my principal artistic concerns during the research-creation period that lasted from the fall of 2013 to the fall of 2017. More specifically, it examines the feedback between myself as instrument-builder, composer and performer within the iterative processes that the research and creation of new musical instruments, new works and new visual and sound installations entails. This analysis acts as an extension of a portfolio of twelve sound works that are intrinsically linked to interactive processes of creation: three new musical instruments, two visual and sound installations, 3 projects of improvisation and four musical works (see complete list of works submitted with this thesis). The text also covers outside contributions to the creative process that come as much from the composers and musicians with whom I collaborate as from the influences of other artists on my practice.

This is, then, an autoethnographic ¹ text, which affords me the opportunity to bear witness to my personal artistic experience and that offers a way, starting from that experience, of shedding light on my choices as well as the questions that accompanied them. The works submitted alongside this thesis answer these questions, spring from these influences, and then themselves lead to further questions.

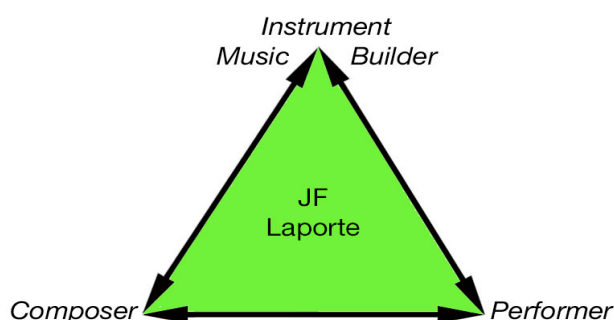
1- For Paillé (2007, cited in Dubé 2016), autoethnography is “a methodology of proximity, a normal, spontaneous, natural, almost instinctive way of approaching, questioning and understanding the world.” (p. 409)

This thesis is divided into four sections. The first outlines the main subject of my doctoral research: the notion of the creative feedback between the instrument-builder, the composer and the performer. Then, in the second part, I examine and define the relationships of influence between these three principal nodes of creativity in my artistic practice. In the third part, I describe outside influences brought by other composers or musicians as well as the music that I write for instruments other than my own. Finally, this thesis analyzes a number of examples of works that I created during my doctorate, which serve to confirm and illustrate the discourse of this thesis in musical terms.

This text therefore examines my research and accompanies the creative work I accomplished during my four years of doctoral studies. It draws a portrait of the different influences within and from beyond my research-creation process.

1 The iterative "internal" creative processes between the instrument-builder, the composer and the performer.

This is where I address the kind of creative works that come from an interactive and participatory relationship between the maker/inventor of musical instruments, the composer who directs them within different types of projects (pieces, sculptures, installations, performances, etc.), and the musician who learns to play, develops playing techniques and performs with these new musical instruments. This back and forth between these three poles of creation is an active and dynamic process. In order to keep things basic and understandable, this thesis proposes the following somewhat simplistic model; in the conclusion to the thesis, i present a more complex diagram.



In the following section, I discuss the role of the instrument builder in the process of researching and creating new musical instruments.

1.1 Instrument-Builder – Instrument

For me, the question of sound is paramount and I will show that it grounds my creative practice, leading directly to the development of new sound generators and thereby new musical instruments. Sound is the original spark in my work, which stimulates the instrument builder a desire to listen more attentively, to understand and to dig deeper.

Then, I will analyze the issue of the materials with which the instrument builder creates the first prototypes and their influence on the response of the instrument and therefore its form and physical appearance. Finally, I will address the importance of the design of the instruments, and end with their aesthetics.

The aesthetic vision of the instrument builder is expressed through sound, matter, design and aesthetics.

1.1.1 Sound: Fundamentally, sound is the basis of the process of researching, creating and developing my new musical instruments.

I largely share Harry Partch's vision who says (cited in Grayson, 1975) :

Primitive man found magical sounds in the materials around him - in a reed, a piece of bamboo, [...] some resonating body. He then proceeded to make the object, the vehicle, the instrument, as visually beautiful as he could. His last step was almost automatic. The metamorphosis of the magical sounds and the visual beauty into something spiritual. They became fused with his everyday words and experience: his ritual, drama, religion - thus lending greater meaning to his life. These acts of primitive man become the trinity of this work: magical sounds - visual form and beauty - experienced ritual. ²

It is very much the same for my own creative practice. My instruments were all developed after dazzling sonic moments that were both memorable and magical. These strong experiences happen during the discovery of as yet unheard sounds coming from new ways of setting off vibrations of overwhelming richness. These treasures I heard pushed me to explore them and to keep listening to them repeatedly and in the end to create musical instruments that would reproduce them. My

2 – When I first discover the quote by Harry Partch it was in French. For the purpose of the thesis I had found the English version, but I still prefer the French version which paraphrases the original text in a more direct and inspiring way.

« Dans l'attitude et dans l'action, mon travail se révèle proche de celui de l'homme primitif concerné par la magie du son obtenu à partir des matériaux qu'il trouve à portée de main. Cet homme fabriquait un véhicule pour le son, qu'il concevait comme le plus magnifique possible, avant de se consacrer à sa pratique au cours de rituels qui faisaient sens dans sa vie. Sa trinité était aussi la mienne : magie du son, importance de l'élément visuel et de sa beauté, expérience rituelle» Philippe, R. (2007)

instruments were all developed and built from a belief in the quality and the singularity of the sounds they would allow me to produce and the trace of what they imprinted on my lived experience.

The discovery of the *FlyingCan* in the summer of 1999 (figure 1.1) is a good illustration of this approach. At the time, I was playing around with the bullroarer (figure 1.2) Oxford dictionaries (n.d.),

a sacred object used in Aboriginal religious ceremonies, consisting of a piece of wood attached to a string, whirled round to produce a roaring noise.

I was an undergraduate student at the Université de Montréal at the time, and I had challenged myself to compose one piece every term for a sounding body other than traditional instruments. With that in mind, as I was experimenting with the bullroarers,



Fig. 1.1 the *FlyingCan*, old (1999) invented instruments
Photo : Matsuoka, M © 2010.



Fig. 1.2 two home made *Bullroarers*.
Photo : Laporte, JF © 2010.

my goal was to switch the small slat of wood for something else: a Coca-Cola can to be precise. On my first attempt, I passed a small metal axel through the can, making an opening lengthwise. Then I attached the whole thing to a string and started spinning the instrument in the air (like a bullroarer). I was stunned by the sound the instrument created. I was so very excited by what I had just heard, that I rushed downstairs to the

cafeteria of the University to find some friends with whom I could share my discovery. Then, once again to my great surprise, when I started spinning the instrument above my head, it made very little sound, almost nothing in comparison with what I had just discovered a few minutes earlier.

Upon reflection, I realized that on the first attempt, the instrument had begun to sing because the lengthwise opening I had made had found the perfect position at just the right moment, completely oriented towards the wind created by the instrument's spin. It was at that moment that I had the idea of adding a small wing behind the instrument that would keep the opening always facing the wing so that it would always be singing when it spun. Then, after a number of experimentations with the size and form of the opening, I arrived at the conclusion that it was best in a rectangular shape, with a variable width and opened on the entire length. Furthermore, after having tested all the sizes of aluminum cans that I had found during my travels across the world (150 ml, 200 ml, 250 ml, 330ml, 500 ml, 950 ml, 1.5 l, 2 l, 3 l, etc.), I determined that the Japanese 1.5 l and North American 950 ml formats were the most effective in the production of rich and complex sonorities. These chosen formats must represent a volume/shape relationship that allows for the generation of a number of types of complex and multiphonic timbres.

It was very similar for my *Acoustic Oscillator* (2013, figure 1.3), an instrument I developed during my doctoral research. I had already experimented with the principle of bringing an instrument into vibration – the oscillation in the high register of a latex membrane trapped and fixed at the end of a tube – in my work during the *Psûko* (2008a, figure 1.4) installation, but had never really taken the time to develop it further. I developed the instrument for the characteristic frequencies in the high register that it could produce so as to create a sound installation that would set around twenty such instruments in the space. Each instrument is tuned to a frequency between 4000 and 12000 Hz. It is comprised of a metallic tubular body, a latex membrane, and a compressed air inlet. Listen to the piece *corrosion* join with this thesis.

Thus, I try to stay constantly attentive and listening to the world around me, ready to experiment with any kind of material and open to discovering as yet unheard sounds

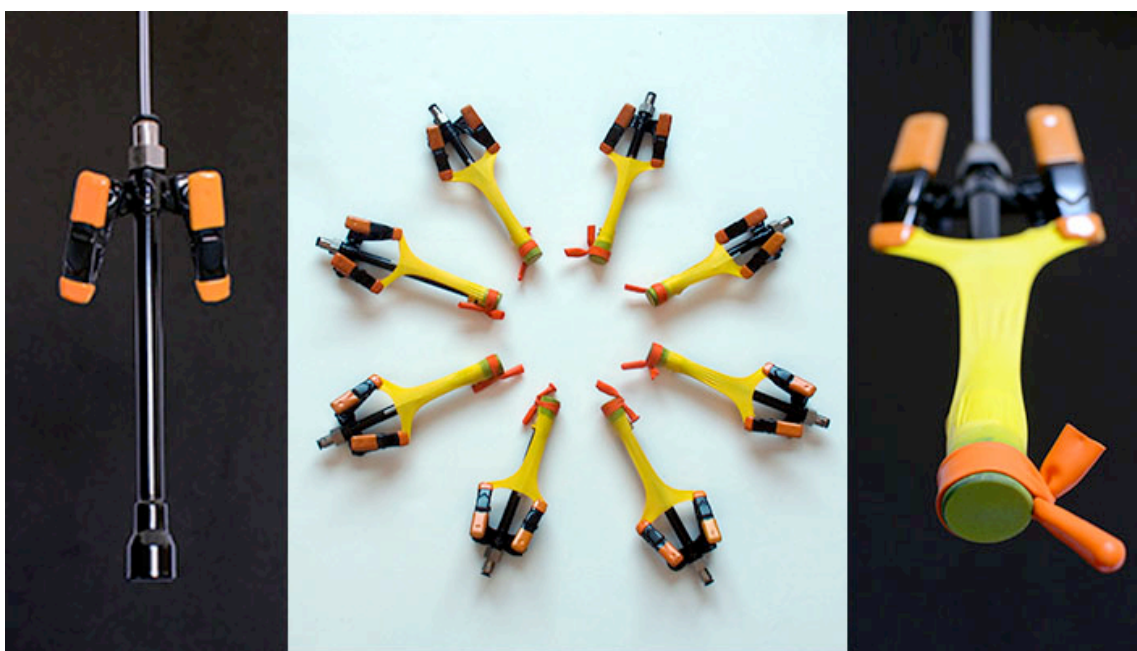


Fig. 1.3 the *Acoustic Oscillator* (2013) invented instrument built during my doctorate research.
Photo : Laporte, JF © 2013.



Fig. 1.4 the *Insects* (2008). The insect (left upper corner) was one of the sound objects, developed for *Psukhô* Sound Installation, shown during an exhibition at Darling Foundry, Montreal, Québec.
Photo : Laporte, JF © 2008.

that will then guide me towards the creation of new instruments. Once functional, I place these new instruments at the heart of a number of different projects that put them centre stage (sound installations, musical works, compositions, improvisation projects, etc.).

1.1.2 Materials: When building my instruments, I generally use everyday objects and materials that can be found in big box stores, but are not meant for this purpose. My instruments are therefore influenced by what I manage to find on the market and depend on the evolution of the materials available in the industry. This also has an effect on the longevity of certain instruments. A good example is the *Bol* (1999, figure 1.5) an instrument that uses a balloon membrane that, in its initial form, had a diameter of 26"-28". At the time of its invention, it was possible to make it that big, since I managed to find latex balloons with a 40" diameter. However, the balloon industry decided a few years back to scale back the size of the largest balloons from 40" to 36", and I therefore also had to reduce the size of my *Bols* since the 36" membranes were too tight to fit on the largest *Bols*.

Materials also play a role in the final design of these instruments and once again, they are dependent on the evolution and state of the market. Certain shapes of PVC tubes (rounded elbows) for example, are readily available in Canada but not in Europe. In building my instruments called *The Pipe* (2013, figure 1.6), I developed an "S" shape because in Canada, the elbows are rounded and that allowed me to create such a fluid and organic shape. I tried to purchase similar rounded elbows in Europe without any success, and could only find square elbows (with a right angle), which had a great influence on the final shape of the instrument, both aesthetically as well as in terms of the sound inside it.

Moreover, the reality of two distinct measurement systems in the industry – metric (mostly used all over Europe) and imperial (used in America, Japan, etc.) – have an impact on the dimensions of the materials that I can use in building my instruments. For example, the metal plates I use in the *Seaquakes* (2004b, figure 1.7) installation are larger in America than in Europe. In North America, standard dimensions are 4' x 10' (or 1.2 m x 3 m) whereas in France, they are somewhat smaller, at 1 m x 2.5 m. The visual impact of the installation is not exactly the same depending on the choice of material: North American plates are much more impressive in their stature than the European ones. And what is true for visual differences also holds in terms of sound frequencies, which then also has an influence on the music with which I can bring the plates into vibration.



Fig. 1.5 the *Bol* (2000). Invented wind instrument.
Photo : Laporte, JF © 2000.

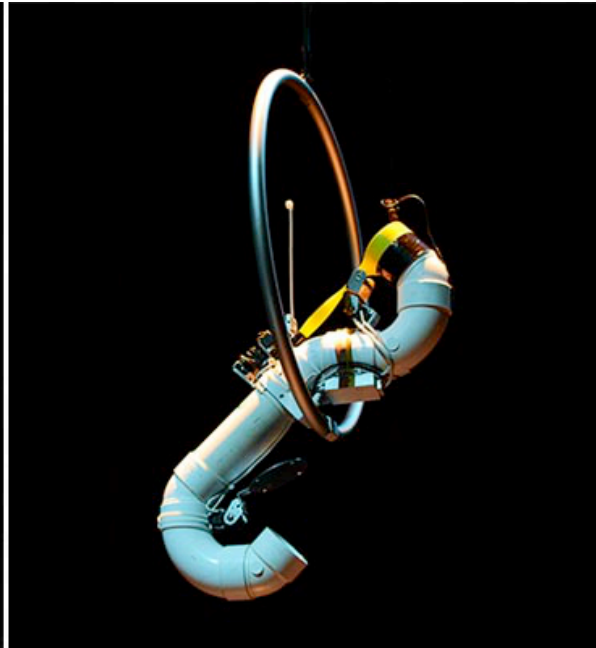


Fig. 1.6 the *Pipe* (2013). Invented wind instrument developed during my doctorate research.
Photo : Laporte, JF © 2013.



Fig. 1.7 *Seaquakes* (2004). Visual and sound installation premiered at Escales Improbables, Montreal.
Photo : Laporte, JF © 2004.

Materials also influence certain aesthetic choices. In the construction of those instruments that use latex for their vibrating surface (*The Pipe* - 2013, *Acoustic Oscillator* - 2013, *Tu-Yo* - 2000, *Bols* - 1999, etc.), I almost exclusively choose to use yellow latex balloons, or sometimes red (in Japan in particular, for example, where the

red circle is the colour of the national flag). The colour of the balloons is not entirely a matter of their visual impact, but also changes physical properties: the pigments that make up the yellow balloons is different from that in black or other coloured balloons. The quality and physical characteristics of the pigments are responsible for these differences. After numerous experiments, I noticed that yellow and red balloons were much more effective and sounded better. They not only have the right elasticity but also the right tension to create optimal vibration. Purple, brown and black ones, for example, are too flexible and stretchy, not offering enough resistance, to the point where the sonic response is compromised. The material substance of the balloons will therefore have an influence on a musician's relationship to the instrument and its playing techniques.

Another example is my *Tu-Yo* (2000, figure 1.8), which are built using two different types of materials: aluminum for the instruments that stay in Canada and the sound installations, and PVC – much lighter – for those that I take on tour. The latter come from Japan, where it is possible to find 3" (80 mm) PVC pipes with ultra-thin walls (around 1 mm), whereas in America, PVC pipes have walls that are around 5 mm thick. The instrument vibrates and resonates more easily with thin walls, which can be achieved either with aluminum or Japanese PVC. Moreover, considering its weight and solidity (thin aluminum loses its shape easily), Japanese PVC pipe is easy to transport by plane or by train. I also experimented with making *Tu-Yo* from stainless steel, but



Fig. 1.8 the *Tu-Yo* (2000). Invented wind instrument first used in the sound installation *Psukhô*.
Photo : Laporte, JF © 2000.

the acoustic results were disappointing, despite the very striking visual effect. Much denser than aluminum or PVC, stainless steel did not allow the *Tu-Yo* to resonate effectively. Furthermore, aside from the fundamental, the instrument did not generate many higher harmonics, making the sound much less rich and therefore less inspiring.

A similar situation occurred when the time came to choose materials for the construction of the *Tube* (2014) in the *Qi* (2014c) installation. In the beginning, I wanted to work with glass, due to its transparent nature and aesthetic qualities. I finally opted for extruded polycarbonate, which is a material that shares the transparent qualities of glass but is much less breakable and much less heavy, which is an enormous advantage when it comes time to go on tour with the 35 Tubes needed for the *Qi* installation.

1.1.3 Design: The role of an instrument's design is to fulfill my needs, to solve certain problems and to propose suitable yet optimal solutions. The form and design of my instruments are intrinsically linked to their operation and the technology that allow for different playing techniques. The design of my instruments thus follows the principles of functionalism and can be summed up by Sullivan (cited in Craven, J. (2017)) famous expression, "Form follows function."

The design depends on working out the shapes and functions that optimize the application of my instruments. This work on the shape explains the importance I place on aesthetic considerations in the development of my instruments. On the functional level, my work comes back to questions of shape and technique.

In developing and building my instruments, I place great importance on ergonomic considerations, so that they might be played with the greatest ease, security and efficiency. I make sure that each of them is easy to manipulate and that the relationship between the musician and the instrument is fluid and natural so that they can express themselves as freely as possible.

If we take my *Bols*, for example, I developed the rounded shape of the legs and mounts in response to technical needs. In the installation mode, I use a roller that can move vertically on the surface of the membrane, which allows for the variation of frequencies and timbres generated by the instrument. In order to motorize that motion, I had the idea of adding an aluminum tube behind the *Bol* and extends above it. Transparent fishing line is fixed to the end of the roller and then inserted into the tube and fixed to a small motor placed at the base of the instrument. This allowed me to distance the motor from the resonating part of the *Bol*, while maintaining the moving roller's capacity to move on the surface of the latex membrane. The instrument's stand was also developed in response to a technical constraint. In the beginning, my instrument stands were straight, which was not very attractive visually and also moved the centre of gravity of the instrument towards the front, making it unstable. So, in order to stabilize the instrument by bringing the centre of gravity more towards the centre of its base, I bent the stand towards the back, making it less visible. This modification makes the shape of the instrument much more organic; the bend of the stand echoes the roundness of the *Bol* and gives the whole a greater coherence. Moreover, once lit from inside and plunged into the darkness of the exhibition space, the instrument seems to float in mid-air, with the stand disappearing entirely and leaving the *Bol* and its colourful membrane centre stage. The latter, when lit, gives off a luminous and very particular glow which envelops the exhibition space with a singular luminescence. This does not take away from the fact that I created the instrument based on the incredibly rich and singular sounds it creates. Their timbre can easily be mistaken with certain electroacoustic sonorities with the difference that these are created by a sounding acoustic body and therefore radiate in a very warm manner around the instrument. The type of sounds the *Bol* emits are in phase with the droning sounds defined by La Monte Young (n.d.) in 2000 as "the sustained tone branch of minimalism."

If we look at the instrument *The Pipe* (2013) as the evolution of the *Tu-Yo* (2000) that I undertook during my doctorate, we can see an example of the relationship between the instrument's form and function. In the beginning, I developed *The Pipe* as a kind of "nose" to insert in the *Babel Table* (2012, figure 1.9), which was an instrument created for a young audience project presented in Montreal.. In order for players to be able to

manipulate the latex membrane of the instrument with their hands, I had to find a very precise position for it. By trying out different ABS pipes, I finally found that I could use two rounded elbows plus some straight sections to create an instrument that had an S shape that was much more compact than the original *Tu-Yo*, which is straight. This new shape allowed me to place *The Pipe* on the front of the *Babel Table*, right between the two *Bols* that serve as its eyes, for this young audience project.

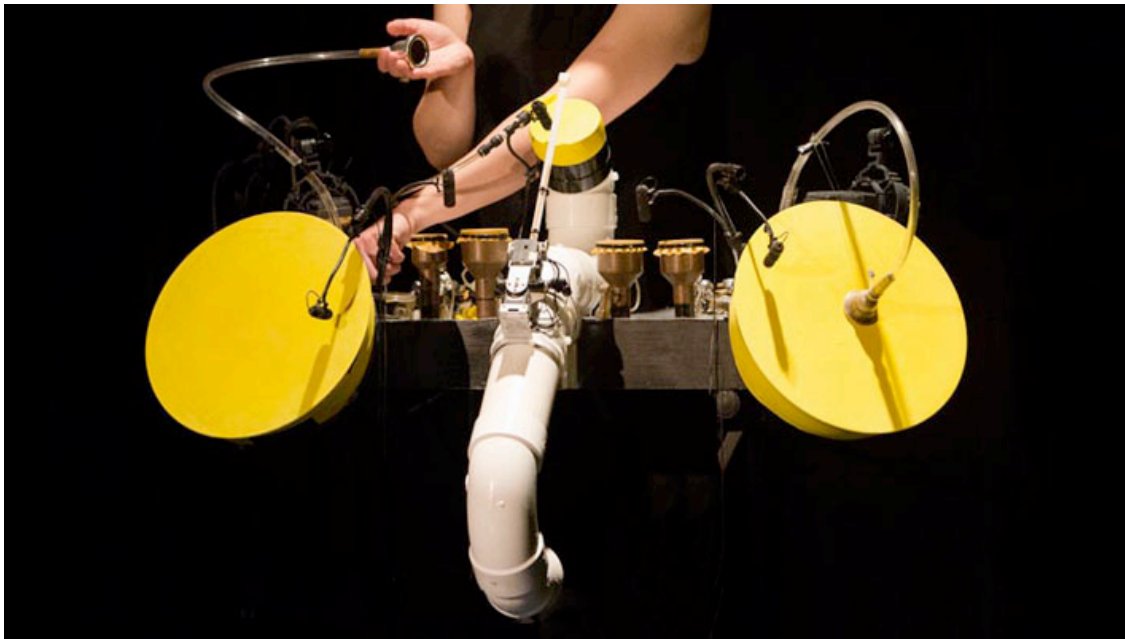


Fig. 1.9 the *Babel Table* (2012). Mix of several invented wind instruments (2 *Bols*, 1 *Pipe*, 6 *Insects* and 6 *Vibrating Membranes*). The instrument was built for a young audience show titled Babaloune.
Photo : Laporte, JF © 2013.

1.1.4 Aesthetics: Once I've discovered new principles of sounding vibrations, I'm always looking to develop shapes that are aesthetically coherent and beautiful to look at. For me, it's all a question of creating instruments that stimulate the senses and perception both for the musician who plays them daily and for the audience member who discovers them in different events. My notion of aesthetics includes all the characteristics that influence the appearance of my instruments, that give them a shape, a meaning and a unique and defined appearance. I make choices based on my personal taste and the materials that I have at my disposal.

My instrument, *The Pipe* (2013), which has an S shape, is a good example. When I finished the construction of the *Babel Table*, I wanted to work with *The Pipe* in a solo

context. It was at that moment that I had the idea to hang the instrument in the air rather than to place it on some kind of stand. Upon reflection, I figured that the best way to achieve this was to perch the instrument, like a parrot, in the middle of a ring that was suspended in the space. This allowed me to construct the instrument in such a way that the technology was completely integrated in the structure and became practically transparent (and thus not apparent). Moreover, placing it in the middle of a suspended ring affords it a light and intriguing character that seems to float in the middle of the space.

This section has served to show that the instruments a maker creates are influenced by the sound they create, and the materials used in their construction also influence their design and aesthetic appearance.

The following section establishes the role and importance of the composer in the iterative process of research and creation of new works.

1.2 Composer – Works

The artistic creation of the composer is expressed through sound, time, form, space and volume.

In this section, I explain how sound materials are central to my compositional practice and how they lead to the development of my musical ideas. Sound material is at the heart of my work (as described in section (1.1.1)): it is where I draw all my inspiration for developing my musical ideas and it is from where my works are born. I will also show how I use time in my work such that audience members can move into the very heart of the sonic phenomenon, inside my music, as it were. I then show how the observation and analysis of sound materials give rise to fitting and coherent musical structures. Finally, I address the question of acoustic and performance spaces where the works come to life, to end up at the importance of volume and dynamics in my music. In short, this chapter illustrates the different parameters that influence the process of research and creation in my new musical works.

1.2.1 Sound: Scelsi said (cited in Solomos, 2011),

“Music cannot exist without sound, but sound exists very well without music. It would seem that sound is therefore more important...”³

He also said (cited in Pankhurst, 2012)

“Yes, one might consider sound the cosmic force that is the basis of everything. There is a beautiful definition that says: ‘Sound is the first movement of the unmoveable,’ and this is the beginning of creation.”

Without going so far as to say that sound is the origin of all things, it still holds true that in my work, sound is the first source. Just like with the instruments, the music I create is principally based on sonic phenomena that intrigue me, call and inspire me. I am most attracted to organic materials, vibrations, rich and complex timbres that I then set in music. What I am searching for above all are rich and complete sonic universes inside which there is an incredibly animated and varied material. Attentive listening of that material allows me to enter into a kind of resonance with it. Terry Riley (Cited in In Code, n.d.) said,

Music can also be a sensual pleasure, like eating food or sex. But its highest vibration for me is that point of taking us to a real understanding of something in our nature which we can very rarely get at. It is a spiritual state of oneness.

My practice seeks neither to rediscover the past nor to put it in perspective: its goal is to reinforce and develop my contact with sound, with sonic material, in order to gain an ever-increasing understanding of its forces and foundations. Thanks to this attentive and deep relationship with the material, I manage to grasp the essence of the sounds that I want to set into music, and that allows me to understand the world better and by the same token, to understand myself more. I feel particularly close to the way the philosophers Hegel and Bergson describe music: Hegel said in *Esth.*, t. III, p. 139. (cited in Lafaye, 2003),

3 - “ La musique ne peut exister sans le son, mais le son existe très bien sans la musique. Donc il semble que le son soit plus important. [...]” (Translation: T. Hron)

“The power of music is in its resonance with the intimate being, present to himself(...) in the unhatched intimacy and depth of sensation.”⁴

Bergson adds (cited in MAZERON, 2016)

“Music puts us in contact with our deep I. It conforms to the immanent motion of the soul, manifesting therefore a power of insight.”⁵ Also, “music represents a privileged art, the one which manifests an interior reality, close to a deep I.”⁶

It is there where I find all the power of sounds and the spiritual scope of music.

On this subject, Rudolf Steiner writes (cited in Wolf, 2001)

“Future development of music will move towards spiritualization and implies recognizing the special character of individual sound. If we immerse ourselves in sound, it reveals three, five sounds or more; a single sound unfurls into melody and harmony leading directly to the spiritual world. One aspires to the understanding of sound in its spiritual depth and one wishes to go from the natural to the spiritual element.”

This is another version of the power of sounds and music as a force for personal transformation and spiritual awareness. Speaking of the impact of sound and music in our lives, Stockhausen adds that in 1972 (cited in Squarepusher, 2008),

“We are no longer the same after hearing certain sounds, and this is more the case when we hear organized sounds, sounds organized by another human being : music.”

Personally, music allowed me to channel my energy and focus my attention on an activity about which I am deeply passionate. It allowed me to have a spiritual practice, anchoring my real life and opening doors of perception and especially self-awareness.

4 - “ La puissance de la musique tient à ce qu'elle résonne dans l'être intime, présent à lui-même « dans l'intimité et la profondeur non éclos de la sensation.” (Translation: T. Hron)

5 - “ La musique nous met en contact avec notre Moi profond. Elle se conforme au mouvement immanent de l'âme, manifestant alors un pouvoir révélateur.” (Translation: T. Hron)

6 - “ la musique constitue l'art privilégié, celui dans lequel se manifeste une réalité intérieure, proche du Moi profond.” (Translation: T. Hron)

Once again, there is great power in the practice of observation and listening in human experience. It is from an early age that I understood that sound and music were important to me, not only in terms of auditory bliss but also in terms of awe and personal transformation. I had a number of transcendental experiences thanks to sound and music, which pushed me, at 25 years of age, to take my chances in music when, at the time, I was working in civil engineering and research on asphalt recycling. Since that change in direction, listening and the discovery of extraordinary sounds, of the unexpected, have been at the heart of my research. My practice is based on attentive and creative listening of sonic phenomena, much like Pauline Oliveros's (cited in Osborne, 2001) *Deep Listening*, which "represents a heightened state of awareness and connects to all that there is." This practice allowed me, in some way, to return to the source of vibration. Once in contact with that source of inspiration, everything can become music. As Arvo Pärt says (cited in Supin, 2002), there is "a need to concentrate on each sound, so that every blade of grass would be as important as a flower."

Thus, my compositional work aims to set to music those moments of sound magic that blew me away, the outcome of my research and discovery. My music aims to allow the audience to come in contact with these riches so that they might in their turn, journey towards the exploration of these sonic phenomena.

In this sense, my compositional work is related to that of composers such as Krzysztof Penderecki in its search for new sonorities. I am thinking, among others, of my string quartet *De la Matière Première* (1998), that explores different ways of orchestrating the resonance of the four instruments, in a similar way to what I've discovered in Penderecki's *String Quartet No. 1* (2013). My practice is also similar to that of composers like Giacinto Scelsi, in its focus on timbre and sound. For example, I composed *Prana* (1998), a mixed work for nine musicians and fixed media, entirely around the notes B and F, concentrating specifically on the multiple ways of creating different resonances of these two pitches across the nine instruments. I then discovered that Scelsi underwent the same kind of research in his *Quattro pezzi su una nota sola* (1989), four pieces for orchestra on a single note.

My music also shares affinities with that of Salvatore Sciarrino, whom I hold in very

high esteem. Even if my approach is different than Sciarrino's in terms of articulation and sound matter, I feel a connection in the nature of the timbres that we are looking to set in music and the deployment of sonic world at the limit of the audible. I'm thinking in particular of *La puissance de la fragilité* (1999c), a piece for violin and cello that uses bow hair attached to each of the strings of the two instruments as a mode of sonic production. The result is a music composed of hissing, rubbing and almost inaudible singing. I find the same characteristics in Sciarrino's works, such as *Sei Capricci* (2004) for violin, in memory of Paganini, that shows supreme timbral virtuosity or even in *L'opera per Flauto* (2001) for solo flute, each movement of which is more surprising than the last. Sciarrino has until now composed a corpus of completely unique and contemporary musical works that are at the same time very Italian, in the sense that his music is very refined, elegant, even in some ways romantic. Sciarrino (cited in Ricordi, 2017) is a contemporary composer whose reflections most inspire me, for example when he says,

“My interpretations of music are ethical messages in which I try to reduce things to the essentials, to reflect the extreme experiences of human reality (life and death). I do not do this because I am an ascetic, or because I have an axe to grind: I'm just following the path of our highest humanist traditions.”⁷

It is this spirit that I composed *Mantra* (1997), a work where sound was the motor behind the composition. I had set out to make audio recordings of the sound of machines, in particular the compressors that are used to cool skating rinks where hockey is played in Quebec. I had access to an arena where I did custodial work for two years. From the first minutes when I turned on my recorder, put on the headphones and held the microphone in my hands, I could feel the enormous potential of the sonic materials of that place. From that moment, I started to explore the different machines underneath the indoor skating rink, where there are hundreds of compressors, organized in groups of three. Even before leaving the space, I knew I wanted to make a

7 - “Mes interprétations de la musique sont des messages éthiques, j'essaie de réduire les choses à l'essentiel, pour refléter les expériences extrêmes de la réalité humaine (la vie et la mort). Je ne fais pas cela parce que je suis un ascète ou parce que j'ai une hache à broyer: je suis juste en train de suivre le chemin de nos plus hautes traditions humanistes.” (Translation: T. Hron)

work based on the recordings of the sounds I had just discovered. Since the materials were comprised of several auditory levels and large variations, I threw myself into the challenge of realizing a work in a single take, without post-production. After around 250 attempts, I arrived at a 26-minute version with which I am very satisfied. I gave it the title *Mantra*, partly because of the 250 takes, which were like mantras to me. That is without taking into account the hours I spent sleeping in that space as a custodian, lulled by the mass of those intense and rich sounds. I also gave it that name because in our present-day lives, we are always surrounded by that type of sound (machines, cars, electricity, motors of all sorts, urban noise, etc.), which have a certain influence on our lives, just like mantras.

This kind of work on continuous sound that some would call drone music (Young, n.d.), as "the sustained tone branch of minimalism." It brings to mind composers like Phill Niblock (cited in Duguid, 1996) and works like *Five More String Quartets* (1993).

"the "score" consists of a list of 500 carefully chosen frequencies which are played in sequence as sine tones in the performers' headphones; they attempt to match these frequencies, and twenty simultaneous tones are obtained by multitracking the string quartet five times. The resulting sound mass is tremendously dense, and in addition to the twenty basic tones, wave phenomena create many more unpredictable, constantly changing difference tones; the exact nature of these depends heavily on the volume the music is played at, and the acoustic properties of the performance space."

There are a number of common elements between *Five More String Quartets* and *Mantra*: both involve continuous music that is played at an imposing volume, but both were also created without any electronic manipulation of the recordings.

Jonas dans la baleine (2014a-15), composed during my doctorate, is a 15-minute work for a duo of *The Pipe* and real-time processing that is a good example of the importance of sound in my work. The piece uses the low hum (60 Hz) of the instruments in a very slow and hypnotic evolution starting from acoustic breath and progressing slowly towards intense and grinding timbres before disappearing. This work can also be considered as a long sustained drone.

1.2.2 Time:

Music [...] has the power to make us feel time.⁸ Mazon (2016)

The other parameter on which I place great importance in my music is time. I love when time slows down, allowing for observation, attention and contemplation. Thus, in my music, I force myself to slow down and stretch musical time, in order to appreciate the internal transformation of the matter as it plays out and evolves. This stretching of time allows me to create music that reveals itself very progressively over long durations, music that seems immobile, as if soaring. Beneath this apparent immobility, the lines of sonic energy are drawn out in permanent motion and constant transformation.

This slowness in the temporal progress also allows me to concentrate attention on the sound itself. This polarisation on the sound allows the consciousness of the listener the necessary time to perceive it in all its different states. This slow time, then, allows for auditory observation, discovery, comprehension and contemplation, which Pauline Oliveros calls *Deep Listening*. I understand this approach as a desire for connection with the world. Such attentive and creative listening to sonic phenomena is also a kind of concentration on oneself. This characteristic allows listeners to enter into an osmosis, a kind of union with sound in such a way as to allow them access to other states of consciousness. And as Lachenmann (2009) writes, "Listening means discovering oneself again, transforming oneself." ⁹

Time is therefore a tool I use to create and construct a particular perceptual space. Slowness, for example, allows me to lead listeners progressively, as long as they are willing, to explore the sonic and musical phenomenon in depth, allowing them to be captivated by the many details of which it is constituted. Here it is not a question of admiring the splendour of an intellectual construction, no matter how complex it might be, but rather to enter into the heart of the sonic phenomenon to discover, in its

8 - "La musique [...] possède le pouvoir de rendre sensible le temps." (Translation: T. Hron)

9 - "Écouter signifie: se découvrir soi-même de nouveau; se transformer." (Translation: T. Hron)

smallest details, the richness of the materials that are put together in music. In this position of listening and union with the musical discourse, we can arrive at in a deep meditative or contemplative state. This musical slowness is in some way a reaction and answer to our ultra-hectic everyday reality.

One finds this same relationship to slow time in the works of French composer Éliane Radigue, such as *Trilogie de la mort* (1998), a piece in three movements (*Kyema* (1988), *Kailasha* (1991), *Koumé* (1993) with a total duration of 2 hours and 50 minutes and constructed from the meeting of frequencies, beating and waves that create a contemplative, meditative and introspective temporal space. In the words of Benoit Deuxant (2015),

Éliane Radigue composes music made for introspection, for contemplation. It is a patient music that evolves in an extremely slow and subtle manner over long periods of time. Even if it is in constant mutation, it seems to be perpetually floating between two states, permanently undecided as to which direction it might take.¹⁰

I like this notion of slowed-down time, which allows us to hear the inner life of sound. I prefer to work with this slow time that affords me the opportunity to refine timbral transformations, to enter into each tiny detail of vibration, sculpting and modulating it progressively and imperceptibly towards other states of vibration. I also like this idea of patient music, which is accompanied by the understanding that the music is not in a rush, that it is not dependent on speed or expediency, but takes its own good time to allow for its discovery and to be heard. This time that it offers implies that upon each listening, there are new things to discover, and the experience is renewed each time. Listening thus becomes creating, as Cage (cited in Nestruck, 2017) suggests: "The act of listening is in fact an act of composing."

In some of my music, the transformations evolve over long durations without any trace of interruption, setting the stage for a continuous and fluid musical flow. I use

10 - " Éliane Radigue « compose une musique faite pour l'introspection, la contemplation. C'est une musique patiente, qui évolue, de manière extrêmement lente et subtile, sur de longues durées. Bien qu'elle soit en constante mutation, elle semble perpétuellement flotter entre deux états, dans une indécision permanente quant à la direction à prendre." (Translation: T. Hron)

transformation, accumulation and superposition so as to never completely fix the music and so that it seems to be constantly in a state of becoming. As Grisey (n.d.) said,

The idea is not to make the different parameters of the music audible, but to conceive of it as a continuum that unfolds rather than develops, of a substance in metamorphosis, an art of transition and of shifting lighting.¹¹

I also try to avoid sudden changes, preferring slow and continuous transformations, progressive accumulation and imperceptible mutation. That can give a static impression, but that offers a space of freedom where it is possible to be absorbed in an even deeper reality. Slow music can therefore be seen as a way to think time!

For a composer like Helmut Lachenmann, who works principally with timbre, there is not this idea of transformation or continuum but rather an exploration of gesture and articulation. I greatly appreciate his thoughts when he (cited in Ryan & Lachenmann, 1999) says, for example, that "a composer who knows exactly what he wants, wants only what he knows and that is one way or another too little." I have a paradoxical relationship to his music, which seems to me to be focused most on musical gesture and articulation, with a formalist tendency. For me, his music does not take enough time to dig deeply into the material, to explore it while allowing us to hear materials which, on first hearing, might not allow for such immersion.

Even if Lachenmann also works with timbre, the fact that he does not leave enough time or the necessary space for it to unfold musically, makes us come out of the timbre and the sonic phenomenon, to enter into a musical discourse. For me, this causes a kind of listening frustration because my ear searches to enter into the sound so as to explore it and follow its natural evolution, while here it is rather oriented towards the quality of the organization of musical gestures. Furthermore, Lachenmann organizes his materials in a serialist manner. He says himself (cited in Zendy, 1997) that

11 - " L'idée n'est pas de faire entendre les différents « paramètres » constituant la musique, mais de la concevoir comme un continuum qui se déploie plus qu'il ne se développe, d'une substance en métamorphose, d'un art de la transition et d'un changement d'éclairage." (Translation: T. Hron)

it is likely that all my decisions and control of the musical text have to do with serial thinking [...] It is true that to create a structure that "works" means destroying pre-existing structures, so, in that structuring process, one cannot abandon serial methods.¹²

That is to say that the form of a work and the actions that occur in it are precisely organized according to given series, which reinforces such a "structured" listening. For him, material is not heard for its sensual power but its structure and organization. I still must admit that on the level of his thoughts and reflections, Lachenmann is a greatly inspiring artist who created new contexts of listening.

Suspended Time (2014b), a work I composed during my doctorate, is a 13-minute mixed piece for fixed media and *Analogic Feedback* (2013-), which is a good example of my relationship with time. I recorded the fixed part one night in June 2007 as a single take of the sound of two trains crossing the rail yard in Montreal. It was a magical listening moment for me and I wanted to bring it back at the heart of a work of re-creation. Thus the recording, without any touch-ups, acts as a score over which I play my *Analogic Feedback*, in an intimate relationship between the memory of that night in 2007 and the moment of every concert. Listen the piece join with this thesis.

1.2.3 Structure:

Any intelligent fool can make things bigger, more complex, and more violent. It takes a touch of genius--and a lot of courage--to move in the opposite direction. (Schumacher, 1973)

In my compositional work, I try to maintain the greatest possible contact with the physicality of the sonic phenomenon, to set gestures and sonorities in music that are natural and organic. To that end, I force myself to work with simple forms and structures so as to leave space for the force of the sonic material I use. As Arvo Pärt

12 - " Il est probable que toutes mes décisions et mon contrôle du texte musical ont à faire avec la pensée sérielle. » [...] « S'il est vrai que créer une structure qui « fonctionne » signifie détruire les structures préexistantes, alors, dans ce processus de structuration, on ne peut pas renoncer aux méthodes sérielles." (Translation: T. Hron)

(cited in Boston University School of Theology, 2010) put it, "I have discovered that it is enough when a single note is beautifully played." One can discover all the beauty in the world in the simplicity of a single note. This also brings to mind an experience that Scelsi recounts (cited in Solomos, 2012) in his research on single sounds:

It is in replaying one note for a long time that it becomes great. It becomes so big that one hears much more harmony and it grows within it. The sound envelops you. I assure you, it is something else. Inside the sound, one discovers a whole universe with harmonics one never hears. The sound fills the room you are in, it surrounds you. One swims inside it.¹³

Scelsi thus describes the wealth of a musical experience that does not necessarily flow from the complexity of the musical setting, but rather the vital force of what exists in the sound. He adds (cited in Kanach, 2011) that

Western classical music has devoted almost all its attention to the musical setting, to what we call musical form. It has forgotten to study the laws of Sonic Energy, to think of music in terms of energy, therefore in terms of life.¹⁴

This approach therefore allows for a redirection of attention towards the quality of sound and is thus a way to study the energy it contains and by that fact even life itself. It also puts the relationship to the musical setting in second place.

Scelsi's vision offers me an example of the power of sound as a source of inspiration and of the importance of maintaining a relationship with it. I also feel that simple forms offer a greater freedom of spirit and allow listeners as well as the composer, to dive into a deeper reality. This freedom offers a perpetually renewed listening, liberated from formal constraints and therefore enabling a deeper contact with the sound. This contact is what creates the force of a musical experience and is also the source from

13 - "C'est en jouant longtemps une note qu'elle devient grande. Elle devient si grande que l'on entend beaucoup plus d'harmonie et elle grandit en dedans. Le son vous enveloppe. Je vous assure que c'est autre chose. Dans le son, on découvre un univers entier avec des harmoniques que l'on n'entend jamais. Le son emplit la pièce où vous êtes, il vous encercle. On nage à l'intérieur." (Translation: T. Hron)

14 - "la musique classique occidentale a consacré pratiquement toute son attention au cadre musical, à ce que l'on appelle la forme musicale. Elle a oublié d'étudier les lois de l'Énergie sonore, de penser la musique en termes d'énergie, c'est-à-dire de vie. [...]" (Translation: T. Hron)

which my new works are generated. As Varèse (cited in Roads, 2015) pointed out,

Art is not born by reason. It is the buried treasure of the unconscious—an unconscious that has more comprehension than our lucid mind.

Choosing simple forms is my way of keeping the most possible energy and attention for the discovery, appreciation and comprehension of the sonic phenomenon. Stasis, the simplest of all forms, allows me to compose music that is concrete (as in, made up of basic materials) but not narrative. As Buydens (2005) wrote,

Non-functional music does not require anything but aims to exist, to overcome us like a drug [...] it is a question of presenting the forces and to carry the listener into a becoming and not to represent forms or communicate a meaning [...] this floating music [...] is marked with the seal of immediacy.¹⁵

This summarizes in some way my music's message.

This does not stop me from working fastidiously to create a journey that reveals sonic phenomena whose matter is extremely rich, as described in (1.2.1). I force myself to keep a coherence of gesture and movement in order to be able to create such sonic expeditions that seem to simply arise naturally both for the listener and the performer. Simplicity of form allows us to let go of giving it attention and thus to come into greater contact or even vibration with the music that is inherent in the material. Thus, as Takemitsu (cited in Brussels Philharmonic, 2016) suggests, "Composing gives a proper meaning to the natural streams of sound that penetrate the world."

Virtuosity in my music thus does not come from the complexity of its construction but the audible richness that is deployed musically. A virtuosity of listening, as defined by Éliane Radigue in the DVD interview *Virtuoso Listening* (Prosaïc, 2011) or Alain Savouret (2010), and which develops and is shared in the experience of the concert or

15 - " la musique non fonctionnelle ne requiert rien mais se borne à être, à nous investir comme un psychotrope [...] il s'agit de présenter des forces et d'emporter l'auditeur dans un devenir, et non de représenter des formes et de communiquer un sens. [...] cette musique flottante [...] est marquée du sceau de l'immédiateté." (Translation: T. Hron)

the listening of a recording. Such sensitive, subtle and attentive listening requires a certain participation from listeners and allows them, if they invest, to reach new levels of awareness and interaction with the music. It is important to me that listening be a blissful experience, and that be it physical, almost Dionysian, and not Apollonic, measured, ordered and rational.

On this topic, certain musical works using minimal structures have particularly influenced me in the last few years. I am thinking, among others, of a piece such as *Four Violin* (1964) by Tony Conrad. Walls (2016) write:

This half-hour landmark reveals the spitfire sonic activity that can be created when rigorously designed microtonal relationships are given enough time to scrape against one another in all their complexity: Conrad overdubbed himself four times to make the harmonies here. The overlaid tones create vibrating beats that leap out at the listener — showing just how "active" a drone can feel when designed by an acoustician.

This 35-minute work is created from a single gesture, and there is very little harmonic activity or variation. Still, when we pay attention and allow ourselves to enter into the heart of the matter, we are led to discover that there is a great activity generated by the meetings of frequencies, and the friction between each track of the violin. For me, this is the kind of music that leaves a lot of space for the listener's creativity. This kind of music creates a space of freedom and of re-creation inside which, as a listener, I can forget that the world has any other goal than vibration. In such moments of bliss, time stands still.

LaMonte Young said (cited in Grimshaw, 2011),

One of the aspects of form that I have been very interested in is stasis - the concept of form which is not so directional in time, not so much climactic form, but rather form which allows time, to stand still.

I believe this is a way to connect to the sensual force of sound as a means of experimentation and as a process of discovery and understanding. As Xenakis (1971) observed,

Art, and, above all, music, has a fundamental function, which is to catalyze the sublimation that it can bring about through all means of expression. It must aim through fixations which are landmarks, to draw [one] towards a total exaltation in which the individual mingles, losing his consciousness in a truth immediate, rare, enormous, and perfect. If a work of art succeeds in this undertaking even for a single moment, it attains its goal.

G rard Grisey said (cited in B ndler, 2001),

What, for me, is very important is to have a sort of ecological attitude toward different sounds, to just accept them as they are and try to find the right place or right function for them in the context of the piece. This is one of the problems composers have -- how to find the right function of the right sound at the right moment.

Thus, the perfect place and function of sonic material in the context of the work leaves all the attention open for the virtuosic listening posited by Radigue. This quality of presence to the world and to music allows for the experience of total and immediate understanding.

That is exactly what I struggle to apply in my own music, working with sounds as they are, listening attentively and in depth so as to find their right place in the work. I then force myself to construct musical worlds that evolve slowly and progressively. As for duration, I rely on my intuition, since "music puts us in sympathy with an intuition for duration," as said Mazeron (2016).

A work like *Corrosion* (2013b) perfectly illustrates this notion of a simple form that leaves space for attentive listening. The work, made up of a long crescendo elongated with a long diminuendo, sets up a progressive accumulation of the song of *Acoustic Oscillator*, vibrating at frequencies in the high register (between 4000 and 12000 Hz), followed by their slow disappearance. This mass of vibrations creates a palpable density and thickness both in the concert space and the listener's head.

1.2.4 Space: Space is often an important element in my work, for example in the case of visual and sound installations that stage my new musical instruments in specific locations. Every time, the work is the same: to integrate the installation in

space in such a way as to include that element in the complete experience. In the context of my installations, I am always looking for a way to create connections between the instruments that I 'install' and the space of the exhibition with all of its parameters in mind: its acoustic, its dimensions, its volume, etc.

In this sense, I try to answer musical questions pertaining to structure and composition by taking into account not only the sonic aspect of the musical discourse, but also the perceptual journey of the audience listening to that discourse in the space of creation. The result is a particular attention to the staging of the installation in the space and its implementation, to the quality of the materials used, to the distinctiveness and aesthetic of the exhibited instruments and to the lighting of these and the exhibition space itself.

In the *Qi* installation (2014c, Appendix 1: installation #1), for example, I created a rectangular space of 4 x 6 m that I placed inside an equally rectangular exhibition space of 7 x 11 m (the Festspielhaus Hellerau in Dresden, Germany). I placed 35 *Tubes* (2014, figure 1.10), the instruments used in the installation, specifically in seven rows of five *Tubes*, methodically distancing them from one another by one metre. The goal was to create an interplay between the space created by the perfectly aligned *Tubes* with the architectural lines of the exhibition space. This back and forth between the interior of the work (the installation) and the exterior (the space of the exhibition), continually transforms as we move around. This way of meticulously lining the instruments up horizontally and vertically in space highlights the presence of multiple lines of architectural perspective, within both the space of the exhibition and the installation.

Moreover, the materials chosen in the construction of the instruments (tubes of extruded polycarbonate) are crystal clear, showcasing the play of light and the reflections of all kinds (from the light sources, the other instruments, from their own presence in space, etc.). Putting the space together in this way creates dynamic interactions between the audience, the instruments, the space and the light. In addition to being enveloped by a buzzing of pizzicatos in motion, audience members see lines being drawn and transformed around them at the rhythm of their movements, in a very progressive manner. The result is a constantly transforming perception of music and space.



Fig. 1.10 *Qi* (2014). Visual and Sound Installation staging 35 *Tubes*, new invented musical instrument.
Photo : Tonlagen Festival, Hellerau – Dresde, Germany, Floss, Stephan © 2014.

Space also plays a central role in my musical works, since it allows me to stage my music by spatializing it in the concert hall. I am thinking, for example, of works *Tribal* (2001d) for an orchestra of 40 musicians playing my instruments. This 60-minute work was created and conceived for the St-Jean Baptiste Church in Montréal, where all possible spaces were utilized: the work begins outside and then the musicians, placed on the balconies and among the audience in the nave, move around. *Vortex* (2004a) for 8 to 12 *FlyingCan* players also comes to mind, with the performers perched on any barrels, high tables, balconies or terraces available in the performance space, such that they can spin their *FlyingCan* above the heads of audience members yet still keeping them at the heart of the sonic phenomenon and the action. Or I am also thinking of *Sirènes Volantes* (1998), which is my harbour symphony for fifteen boats and two trains that occupied the space of the Old Port in Montreal. These and several other pieces rely on theatrical staging as a central parameter, implicitly integrated in the composition.

This is particularly true of *Jonas dans la baleine* (2014a-15, Appendix 1: work #2), part

of my doctoral work. This piece was written for several of the instruments of the Plateforme Totem (see Appendix 1), which was itself put together for the creation of five works by different composers (Michael Edwards, Benjamin Thigpen, Zack Settel, Michal Setta and myself). It is made up of 40 instruments (2 *Pipe* (2013), 18 *Tubes* (2014), 10 *Vibrating Membranes* (2010, figure 1.11) and 4 duos of *Telescopic Tu-Yo* (2010, figure 1.12), placed in such a way as to create an installation inside of which the



Fig. 1.11 *Vibrating Membranes* (2010). Invented wind instrument
Photo : Laporte, JF © 2010.



Fig. 1.12 *Telescopic Tu-Yo* (2010).
Photo : Laporte, JF © 2010.

audience is invited to move around. All the instruments are remotely controlled through OSC on iPads. In my own work, I mainly used a duo of *The Pipe* (2013) as a solo instrument, moving around in space during the performance. I could thus start the work without putting my presence into play as the audience discovered the music: people could concentrate on the movements and sounds of the duo of *The Pipe*, which were amplified and occasionally processed live for this occasion. The installation-like presentation afforded the public an opportunity to move and thus feel the transformation of the vibrations alongside their movements in space.

This approach springs from experiences I had in my first years of musical research (exploring empty ship holds while researching possibilities for my harbour symphony *Les Sirènes Volantes* (1998), recording wind and ice during the ice storm of 1998 for my piece *Prana* (1998), exploring a grain silo for the piece *L'éveil d'un Titan* (2000b). Such experiences made me conscious of the power of sound as well as the space in which it occurs and in which it is staged.

This feeling was confirmed during a concert in Switzerland in 2003 during the Festival Archipel while listening to a work by Luigi Nono, *No hay caminos, hay que caminar* (1990). This 25-minute work for seven choirs and seven orchestral groups placed around the audience is distinguished by its conception of space, in which the resonance of the concert space resonates in a constantly renewed, allowing for the appreciation of sonic parameters other than pitch and duration. As Petazzi (1999) said, in this work,

“Nono works on sound and space towards a radical re-evaluation of the relationships possible between these two dimensions.”¹⁶

During that concert at the Festival Archipel, the work was presented twice in a row in order to allow the audience to change places for the two versions. This was a revelation for me, not only of the quality of Nono's musical work, but also of the perception of space and sound in the space of the concert (a large church), which truly led to "double listening." The same music but two completely different experiences, with this impression of not having heard the same versions, certainly a result of both the change in perception between the first discovery and the re-listening as well as the change of position in space. This experience was imprinted in my memory and continues to feed my reflections on sound, space and the experience of music.

1.2.5 Volume: In my works, the volume at which the sound is produced is of capital importance. Whether it be infinitely soft, as in *le chant de l'inaudible* (2001a), a saxophone quartet where the sounds created by the four musicians are hardly audible

16 - “Nono travaille sur le son et l'espace, pour une réévaluation radicale des relations possibles entre ces deux dimensions.” (Translation: T. Hron)

(which I believe forces attentive listening), or extremely intense, like in my 6-minute piece *explosion* (2014a) for two *Analogic Feedback* players, audio volume is an important parameter. It allows me to capture the audience's attention in such a way as concert space.

Once again, intensity makes it possible to create a certain dramaturgy, to create musical tension that forces a certain type of listening and in some way conditions the audience's listening. In a work like *explosion* (2014a), for example, the audience is surprised by a dense and sudden sound wall that is never dampened. Listeners might be overwhelmed or lose their bearings. But little by little, the ears of the willing start to open and hear a rich, complex and extremely animated material. And just at the moment when the listener starts to develop a taste for this music, it suddenly stops, leaving for some a certain frustration at not being able to enjoy this material longer. Furthermore, in this kind of music at high volumes, the projected sound comes into relationship with the space it inhabits, creating a situation in which what the audience hears is the result of what is played by the musician(s) and the acoustic of the space of the concert. In the work of a composer like Phil Niblock, for example, the volume at which his work is performed brings it into relationship with the acoustic of the hall, thus creating a magnified listening space.

Phill Niblock (cited in Freerix, 2011) describes it thus:

"I felt the music had to be heard live, when you can play it with a decent sound system in a large space and loud, because it's then that the overtone patterns start to happen." For him, "it's microtones that do the work." And he adds (cited in Saunders, 2009), "You really hear a completely different overtone pattern at the louder levels. There's one piece in particular, from 1974, and for cello, and it's only eight channels and not all eight channels are on all the time either. When it's loud enough, you hear the overtones and you lose the cello completely and when you turn it down you just hear cello. It's just the best example of what happens with different loudness levels."

Niblock refers here to the phenomenon of otoacoustic emissions (OAE).¹⁷

17 - OAEs reflect the spontaneous activity of the ear, which not only hears sounds but also creates them in response to external sonic stimulations. Thomas Gold theorized OAEs in 1948 and David Kemp proved their existence in 1978.

The addition of a slow evolution projected with a related dynamic affords an immersive experience of the music that might not exist without a certain volume. This is exactly the case in a show like POL (1998) (cited in Granular Synthesis, n.d.),

a Granular Synthesis work for 7 screens, where the audience is assailed and then invaded physically and mentally by a crushing flow of stimulation, created from audiovisual samples of the body and voice of the Diamanda Galás. Sensory bearings overwhelmed, everyone is led to an experience of great intensity, at once personal, total and unique.¹⁸

In my more introspective music, such as *Intimité* (1999b, solo flute), *Confidence* (2000a, solo violin), *Le chant de l'Inaudible* (2001a, sax. quartet) or even *Parfums de poussières* (2013a, Ensemble Transmission), the dynamic is reduced to its lowest level, in a kind of chiaroscuro at the limit of the audible. These works are related to the work of Sciarrino in their musical staging of individual timbres and the highlighting of hardly audible sonic phenomena. This kind of music demand a particular attention from musicians, who must concentrate on sonic universes that are almost silent and fragile. It also requires new levels of listening from the audience, as Sciarrino remarks (cited in Kaltenecker & Pesson, 1990) :

the listener is obliged to lower his threshold of listening, so that at a certain time, he hears more.

What attracts me to these almost minimalist works, beyond the reduced volume, is the role it offers the audience, offering the possibility to come into and back to the work progressively and slowly to discover all the richness, subtlety, refinement and power of the primary material that it brings to bear. The result for me is an experience of great intensity that I feel is full, intimate and singular. In some way, the limitation of the structural frame gives the imagination the opportunity to take over the construction of a singular, individual, rich and profound experience. Some of my works are related to

18 - " POL, œuvre de Granular Synthesis pour 7 écrans, où le spectateur est assailli puis envahi physiquement et mentalement par un flux écrasant de stimuli, créés à partir des échantillons audiovisuels du corps et de la voix de la chanteuse Diamanda Galás. Bouleversé dans ses repères sensoriels, chacun est amené à vivre une expérience d'une grande intensité, à la fois personnelle, totale et unique." (Translation: T. Hron)

composers in the minimalist tradition like Niblock or Young, but they differ in that they put timbre rather than sustained pitches in the forefront.

In this section, we have seen how sound is the primary source of the composer's work. We have also been able to see that time plays an important role and that the composer prefers it to be slow and favours simple forms that allow the audience to explore the heart of the sonic phenomenon. We have also noted that in the creation of works, the composer seeks large spaces and that volume is a parameter that allows him to create a drama of listening, staging works in a particular way.

1.3 Performer

The following section establishes the role and importance of the performer in the iterative process of research and creation, in the development of new instruments and the interpretation of new works.

In this section, I start by defining the relationship that as a performer I foster with the instruments that I play, how they help me manipulate sound, and then I show how that is in fact at the heart of my practice as defined in (1.1.1). I then attempt to show the importance of relationships with other artists with whom I play before dealing with the notion of time that is implied in my relationship as a performer with the sound and the instruments. Finally, I cover the physicality involved in the creative process, in the physical relationship I have with the sound and the instrument.

Performers' aesthetic reflections are expressed through instruments, sound, union, time and physicality.

1.3.1 Instrument: Since the very beginning of my forays into the world of music, I have had very little affinity towards playing traditional instruments. Early on, I could see the possibilities for the expansion of my creativity within composition in a way that would allow me to create music that did not have to suffer from my lack of instrumental

virtuosity. Moreover, thanks to my experience in civil engineering and house construction, I quickly started to experiment with different materials and to build my own musical instruments. These allowed me to start playing on a daily basis and to make instrumental practice a way of life. In the words of John Coltrane (cited in Keizer, 2010),

All a musician can do is to get closer to the sources of nature, and so feel that he is in communion with the natural laws.

What interests me as a musician is the experience of sound through intense listening, again like Pauline Oliveros's *Deep Listening*. This kind of listening allows for an enhanced awareness of music and the sounds that it implements. This is the kind of quality of deep and essential attention that gives musical action its entire meaning.

1.3.2 Sound: I like to listen and stay attentive to the sonic world that surrounds us, such as it is. This attitude led me to discover new sonorities on traditional instruments. That is the case in my work *Impression* (1999a), where I rub a key of my cello on a rough surface. Similarly, in *la puissance de la fragilité* (1998), for violin and cello where the musicians, of which I am one, pull and rub their fingers on bow hairs tied to the strings of the instruments in order to make them vibrate. And also in *l'invisible piano* (2001b), where I use rosin on my fingers to rub the strings of a grand piano. This approach also brought me to discover new modes of creating sonic vibration, which in turn led to the invention of instruments as described in section (1.1.1).

In my opinion, the performer and the instrument can only come into communion through the sound itself. As Scelsi said (cited in Wolf, 2001),

He who does not penetrate to the interior, to the heart of sound, even though a perfect craftsman, a great technician, will never be a true artist, a true musician.

In a certain way, it is the sound that allows them to be connected, and without the presence of that primordial link, it is impossible for music to rise above a certain level.

The practice of a musical instrument has had a powerful transformative effect on me and echoes Terry Riley when he says (cited in Proxemia, 2014),

Music can also be a sensual pleasure, like eating food or sex. But its highest vibration for me is that point of taking us to a real understanding of something in our nature which we can very rarely get at. It is a spiritual state of oneness.

Music is indeed a spiritual activity for me and I share Hariprasad Chaurasia's vision when he states that (cited in Gottstein, 2002)

Whoever gets involved in this field becomes spiritual because the music itself is purely spiritual. The music is a prayer, a rare kind of prayer. Music is created by the Supreme entity ('Brahma') so that we can get an understanding or a view ('Darshan') of that entity.

And the same is true of the following quotes from Beethoven (cited in Fitzpatrick, 2013): "Music is the mediator between the spiritual and the sensual life," and Oscar Wilde (cited in Le Monde, 2017) : "Music brings the soul into harmony with all right things."

There are obvious examples of the elevation of music in its history, even recently. I am thinking here of musicians like John Coltrane, among others, who were able to achieve uncommon levels on performance. Coltrane himself said (cited in Irvin, 2009):

My music is the spiritual expression of what I am — my faith, my knowledge, my being...When you begin to see the possibilities of music, you desire to do something really good for people, to help humanity free itself from its hang-ups...I want to speak to their souls.

Clearly Coltrane's contact with the sound of his instrument was completely established and the two were really one and the same. A work *A Love Supreme* (1965a) on the recording of the same name is a good illustration. Such contact and union create a rich and powerful work that influenced (and continues to influence) a large number of artists who followed him.

Thus it is through contact with my instruments that I develop an increasingly deep

relationship with music that feeds me enormously as a human being. This relationship with sound allows me to understand the world better and to come ever closer to my deepest essence. This privileged relationship with music allows me to shine, to feel happy and to live more fully.

1.3.3 Union: The notion of union is also, in my opinion, extremely important for performers. By union, I refer to the relationships between the different musicians of the same work with those who are listening to it. What is stimulating as a musician is, of course, the ability to master one's instrument in such a way as to play as freely as possible. To find oneself on stage as a solo artist is a strongly enriching and extremely inspiring experience. It allows us to hold the attention of the audience alone and to transport them through our playing. As Hariprasad Chaurasia (cited in Shivaram 1995),

When I play, it is not for the audience. I play for that superior Power in between the audience and me. [...] I perform for "that Power." If He is satisfied and happy, I feel blessed.

Meeting other artists, however, especially other musicians, is also very inspiring. When it comes to interacting with other musicians, our playing finds itself greatly modified, especially in improvisatory contexts. In these contexts, we are brought to go beyond ourselves, to explore music in different ways, to let ourselves be surprised or take on a different role (the roles of accompanist, respondent, soloist, etc.). Improvisation also has the power to create new contexts and types of music, which can lead us to play in completely different ways than we might as soloists. In these contexts, I am not entirely in control since I am interacting with others, which requires me to be constantly attentive not only to what I am producing, but also how I am exchanging with the others. In the words of Alain Savouret (cited in Canonne, 2010), "the goal is to hear the world better." ¹⁹ It's extremely enriching as a musician, since one discovers sonic territories as yet undiscovered. In addition, group projects bring the notion of dialogue with the other or others into play: it is no longer the solo play that guarantees the quality of the result, but the quality of the exchange and sharing among the musicians.

19 - "le but est de mieux entendre le monde." (Translation: T. Hron)

In other words, the music arises from the encounter among the musicians. In these situations, it is no longer a question of *my* music, but of *our* music. For there to be union, there therefore needs to be listening, dialogue, sharing and exchange, and I believe that a part of what is transmitted to the audience is exactly that quality of union itself.

During my doctoral research period, I developed three projects largely based on the principles of musical improvisation. LBB (2016) is a trio project with jazz drummer Emilio Bernè and blues-rock-pop guitarist Carlo Barbagallo, where I play my *Analogic Feedback* instruments. I really find playing with this trio extremely intoxicating, since it engenders a feeling of excitement heretofore unexplored. You can listen the recording of *L.B.B. Trio* join with this thesis. As Joëlle Léandre (2011) would say, "Improvisation is music of jubilation where the primary driving factor is incarnate liberty."

I have euphoric moments playing in this trio, ecstatic moments that transport me musically into another temporality. During these moments of intense vibrations, I feel very strong and inspiring sensations. Mihály Csíkszentmihályi (cited in Nakamura & Csikszentmihalyi, 2011), calls this state *flow*.

He define the flow state as an optimal experience that implies intrinsic motivation and interest. When attention is completely absorbed in the challenges at hand, the individual achieves an ordered state of consciousness. Thoughts, feelings, wishes, and action are then in harmony.

I think that as audience members, we receive the energy contained in that flow, the energy that is among the musicians or members of a group. It is in fact an intrinsic part of the experience of a live music event. It is also clear that every musician in a group is influenced by the energy that they receive from the other musicians, which is something that cannot happen in a solo performance, even if in such cases the musician can feel the energy created by the audience's attention.

The union among two or more musicians in the moment of a performance onstage can be a magical moment of communion. Bringing music to life live in front of an audience requires a very particular quality of communication and union. It is a connection of

exchange, communication and sharing that is enormously nourishing. This notion of union is well documented in the videos submitted with this doctoral thesis. There are works by the LBB trio, the Inner Island duo and the RUST duo, three “*comprovisation*,” (as explained by Dudas, 2010) projects that I developed over the four years of my doctoral research.

These three projects are based on improvisation as a means of expression. In each one of these projects I use my invented instruments, especially the *Analogic Feedback*. With LBB (guitar, drums and feedback), I explore rhythm through a kind of entirely improvised free jazz rock noise that always uses predefined ideas or forms. With RUST, it is more a question of creating music from materials that have been structured throughout our residencies and concerts. At a certain moment, we manage to determine each piece in such a way that we can perform them again keeping the same identity. In the piece *Traces de poussières* (2015) with Inner Island, I explore short musical phrases and silences always in a kind of call and response, still with my *Analogic Feedback*.

In these three projects, I am exploring physical playing, which implies the body in action, both of the performers and also of the instruments, in keeping with the concept of embodiment that I will take up in (1.3.5). Moreover, what I am looking for in improvisation is to develop an ever increasingly complete knowledge of my instruments alongside a greater mastery that will allow me to express myself musically without forethought. The idea is to be able to express myself freely with the instrument in the same way that I use language and thus to refine my performative reactions to those musicians with whom I interact musically.

1.3.4 Time: Time is something primordial in my approach to music, as I describe in chapter (1.2.2) and this also holds true in my performance work. The perception of time in the concert situation is extremely variable. Sometimes one has the impression of playing many long minutes only to realize that actually it was only one or two, while at other times it is the opposite impression, that is to say, of feeling one has played only briefly when in fact ten to fifteen minutes have gone by. Henri Bergson (1993) gives a

good definition of this relationship of perception and time:

He distinguishes between felt time, the time of consciousness – duration, from objective time, the one on the clock, the one used by scientists. The latter cannot be compressed or extended, whereas duration is a function of the person experiencing it. ²⁰

This relationship with time makes me think of the works of Morton Feldman's last period, which can last several hours and where the notion of time is suspended, which demands a concentration and total availability from both musicians and audience. In this music, it becomes less important to enjoy the global form of the work than to savour the depth and quality of the materials set to music in the present moment. These materials are never presented in the same way twice, creating constant surprise while listening.

As a performer, it even happens that one is no longer present in time, waking only once the piece is finished. I remember a solo piece *spin* (2008b) that I played on a concert some years ago. I recall the beginning of the piece, when I stopped playing after a minute to ask that some loud ventilation be turned off, and then I only remember my return to reality at the end of the performance, during the ovation by the audience. Between the two, I was elsewhere, absorbed in bringing the piece to life, and I have no memory of the 18 minutes that passed.

Music would thus seem to have the power to make musicians lose track of time. When performers manage to stay very focused and perfectly immersed in the sonic phenomenon they are generating, they come into a kind of osmosis with the material to the point of vibrating in sympathy with it. In these moments of ecstasy, the music rises to magical heights and the perception of time is erased to leave full range of action to the experience of the music. This state of optimal experience is what Csikszentmihalyi (1990) calls a “flow state,” cited in Iyer (2014), a mental and physical state of utmost relaxation, focus, and concentration, known to be conducive to creative thinking.

20 - “Il distingue le temps ressenti, le temps de la conscience – durée –, du temps objectif, celui de l’horloge, celui des scientifiques. Ce dernier est incompressible et inextensible, tandis que la durée est fonction de la personne qui l’expérimente.” (Translation: T. Hron)

1.3.5 Physicality: As a musician, another important aspect for me is the integration of my physical body in the production of the sound. Playing an instrument involves the entire body and creates an incomparable kind of tension during the concert. One of the things that is transmitted to the audience and that is responsible for the power of live music is just that tension and what it can set in motion. The energy transmitted in this way is unique and makes the concert a special moment. What I enjoy as an audience member in live concerts is exactly that physicality, that state of flow that creates a unique link between performers and their instruments.

On this subject, it is not so long ago (November 24, 2014) that I was struck by this state of flow during a concert I attended at the HCMF, where I discovered the trumpet player Peter Evans for the first time. It was a moment of unusually rare intensity of performance that deeply affected me, a moment that stays etched in my memory. I was also touched by the fluidity of the whole: the musician, the instrument, his way of moving and the music he was producing. It was a great moment in music for me and a very inspiring discovery. Like Dave Douglas says (cited in Chinen, 2016),

The kinds of things he was doing, hardly anybody was doing, [...] He has now further developed those techniques into some sounds that are wholly his own. That doesn't happen too often.

What seems important to me in music is direct contact with the sonic material; this is the idea that music is experienced first and foremost through the body, when it comes in contact with vibrations. This is when the body adjusts to the rhythm and the breathing to the musical flow, even before the mind has a chance to enjoy the musical result in an intellectual way, all while being a part of it, in such a way that, in the end, the music and the body are no longer separate and dance in harmony. This refers to the concept of embodiment, where the body is directly tied to the development of emotions and vice versa.

As V. Iyer (2014) point,

Music is born of our actions—its ingredients are the sound of bodies in motion—and therefore music cognition begins as action understanding.

I recently had an experience that perfectly illustrates the relationship of the body as a transmitter between mind and physical environment. For the last four years, I have been developing and playing electroacoustic instruments that I call *Analogic Feedback*, presented in section (4). Over the course of those years, I've developed a close relationship with the sounds the instruments produce, to the point that I've even developed a physical response – bodily sensations and a way of moving – with the sounds.

During a recent concert (November 18, 2017) with the RUST duo, I had a very strange experience while touching my instruments. The night before the concert, I set all my instruments up so as to be ready on the day of the presentation. As I was setting up, I had a slight electrical problem that subtly transformed the sound of my instruments. In the beginning, I couldn't understand what was happening and I had a strange sensation playing and listening to my instruments. I spent the day of the concert recalibrating each of my objects so that I could obtain a sonic result close to the one I normally produce. And I realized during that day and even more during the concert, that my body didn't move at all in the way I was used to. I was no longer in a state of bodily fluidity during the concert and I did not feel I was at one with the body of the material, with the sound itself.

I was definitely not in a state of flow, but rather a state of hyper-concentration and most of all I was completely sucked in by the mental energy necessary to make my instruments resound in their habitual way without ever managing to achieve that completely. After the concert, I was not able to tell people whether we had played well or not, because I had not been able to take any joy from the music that we had played.

The day after the concert, we had the opportunity to record the music we had played the night before. I completely took the instruments down and set them up again to see if the problem was not the result of something that had happened during the set up. Once I finished, I immediately made one of my objects play (the spring plate), and I immediately recognized my sound, the one to which I had become accustomed and to which my body responds spontaneously. I broke into a grin, as if I had just rediscovered something familiar. I immediately found my sensation of pleasure and

excitement; I was in familiar territory, fully in command of my abilities.

We played *excavation* (2017), the new piece we had premiered, again right away, and immediately I felt the movements of my body changing. It was striking how in tune I was with the sound of my instruments. And I especially noticed that my body was more in harmony with what I was producing. I felt my body dancing to the sounds and the music, with fluid bodily movement and consonant with the materials being generated and the musical gestures I am normally called to produce while playing these instruments. I felt my body breathing fully, and especially, I did not have to think, since the movement was natural and I was therefore available to experience the sound completely.

I completely agree with Iyer (2014) when he wrote;

Music is understood as the sound of human bodies in motion; to listen to music is to perceive the actions of those bodies, and a kind of sympathetic, synchronous bodily action (i.e., dance) is one primary response.

As this section describes, sound is at the heart of the instrumental practice of performers and it manifests itself in numerous ways through the sound of their instruments. We have been able to underline that a union with the sound, the other musicians and the audience is desirable and that time is not measured but felt and experienced. Then we have recognized that the body is directly implicated in instrumental playing and that it affects the perception musicians have of the sound they are producing.

Finally, this chapter has allowed me to show that my creative practice leads to the construction of new musical instruments and that these lead in turn to the composition of new works and sound installations that set them onstage. We have also seen how these new musical instruments can feed the performer musically.

2. The internal relationship of influences.

Having described three poles of research in my musical practice, I now examine and define the internal relationships of influence among the three principal nodes of creativity in my practice (composition, instrument-building, performance), in other words, the iterative process of creation between the instrument-builder, the composer and the performer that I am. This chapter focuses on internal influences (thus from me to me) whereas in chapter (3) I take up external influences (thus from other composers, artists, etc.).

2.1 The Instrument-builder Influences: As a first step, I explore the influences of instrument-building on the composer and the performer. I start with the ties that bind the instrument-builder with the work of the composer (2.1.1), and then concentrate on the influence of the instrument-builder on the development and evolution of the playing of the performer (2.1.2).

2.1.1 Instrument-builder ---> Composer

Instrument builders explore primary material, attentive to all the possibilities of generating sound and if possible the singular and rich sound. Starting from their observations, they shed light on certain potentials inherent in the material. This was the case in, for example, the *Bol* (1999), an instrument whose first breath was born through the connection between a stainless-steel salad bowl and a latex balloon. The same is true for the *Tu-Yo* (2000), an instrument brought to life from the relationship between a PVC tube and a latex balloon. And it also holds for my *Analogic Feedback* (2013-), sound interfaces created by the connection between a piezo element and a small exciter that I developed as part of my doctorate. The bulk of the work was then to discover the sonic possibilities and to develop modes of playing these unique sonic generators.

New ways of making sound induce new ideas for works, new musical forms or parts of future compositions. Thus in working on the construction and development of new

musical instruments, the instrument-builder contributes to ideas for new works by observing these new sonic generations and their physical reality.

The instrument-builder, by virtue of also being the composer, has access to other types of information related to new musical instruments. He thus knows the mechanical functioning and technical possibilities as well as constraints linked to the instruments' physicality. These details offer new paths of exploration and new doors of understanding and appropriation of these new instruments. The instrument builder, thanks to his understanding of the instruments thus offers the composer a more complete knowledge of these, which leads to the conception of different music. This contribution is perfectly in line with musical learning (instrumental practice, instrument-building, composition), perception (bodily and spiritual), attention and intelligence.

The instrument-building work I practice is not unrelated to other artists whose practice includes both composing and instrument building, such as for example Harry Partch. The large majority of his instruments were based on microtonal scales, which is very different from my approach, which is more focused on timbral research, such as that of the Baschet brothers and their instruments such as the Cristal Baschet. My work essentially concentrates on researching new sonorities and timbres rather than the development of an instrumentarium that can respond to questions related to vertical harmony from a tonal, modal, microtonal, atonal or even spectral mindset.

There is the composer and performer Ellen Fullman who has imagined a long string instrument and plays it in a completely surprising way, rubbing her rosined fingers along these very long piano strings. Her practice is very inspiring and has led to the creation of magnificent works. I hesitate, however, to speak of a new musical instrument since it is really the extension of an already existing one. Moreover, history proposes several examples of experimenting with rubbing piano strings, such as in the music of George Crumb and John Cage, among others.

One could also take composer/artists from the sound art world such as Pierre Bastien and his Mécaniums, Pierre Berthet and his elongated pianos (he also uses piano strings fixed at one end to actual piano strings and at the other to suspended metal

pots), Yuri Landman and his hijacked guitars. But in all these examples, it is more a question of extended or diverted instruments. My practice, on the contrary, is in a large part dedicated to finding new ways of sounding that then sometimes led me to turn those discoveries into musical instruments.

There was the musician Hans Reichel, who was not a composer but who invented the Daxophone, Oddmusic (2008):

The Daxophone, invented by Hans Reichel, is a musical instrument of the friction idiophone category. It consists of a thin wooden blade called a tongue fixed in a wooden block, which holds one or more contact microphones, and is usually mounted on a tripod. Most often, it is played by bowing the free end, but it can also be struck or plucked, which propagates sound in the same way a ruler halfway off a table does.

This particular case involves an electric instrument, whereas my practice is particular in its research on the acoustic world where sound production is ruled by physical principles.

In all the cases above, what we have in common is the idea of creating music from sources other than traditional instruments, to find new sonorities or create new listening context, and that to add our contribution the enrichment of the musical world. Helmut Lachenmann suggests that (cited in Wagner. & Ernst, 2008)

It's true that I'm trying to search for new sounds, but this is not my aesthetic aim or credo as an artist. With conventional or unconventional sounds, the question is how to create a new, authentic musical situation. The problem isn't to search for new sounds, but for a new way of listening, of perception. I don't know if there are still new sounds, but what we need are new contexts.

What I try hard to do in my work as instrument-builder and in the creation of new sonic generators, is to create new contexts for playing and listening.

If I had to point to a single artist whose instrument and the music he managed to produce with it, fundamentally surprised me, I choose Stan Wood and his vibraband, a piece of stretchy elastic that is slid between the teeth whose sound is reminiscent of

the trumpet. It is enough to pinch the elastic between one's lips and to blow in such a way as to allow it to vibrate, with the various pitches created by stretching more or less the elastic end. Absolutely fascinating.

It is in this spirit that my instruments have come to life. Clearly and attention to the world around me lead me to discover new ways of generating sound which then in turn give rise to new musical instruments. These sound materials as well as these instruments then inspire the composer who will stage them in different types of musical projects.

2.1.2 Instrument-builder ---> Performer

Instrument-builders, when working on the design of a new musical instrument, test them mechanically and check the sound of these new principles of sonic vibration in order to validate their initial ideas.

It is during these tests and experiments that they can validate the concepts and visions they had. It is also during these stages that new ideas spring up as a result of attentive listening to the different sonic phenomena that have been realised by the concrete gestures that they are led to make. These first gestures lead instrument-builders to follow the sound through its different possibilities of transformation and thus they also lead to the control and mastery in playing this new sonic generator. The instrument-builder as performer thus also has a shared knowledge of the instrument, its playing techniques and the sonorities that have been discovered. This consequently feeds the understanding of the performer and offers new tools to push the mastery of the instrument even further. Thus, the musician understands the functioning of the instruments more thoroughly and can improve their performance, even develop new, unheard-of playing techniques.

The instrument-builder, through the new ideas that are realized, allows the performer to approach the instrument more openly. Thanks to their vision of the material, they allow performers to explore further the new instruments and to keep discovering new playing

methods. This understanding of the material allows performers a greater freedom of thought towards the sonic phenomenon and a greater space for discovery and adventure.

As an instrument-builder, with the help of my compositional choices, I have voluntarily chosen not to develop a key system in order to favour a more physical contact with the instruments and sonic timbres. The goal of this choice is to allow the performer to come into a kind of communion with the sound of the instrument and become at one with it. My instruments are mostly based on the singularity of their timbres, and I developed their playing techniques in order to evolve these timbres over long durations and to be able to create transformations from one state to another. In this way, the musician is at leisure to let the material evolve rather than to dedicate time to the learning of fingerings and techniques. Here it is active listening to the sound that is of prime importance. As an instrument-builder, I have chosen to robotize certain instruments, such as *The Pipe*, and to develop digital interfaces that allow for playing the instruments in a different way.

Thus the instrument-builder influences the composer in their knowledge of the material and the invention of new musical instruments, which in turn give rise to new ideas for works. I also underlined that this allows performers a more complete understanding of their instrument and to reach further in their mastery of them.

2.2 The Composer Influences: In the two following points, I will address the question of the influence that the work of the composer exerts on that of the performer and instrument-builder. First I will look at how the composer influences the vision and playing of the performer (2.2.1); then, in a second step, I will examine how the composer influences the work of the instrument-builder in the development and evolution of new instruments being made (2.2.2).

2.2.1 Composer ---> Performer

Because of their knowledge of forms, structures and articulations, composers feed the

minds of performers, who, while playing, remember these notions of composition and organizations. The research and thinking of composers allows performers to go beyond a simple score and help make its way on the path to creation.

Composers also contribute to the evolution of instrumental practice through the music they give shape to, the choice of materials to set to music and the demands (musical or technical) placed on performers who might then go beyond themselves both musically and technically. By their aesthetic choices and the music they compose, the composer allows musicians to explore new avenues on their instruments, thus enriching their knowledge and mastery of them.

This idea of pushing the limits of performance can be found, for example, in the work of a composer such as Brian Ferneyhough, of the new complexity school. Fabien Levy (2008) writes the following on musical complexity:

Extreme complexity in writing is in line with Ferneyhough's remarks, that add that 'notation is always relative to intention.' Ferneyhough is seeking in particular, through his double graphic complexity of notation and deciphering, to push professional musicians outside of their conventions and to create, through the resulting tension, unexpected, noisy, unpredictable, unstable sounds that eschew categories of harmonic notes and metrical and mastered rhythms.²¹

I agree with Ferneyhough's notion of pushing musicians beyond their conventions but where he uses extreme complexity of notation, I use new playing techniques, unique sounds and even new instruments.

Another way to put it is to say that composers create a frame of learning, research, exploration and deepening of the musician/performer's knowledge in the choices they set in motion through composition. In the context of my doctorate work, I have written

21 - “ L'extrême complexité de l'écriture est ici cohérente avec le propos de Ferneyhough qui ajoute : << La notation est toujours relative à l'intention>>. Ferneyhough cherche en particulier, par la double complexité graphémologique de la notation et de la lecture, à pousser le musicien professionnel hors de ses conventions et à créer, par les tensions qui en résultent, une sonorité inouïe, bruité, imprévisible, instable, dépassant les catégories de la note harmonique et entretenue comme c'elle des rythmes “métrisés” et “maîtrisés”.” (Translation: T. Hron)

very little for other instrumentalists and thus have not had the opportunity to push them beyond their limits. In the works I have composed for myself as the performer, such as *Jonas dans la baleine* (2014a-15), I largely created a musical situation that allowed me as a performer to enter the heart of the sonic phenomenon in order to make all of its subtleties audible.

2.2.2 Composer ---> Instrument-builder

When working on the writing of new works for such new instruments, The composer questions their potential and possibilities. These questions might lead to improvements, as in modifications to these instruments in order to answer the needs of the composer's proposal. It often happens during the composition of a new work for new instruments that the composer asks things that lead the instrument-builder to make adjustments or additions to the instruments, modifications that might be integrated subsequently in a more permanent way.

Especially when it comes to new musical instruments that are not yet entirely developed and for which there is no complete method, the composer aims to understand the possibilities of these instruments before starting the work. When various sonic possibilities arise, so do questions about the manner and methods of making sounds, different possible actions or transformations, articulations, etc.

These questions presume that experiments and answers will follow, and often that exchange leads to the discovery of new possibilities, whether in terms of sound (new timbral possibilities) or technology (new valves, taps, pedals, etc.). Thus the desire composers feel to understand the instrument, alongside their creativity in composition, feeds the instrument-builder, allowing for the refinement and optimization of the instruments that are developed.

During my doctorate, I refined the control box for my *Analogic Feedback* in a similar way, thanks to my compositional questions. Once I had created different sounds, I wanted to play several of the instruments at the same time. I therefore spent several

weeks thinking about a way of integrating all the technology underpinning the playing of *Analogic Feedback*. I came to the conclusion of needing a single control box for 4 stereo amplifiers, 8 impedance transformers, 8 exciter transducers, 2 electronic cards to control the motors, etc. After several attempts and three different versions, I was able to develop the model with which I am now performing (figure 2.1).

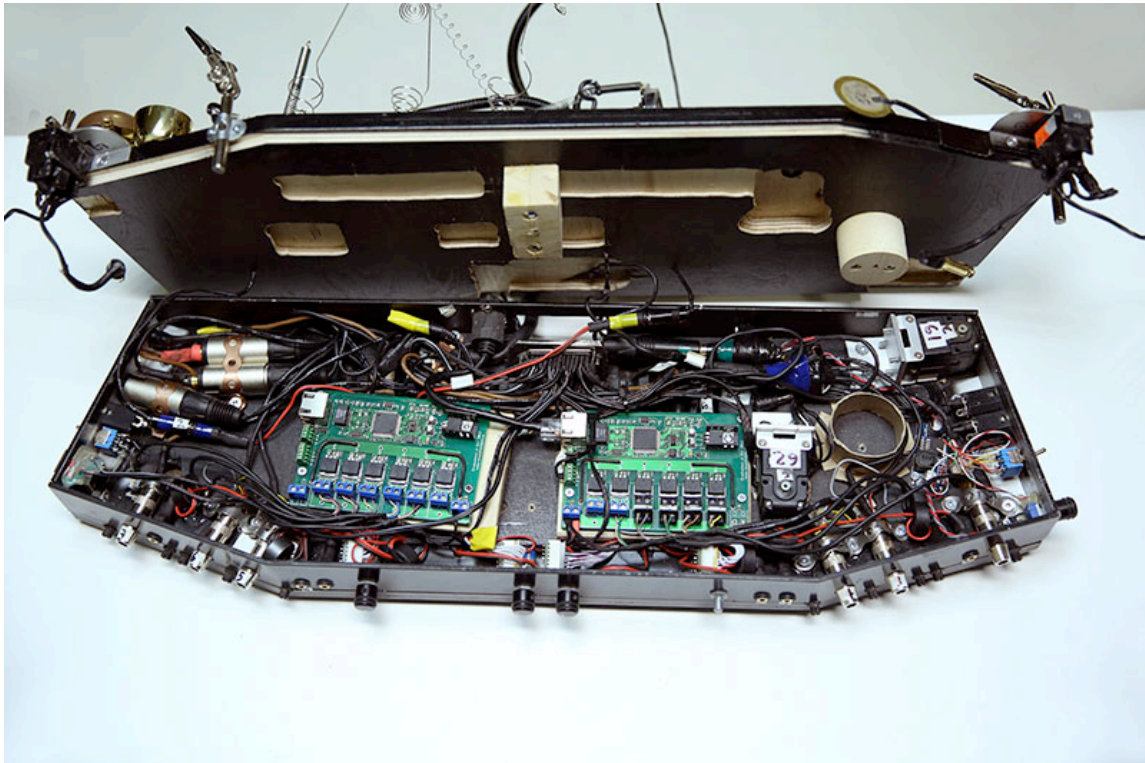


Fig. 2.1 *Analogic Feedback Control Box* (2016).
Photo : Jean-François Laporte © 2016.

This section has shown how the composer allows the performer to refine and push instrumental performance further through the composition of music. We have also discussed how the composer also encourages the instrument-builder in refining these instruments to optimize their function and sound.

2.3 The Performer Influences: In the two points that follow, I examine the influence that the performer exerts on the composer and the instrument-builder. First I will delve into how the performer's playing feeds the composer's thinking (2.3.1); then in a second step, I will discuss how the performer's expertise of these new instruments comes into play in helping the instrument-builder to perfect them (2.3.2).

2.3.1 Performer ---> Composer

The performer's practice of the instrument allows them to be at the forefront of the sonic phenomenon, its vibration. Thanks to this direct connection, performers connect with the primary principles of sound generations, principles that could stimulate the composer's ideas. Moreover, the close connection with the sound allows performers to pass on information about the actual practice of these instruments, which results in the composer being able to write musical ideas that are coherent with the physical and musical gestures possible on the instruments. The performer's fastidiousness, reflection and improvement also continue to elevate the playing to new levels that cannot but inspire the composer and lead them to write new works.

The performer's expertise can also answer questions related to certain (im)possibilities of and with the instrument. The performer's technical practice and knowledge of the instrument, coupled with attentive and concentrated listening, often leads to the discovery of new musical and sonic possibilities, since it is in its handling that the unexpected can appear and astonish. These treasures of new sounds, once brought to the surface, require exploration and mastery. It is then up to the composer, if interested, to find a context to take full advantage of these novelties.

This was the case when I started to play my *Tubes* (2014). Once I had discovered the playing principles and refined the instrument, I could finally begin to have fun with it. It was in exploring the transition from one harmonic to the next in a rhythmic manner that I discovered the potential of that approach to my instruments. I took pleasure in producing rhythm and listening to the evolution of melodic lines produced by the succession of different harmonics. This gave my composer side the idea to make this characteristic the central focus of the *Qi* (2014c) sound installation.

A large majority of musical composers were influenced at one time or another by great musicians (be they of the same or a different culture). Steve Reich's *Drumming* (1971), for example, was inspired by the study of African percussion during a stay at Ghana University in the summer of 1970. The same is true of Salvatore Sciarrino, whose piece *Sei Capricci* (1976) for solo violin was inspired by the great Paganini and is a homage

to the latter's *24 caprices* (1819). And how many composers were and still are influenced by the playing and music of John Coltrane?

2.3.2 Performer ---> Instrument-builder

Since performers regularly practice and perform their instruments in concert, they are always looking to improve their ability to respond to the various musical demands made by composers. This permanent search for efficiency and optimisation allows musicians to suggest precise improvements from the instrument-builder that can affect the practice and control of the instruments.

Thus in this exchange, the performer has the power to help evolve the instrument that will then inspire yet greater levels of expression and technique. This research also allows the instrument-builder greater insight into the functioning of the instrument and to add necessary improvements and corrections in order to keep increasing efficiency and optimization.

It is often the case that musicians have particular requests based on playing, on the music to be staged, or on certain technical considerations. These reflections and questions feed the instrument-builder to then change and improve the instrument to fit the musicians' needs. The exchange allows the instruments to evolve and become ever more complete, functional and effective.

It is thus performers with their background, their knowledge of musical science that help turn these new sonic generators from simple tools, simple sonic objects into real musical instruments.

During my doctorate, I experienced these issues by the improvements I made to my *Analogic Feedback* thanks to my questions as a performer. One of my objectives was to be able to play these instruments with the same physicality I enjoy on all my instruments, that is to say that I can manipulate them and feel the sound through my hands. I was concerned about hum because when I held the piezos in my hands they

were not isolated from the phenomenon. Looking for a way to solve this problem, I discovered a kind of liquid plastic to dip the piezos in, creating protection from the hum. My instrument-builder side thus allowed me to have instruments that I could touch and manipulate freely, and that opened the door to an infinite number of playing possibilities.

We have thus seen how the performer allows the composer to have a more complete vision of the instruments and to put the discovery of new possibilities at the forefront, which leads to the composition of new works. We have also been in a position to understand how the performer feeds the instrument-builder with technical knowledge and with additional requirements that lead to a more effective instrument.

In this second part, we have therefore explored the internal influences between the three poles of creativity in my artistic practice, those of the instrument-builder, the composer and the performer. In the third section, I present various external contributions to the iterative process of research and creation, and explore the influences of other composers and musicians who play my instruments, as well as the works I compose for instruments other than my own.

3 Other Artists' Influences: In the following chapter, I closely explore those external influences on the iterative process of research and creation among the instrument-builder, the composer and the performer. I first take up the inspiration other composers who have written works for my instruments have had on the evolution of those instruments and my own creative process. I then address the question of the influence of other musicians who play my new instruments. Finally, I examine how writing for instruments other than my own affects me.

3.1 The influence of other composers

In order to push myself further as performer and composer and to push research around my new musical instruments forward, in 2009 I launched a series of concerts entitled Totem Électrique. This series stages musical works composed specifically for one of my invented instruments, accompanied by an electric/electronic component (fixed media, digital processing, live electronics, etc.). Productions Totem Contemporain, a company I founded in 2003 to put my new musical instruments at the heart of a number of artistic projects (Totem Électrique, Totem Danse, Totem Installation, Totem Jeunesse, Totem Off-Series, etc. see Laporte (2017-Web)), produces these concerts.

One of the reasons for establishing this series, other than to create a repertoire for these new instruments, was to allow other composers to contribute to the research and development of my new musical instruments. In commissioning new works from different composers on the contemporary music scene (local, national and international), I give them an opportunity to contribute to the process of research and development of these new instruments. They bring individual approaches in the new music that they invent and through the reflections and questions that their works arouse.

Over the course of my doctoral research, I commissioned more than thirty-two new works (Totem Électrique, 2018) that were all premiered during Totem Électrique concerts. Inaugurated at the Conservatoire de musique de Montréal, where I premiered four or five new works every first Saturday in June, I subsequently opened the project

up internationally. During my doctoral research, I was able to put together a Totem Électrique - Huddersfield, where I commissioned four composers from the university (Marc Codina, Stephen Harvey, Girilal Baars and Ryoko Akama). I was also able to organize a Totem Électrique - Torino (with five composers from the Turin Conservatory), a Totem Électrique - Dalhousie (five composers from Dalhousie University in Halifax), a Totem Électrique - Daimon (four visual artists from Gatineau-Québec composed a new work), as well as Totem Électrique - Berkeley. With CNMAT (Center for New Music and Audio Technologies) at the University of California at Berkeley, I commissioned five works that will be premiered in fall 2018.

The composers I commissioned to write works for my new instruments have thus contributed to their development and sometimes their improvement. With the questions they raise, composers have led to the modification and improvement of my instruments either through the addition of new functions or through corrections to what already existed.

For example, in the piece *At the Discretion of River* (2017) for *Tu-Yo* by Samuel Béland (see the description of the instrument at 4.1.0), the composer wanted to be able to create hard cuts in the sound, to write short musical phrases, and to play dry and loud staccatos. In its initial configuration (figure 3.1), the instrument comprised two *Tu-Yos*

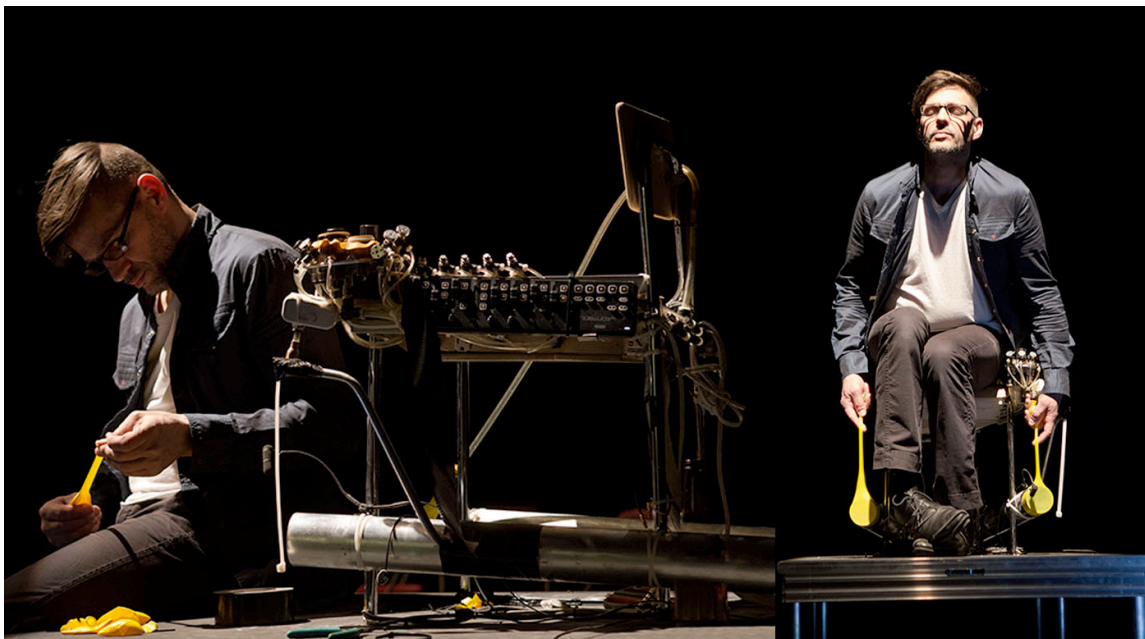


Fig. 3.1 *rust control chair* (2010). The chair with 2 *Tu-Yo* & the controls of the compressed air (for 18 instr.). Photo : Jean-François Laporte © 2016.

that are placed and fixed horizontally under a chair, fed with compressed air. Equipped with valves, as the performer I send air towards one or the other *Tu-Yo* by opening and closing them manually. Thus activating and stopping the sound functions differently in traditional wind instruments, since the action is more direct (the instrument is connected directly to the source of air coming from the musician's breath).

Mr. Béland wanted to construct a work made up of silences and dry, fast gestures with very few long, sustained sounds. After a number of attempts with the valves, it became obvious that what he wanted would be very difficult to achieve with the interface as it was. After exchanges about this idea of reactivity with the composer, and coming to understand the importance of that aspect in his artistic proposal, I decided to search for a way to make the control of the air more reactive. I finally decided that it would be better to control the air with my feet as well as the valves, which allowed me more direct and rapid attacks while also freeing up my hands to perform other kinds of manipulations on the latex membrane. Moreover, I also decided to modify the instrument's position by placing it vertically (figure 3.2), freeing my body and allowing it to participate more fully through subtler musical gestures, which in the end adds to the musical experience both for myself as the performer and for the audience. This is yet another example of the concept of embodiment, in which the body is directly linked to the development of sensations and emotions, and vice versa. This particular case is a

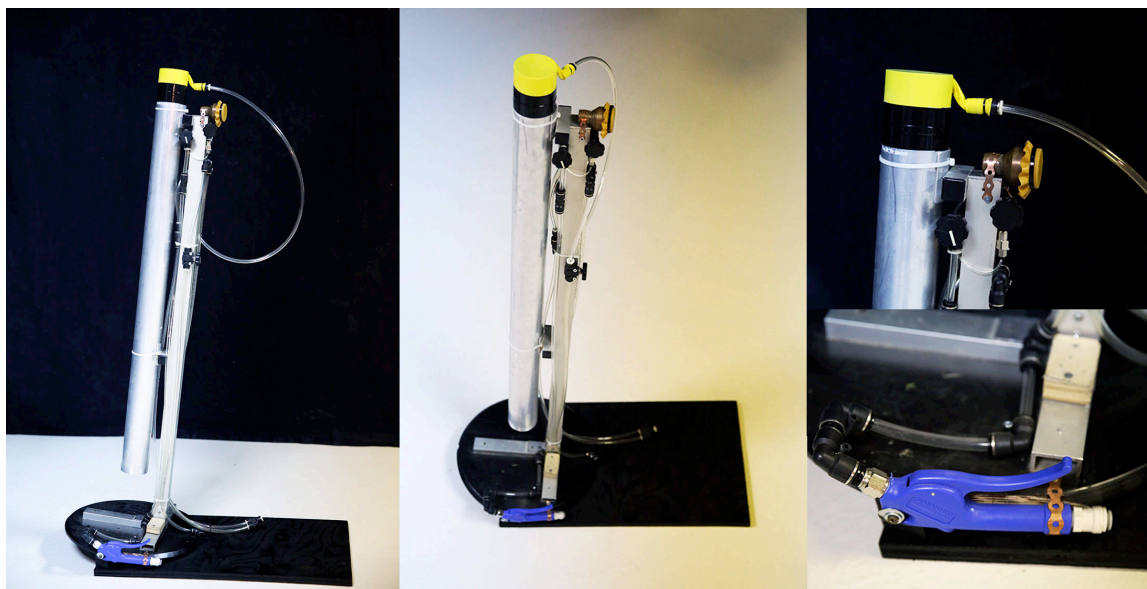


Fig. 3.2 *Tu-Yo & Vibrating Membrane* (2017). The new position of the solo *Tu-Yo* for Béland's piece.
Photo : Jean-François Laporte © 2017.

clear example of how placing the instrument vertically allowed me to embody the musical gestures and gave me the feeling of having better means to play Mr. Béland's work.

It goes without saying that this research and development engendered through collaboration, with other composers, is very enriching for me because it not only improves the performance of my instruments but also because it allows me to continue discovering new possibilities and ideas, both technical and musical, with these new instruments.

Beyond the influence that outside composers can have on the evolution of the instruments, they can also add to the evolution of the performer's playing. Interpreting these new works allows me to evolve and improve my playing techniques. Frequently other composers set new musical gestures and sounds in music. Above all, these new musics offer playing contexts that are new to me. Furthermore, each composer approaches music differently, which is very enriching for me as a performer: these collaborations allow me to explore my instruments in multiple ways, from different angles, with new ways of playing, etc.

I am thinking, among others, of a piece like *Mono no aware* (2013) by composer Pierre Alexandre Tremblay for the *Babel Table* (2012-13) and live processing. It demands a lot from the performer and the virtuosity of movement is difficult to achieve completely. As this piece develops, the musical gestures accumulate and are superposed in such a way that at the most intense part of the work, its climax, the performer is at the limit of the possible. This created a very interesting musical tension that obviously required the performer to push against his own instrumental boundaries.

Clearly, I had to work intensely to move the work forward, to find ways of playing more and more things at the same time and to be even more active than I normally am. I therefore worked on the choreography of the movements, which I had learned through my relationship with percussionist Julien Grégoire (who plays with the Nouvel Ensemble Moderne in Montréal), and who explained that to play extremely complex works like those of composer Brian Ferneyhough, one had to memorize the

choreography of gestures and movements. Such training allows a performer to gain both speed but most of all to achieve mechanical, almost automatic gestures, rather than to have to think during the concert about where to put their hands or the sticks, for example. This is what I had to do in order to perform Tremblay's work with the vitality and virtuosity it required. Once I had worked and mastered the idea, I was able to slowly push the limits of what I could play simultaneously, while still keeping the tension that gives a particular and very inspiring character to the work. Thanks to a composer like Tremblay, I was able to move further musically than I had thought possible, and to push my boundaries as a performer.

Lastly, I would like to add that the premiere of a work written by another composer allows me, as a performer, to be free of a certain stress: that of authorship. This gives me a surplus of energy that I can use in service of the music.

Thus, in their unique approaches and the works they have composed, other composers have had a number of different influences on the evolution of my work. In *Ksana* (2012) by Benjamin Thigpen for example, I had very good memory of this piece for *Tu Yo* and computer where he augmented the instrument by frequency and pitch shifting. I reused the technique in my piece *Jonas dans la baleine* (2014a), a work for two *Pipes* and live electronics.

Clearly, when I set my mind to writing new works for my instruments, there is a lot of material that springs from my encounters and exchanges with other composers that gets recycled and reappears in my works. I am thinking for example of using contact microphones attached to my acoustic instruments, like Nicolas Bernier did in his work for the *Siren Organ* (2000, figure 3.3) entitled *Micro_Mouvement* (2014). I will also most certainly use the new *Tu-Yo* position that I discovered playing Béland's piece in my future work.

My doctoral research allowed me to understand that it is very important to open my research activities to the community, to find ways to bring contributions from contemporary artists into the process of research that allows for the evolution of new musical instruments and to perfect them while at the same time pushing my ideas as

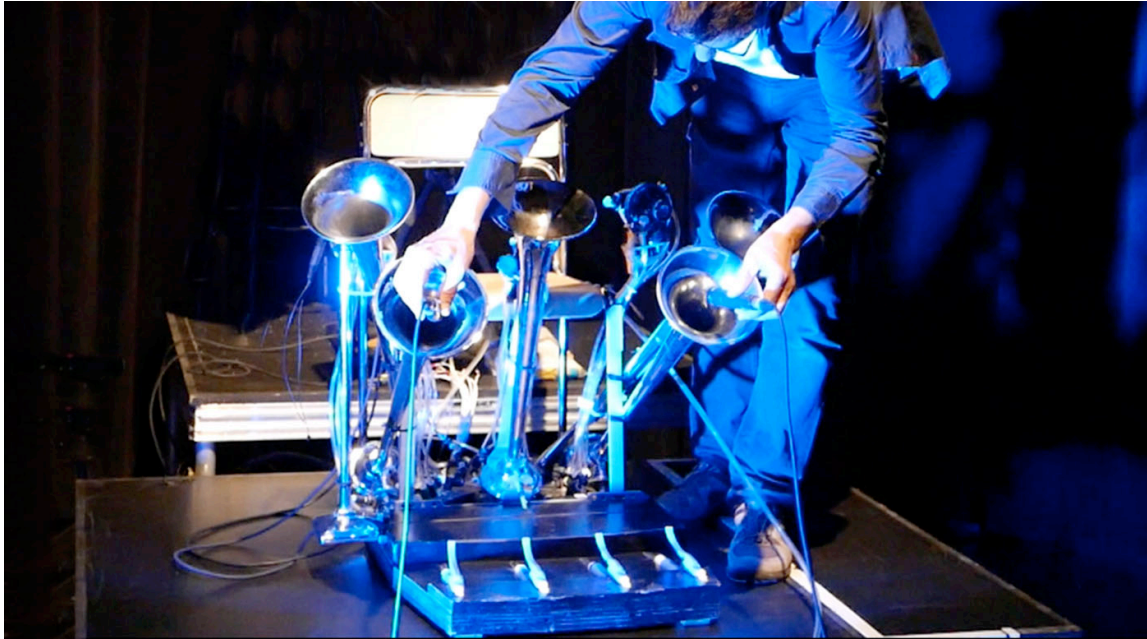


Fig. 3.3 *the Siren Organ* (2000). New invented instrument using boat and truck horns.
Photo : Jean-François Laporte © 2015.

performer and composer further. In the end, it is an experience of sharing and exchange that is at once very important and extremely enriching. It allows me to confront and push back the boundaries of my performance, to enrich my ideas as a composer and to improve my instruments as a builder.

3.2 The influence of other musicians

The study and knowledge of the work of other artists (musicians and others) is an inexhaustible source of inspiration. It nourishes my work and allows me to rejoice from the quality of what artists today and those who have come before have achieved. I am thinking here of musicians like John Coltrane who, despite making a very different kind of music from my own, inspires me deeply in the power of his offering, in the intensity emanating from his music and in the spirituality present in the last part of his life (1960-1967). Coltrane (1965) said

During the year 1957, I experienced, by the grace of God, a spiritual awakening which was to lead me to a richer, fuller, more productive life. At that time, in gratitude, I humbly asked to be given the means and privilege to make others happy through music.

The energy, effort, attention and work that Coltrane dedicated to his music are inspiring to me and helped me understand that achieving those heights of performance requires a lot of time. Much time for practice, research, playing, experimenting and thinking, and without this fastidiousness of work, it is not possible to achieve such levels of connection with one's instrument. Rudolf Steiner (1912) suggests in a lecture in Munich that "Without effort it is impossible to attain a true knowledge." Many of Coltrane's works reflect an inspiring intensity; I mention *Olé* (1961b), *Africa/Brass session* (1961a), *Kulu Sé mama* (1965b), *My Favorite Things* (1965c, the version that lasts more than 20 minutes or the *Olatunji live concert* version (1967), which 34 minutes) etc. I always aspire to have my music communicate a similar intensity and energy.

It is also clear that, attracted by novelty and interested in innovation, each new musician who walks outside the beaten path motivates me. Here I will mention musicians like Stan Wood and his *Vibraband* (see Somekh, 2007) for example, or Gordon Monahan and his *Speakers Swinging* (1982). I also refer to composers like John Cage and his *Complete Music for Prepared Piano* (2007), Harry Partch and his instruments, Penderecki and his new playing techniques and graphic (*Threnody to the Victims of Hiroshima* (1960), *De natura sonoris n°1* (1966), *Anaklasis* (1959-1960), *De natura sonoris n°2* (1971) etc). All these composers opened doors that have in one way or another, facilitated and influenced my own research.

Then there is also the influence of other musicians who play my new musical instruments such as Ida Toninato, Marie-Chantal Leclair and Jean-Marc Bouchard. Ida Toninato composed two young audience shows using the *Babel Table* (2012-13). I found the way Toninato appropriates the *Babel Table* very stimulating, especially seeing her find her own ways of making the instrument sing. Naturally, we spent several hours together in the beginning, when I showed her all the playing techniques I had developed, but I quickly realized she also had her own approach to the instrument. Marie-Chantal Leclair and Jean-Marc Bouchard have also played new works in the Totem Électrique series since its inauguration 2009. Both have developed their own approach to the instruments and play them in a very personal way.

It is actually quite strange for me, having discovered and invented the instruments,

because I have a tendency to consider my own way of doing things as the reference. This kind of work with other performers requires a certain detachment and letting go. In the end, I am convinced that playing an instrument is a personal thing and there are several ways of playing that instrument, all of them valid. Moreover, listening to other musicians play my instruments in concert brings me a lot of information about my way of playing and about the sound of the instruments from the listening and audience standpoint (which I never have when it is me playing). This gives me another perspective on listening to the sound of my own instruments. This relationship to my instruments through other performers allows me to reflect on my own work as a performer and pushes my reflections as such forward.

I do notice, however, that the fact of having discovered and invented the instruments affords me something different, that is noticeable in my way of playing. Having invented the instruments and discovered a good portion of their playing techniques, I play in a more intuitive way. Also the fact of having built the instruments allows me to integrate playing techniques differently, perhaps more completely.

During my doctoral research, I spent a lot of time developing the instruments I call *Analogic Feedback*. I began this work within a RUST duo project with Benjamin Thigpen, a composer specialising in Max/MSP, who had taught me that software when I took the composition course at IRCAM in 2003. We both started working together on these new sound generators based on feedback principles. The discoveries each of us made pushed the other further. Then over the course of several months of experimentation and development, we realized that our respective approaches had taken different paths. I had opted for a physical focus that involved the body, either that of the performer or the objects, such as for example the bouncing of a piezo on top of an exciter. Benjamin opted for developing audio processing that enhanced the feedback sound, for example the division of the spectrum of each sound into several frequency bands that are spatialized individually.

I borrowed this spatialization idea in a control patch that I apply to the sounds that I send to the concert hall PA system. Sounds are panned with a random trajectory. Benjamin also concentrated on working with one or two instruments at the same time

while I opted for the use and multiplication of eight instruments simultaneously. This once again underlines my penchant for working with sonic masses while at the same time it is clear that our numerous exchanges influenced the development of my instrument.

3.3 Influences in composing works for other instruments

As a composer, despite having little affinity for traditional instrument performance and in spite of having invented new musical instruments, I've always enjoyed the challenge of composing new works for traditional instruments. This is a completely different kind of challenge than composing for my own instruments, one which requires solving different kinds of problems and answering different types of questions, which I always find very stimulating.

Unlike writing for my own instruments, composing for traditional instruments invites comparisons with the body of existing works. But even with traditional instruments, my approach stays the same: searching for unexpected sounds, discovering of materials that make the instruments sing, generating the unpredicted.

Rather than conduct academic research (going to the library or reading books on composition and instrumental technique), I rather spend a lot of time with the instruments for which I write, so as to appropriate them and try my own experiments. Thus, for every new piece I write, I find a way to have the instruments in question at hand. I spend a lot of time with the instruments, playing with material, keeping my compositional ears wide open. I force myself to approach the instruments every time as if I did not know them.

I need the material to pass through my hands, through my body, because that allows me to come into contact with the sound material in a more sensual way. This is again related to concepts of embodiment. It is only after having played and explored the instrument or instruments that I can start writing a new work, just like I would with my own instruments (as described in section (1.2.1)). Moreover, my instrument-building

side helps me to go beyond the known playing techniques and to bring to light sonic possibilities that exist but are little known (since they have often been cast aside by tradition).

This way of operating led me to compose *Impression* (1999a), a work for cello and rough surface. At the time, between two experimentation sessions, I wanted to place the instrument against the wall and it slipped. The motion created a small scraping sound that captured my attention. As an instrument-builder, I went to work to find out what had created the hissing noise and realized it was the peg rubbing against the wall. By studying the phenomenon, I realized that in pressing one of the instrument's pegs against the wall and moving it forwards and backwards, I could generate and control a whole host of different sounds.

As a composer, I then went to work to find a form and a structure for this new piece. This is another example of how the sound is the initial spark for my musical projects; that this first sound gives rise to the work. Once again, the composer/performer relationship is actively brought to bear on the composition of a work for traditional instruments.

Within the context of my doctoral research, I did not write any works for instruments other than my own, but I am just beginning a new work for violin, cello and sewing machine – a commission from the Belgian group *besides*. The idea I will try to develop is to use the playing techniques I developed with my *Analogic Feedback* for the two traditional instruments. This involves amplifying the sound of the strings with contact microphones, using these to vibrate in sympathy with the strings, using vibrating motors to create rhythms and bouncing them on certain chosen strings, etc. Clearly, my doctoral research will contribute to this new composition project.

This third section allowed us to see what the other composers I have commissioned to write new works for my instruments have afforded me as a performer in the refinement and development of the instruments I invented. We have also seen how other musicians inspire me to always go further in pushing my boundaries. Finally, we have seen the influence of writing for instruments other than my own.

4. Body of instruments/works realized during my doctoral research.

In this fourth chapter, I show three more complex examples of projects that underline the discourse of this thesis. First, I examine the new musical instrument called the *Tube*, and then analyze the *Qi* visual and sound installation that stages this new instrument. I then do the same for the new instruments I call *Analogic Feedback* and the work *le chant des machines*, which stages them. I end with a description of an *Inner Island* improvisation I performed during my doctorate. The influences between the instrument-builder, the composer and the performer are thus made apparent during the whole creative process.

4.1.0 The Tube – musical instrument

The Tube is a kind of harmonic flute based on the Koncovka or the Fujara, two instruments originating in central Slovakia and used traditionally by shepherds for their entertainment (Rybarič, Chalupka, Elschek, 2001). *The Tube* differs from the Fujara however, in that it does not have any finger hole other than the end of the extruded polycarbonate tube.

As seen in section (1.1), my instruments are inspired by the sound they can produce. They are then distinctive thanks to the material chosen for construction, their design and their aesthetic. *The Tube*, which I developed in the second year of my doctorate, is no exception.

I developed *The Tube* because of the sound it makes, a clear and deep sound similar to pipe flutes (bass and contrabass recorders, Koncovka, Fujara, etc.). The sound is produced by a wave at the upper extremity of the instrument. The air is brought to oscillate through a narrow parallel channel (B - the chimney, figure 4.1), sculpted in a Teflon plug (A, figure 4.1) that is inserted inside the principal section (E, figure 4.1) of the instrument. The air is forced towards the bottom of the channel and projected against the pointed lip (C, figure 4.1), creating the resonance at a certain frequency of the column of air in the transparent tube. This transparent tube is adjusted on the embouchure and serves as the principal resonator. The fundamental of each *Tube* is

determined by the length of the whole. A more detailed video demonstration, *Tube1*, of the instrument can be found in the Submitted works.

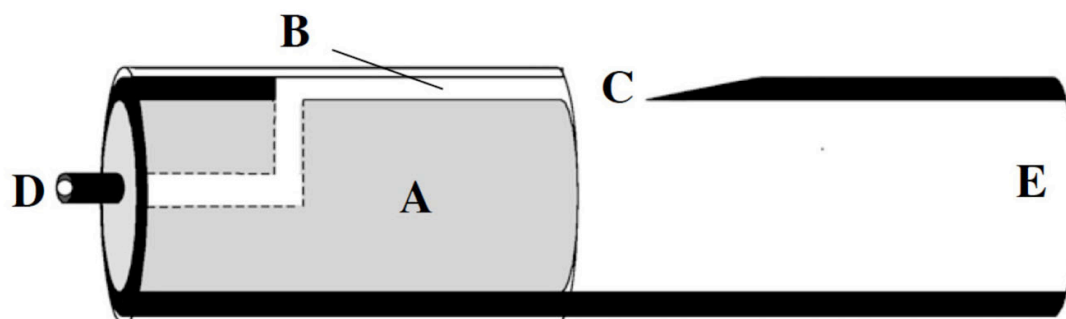


Fig. 4.1 *the Fipple* (2014). Restricted mouthpiece for the *Tube*, new invented harmonic flute.

Image : Jean-François Laporte 2015, based on the recorder image retrieved from [https://en.wikipedia.org/wiki/Recorder_\(musical_instrument\)#/media/File:Recorder300.svg](https://en.wikipedia.org/wiki/Recorder_(musical_instrument)#/media/File:Recorder300.svg)

The interesting feature of the *Tubes* is the changing from one harmonic to another, based on the variation of the air projected into the instrument (see the video *Tube1*). Thanks to the relationship between the length of the instrument and the internal diameter for the tube, each instrument can generate a different series of harmonics - around twelve, depending on the intensity of air projected into the instrument. This harmonic series is based on the length of the instrument and can slip by a semitone if the end of the transparent tube is blocked (either by a hand, a knee, a foot or the ground).

Using compressed air and computer-controlled, high-efficiency electronic valves, it is possible to generate different types of sounds ranging from long sustains to short attacks. It is thus possible to create polyrhythms, by combining a variety of the harmonic series based on different lengths of *Tubes*, as in the *Qi* installation.

When I became interested in the construction of the *Tube*, the main idea was to move away from the exploration of timbre, in order to focus instead on a certain kind of harmony. It was not that I had never concentrated on harmony, but in my earlier work, I mostly favoured researching timbres that would be rich and complex enough almost to stand on their own. The *Tube's* intrinsic harmonic series seemed to impose an attention to harmony.

The *Tube*'s origins.

I developed the instrument after having discovered the principle of end-blown flutes. I remember an experience I had in 2002 when I was composing a piece for a reconstitution of a Roman organ at the Abbey in Royaumont, France. At the time, I instinctively took one of the organ pipes in the abbey and played it with my mouth. To my great surprise, when I started to blow the pipe I had just taken out of the organ, variations in breath pressure caused the instrument to play different harmonics. It is one of the main differences (that I learned a little later) between organ pipes from the Romanesque period and contemporary organ pipes, which are built such as to generate a purer and more powerful fundamental with fewer harmonics.

My idea at the time was to make the sounds of the organ mobile, to break out of the paradigm of sounds fixed by the fact that organs are always set up in permanent way. This means that the sound of an organ is static in space, it does not move. Composing for four musicians playing organ pipes with their mouth, I could imagine constructing a path by which the audience could stay in the organ universe but suddenly be surprised by the movement of sounds and instruments in space moving through the abbey. This motion opened listening to a very inspiring other place, meeting the performance space as its own parameter in the musical discourse as described in (1.2.4).

Inspired by this acoustic experience, I began to experimenting with different materials including fluorescent tube guards. I had a stash of these in T12 format (the biggest format for fluorescent tubes that are 8 feet long and 40 mm in diameter) that I had used to make *Tu-Yo Females* (2000) in my work *Tribal* (2001d). I had really liked the visual result of the grand finale of that piece when 40 musicians, standing side by side in front of the hotel, created a transparent wall with their see-through, 8-foot-long *Tu-Yos*.

I thus started looking for a way to make these transparent tubes resonate with a different mechanism than that of the *Tu-Yo Females*, which was fairly fragile (using a perforated latex membrane at one end, which was very fragile and light-sensitive). I made the link between my experience at the Royaumont Abbey and my piece *Tribal* and started experimenting with a recorder windway that I inserted inside one of the tube guards (figure 4.2). The sonic result was seductive despite the as yet not optimal

system. I had found a principle that would allow me to generate 2 to 3 pitches with a single instrument.



Fig. 4.2 *the origin of the Tube* (2014). First experiment with a recorder fipple within a Tube Guard T12.
Photo : Jean-François Laporte © 2014.

After several days of research and experimentation, I managed to design an embouchure that was perfectly adapted to the diameter of the tube guards and thus created a more optimal vibration. Thanks to my new embouchure (figure 4.3), I managed to produce more harmonics and a richer sound. I was almost there but felt I could go even further. That's when I remembered that there were smaller tube guards, and so I went out and got some T8 formats (4 feet long with a 30 mm diameter) and I made a smaller embouchure to fit this new tube size. I had arrived: I managed to produce harmonics 10 to 12 for the same tube despite the fact it was shorter and smaller. So, I decided to use this latter size of tube guard in the design of the *Tubes*. This is a good example of the interaction between instrument-builder and composer in the design of an instrument. The composer explores the potential of the instrument and seeks to make it more effective in producing harmonics pushes the instrument-builder to improve the construction materials that might enable such optimum conditions.

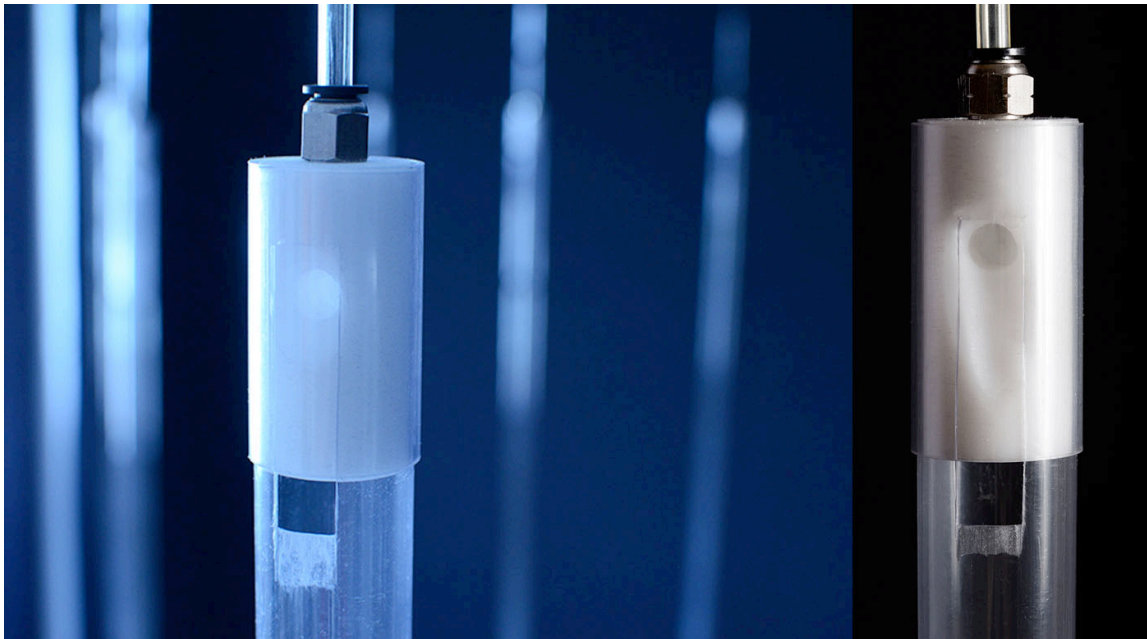


Fig. 4.3 *the Fipple of the Tube* (2014). The new fipple built specially for the *Tube* and a Tube Guard T8.
Photo : Jean-François Laporte © 2014.

I arrived at the conclusion that the larger fluorescent tube protector had a diameter to tube proportion that was less optimal than the smaller format. I am not giving up on the idea of using 8-foot tube protectors, but I have to continue developing an embouchure that can take advantage of the dimensions of that tube, and which would allow me to generate more intense and imposing lower frequencies. One possibility might be experimenting with a stronger air pressure, because I suspect that more air is needed to activate the vibration in this larger column. It is a task I will continue with after my doctorate. This is also another example of the importance of materials in the behaviour of musical instruments, as I describe in (1.1.2).

I built the instrument in extruded polycarbonate, which I chose for its crystal clarity and translucence and gives the instrument its particular character. Moreover, polycarbonate is an extremely shock-resistant polymer (it is used to construct astronaut helmets) and does not warp with light or humidity. This is only enhanced when the instrument is suspended and seems to float in the air (figure 4.4). On this level, the instrument's design conforms to the aesthetic principles raised in section (1.1.3).

Finally, I cut the instrument in two parts. The first is the whistling part, made of a rigid tube a little smaller than the diameter of the tube guard and the Teflon part that acts as



Fig. 4.4 *the Tube* (suspended on the ceiling) central piece of the visual & sound installation *Qi* (2014).
Photo : Jean-François Laporte © 2014.

an embouchure, and the second is the resonator, the tube protector itself. The upper part fits perfectly inside the tube protector, which makes it possible to slide the resonating body (the tube protector) along the rigid part (which generates the sounds and is fixed to the air input), and therefore change the fundamental of the instrument as well as its harmonic series. I can therefore tune the instruments very precisely and construct the harmonic series I want, either by using the sliding principle or by using tube guards of different lengths. The video demonstration shows this in action ([the_TUBE_Origine_&_instrument](#)).

4.1.1 Qi - Visual and Sound Installation

As described in section (2.2), I create sound installations based on my exploration of sound, a relationship with space, and the simultaneous staging of time, structure and volume. I also take care that the installations live up to the visual and aesthetic criteria I discuss in section (2).

Qi is a visual and sound installation (see the video documentation) that stages 35 suspended *Tubes* on a conventional grill in the exhibition space. The premiere of this

installation took place during the Tonlagen Festival (Hellerau-Dresde) in October 2014. During my research and experimentation towards building the *Tube* instrument, I had a number of ideas for works that could take advantage of this new instrument. Once I had developed the instrument, I immediately wanted to place it at the heart of a visual and sound installation project.

As I suggest in section (2.2), my works and sound installations come to life through the sounds they generate and stage. The majority of my invented instruments create unique and particular timbres. The *Tube* is an exception since its sound is more conventional, familiar and similar to flutes found across the world. As soon as I had finished developing the *Tube*, I wanted to work on harmony and rhythm in a similar way to the repetitive music like *Vermont Counterpoint* (2002) for flute by Steve Reich. The main idea was to explore a certain form of harmony and rhythm, in opposition of my previous works where I concentrated on researching rich and complex timbres that could work almost on their own.

I gave the installation the name *Qi* because of the Chinese and Japanese spiritual principle that relates to the nature of the project, according to its definition (Qi, 2014c). It is the notion of air, breath and energy that I wanted to harness in this visual and sound installation.

*In traditional Chinese culture, **qi** or **ch'i** is believed to be a vital force forming part of any living thing. Qi translates literally as "breath," "air," or "gas," and figuratively as "material energy," "life force," or "energy flow."*

In this installation, I wanted to create a sonic and musical space in which the audience would be able to circulate, surrounded by the 35 instruments and the music they can generate. To this end, the upper portion, the whistle, is at the level audience members' ears, which strengthens their contact with the instrument. The set is spread on a rectangular surface of 4 X 6 metres. 35 instruments make up the matrix and allow me to create a space for the sounds and give them a spatial dimension. Moving freely around this sounding space, audience members choose their own sonic and visual path, surrounded by the sounds produced by the instruments. One of the ideas behind *Qi* was therefore to explore the close relationship between space and sound, to put in

perspective one's own position in the size and space – both horizontal and vertical – of the installation, as well as in relation to the instruments themselves.

In *Qi*, I also wanted to work on a musical parameter that I had set aside in a number of my earlier projects: rhythm. Not that I had never worked on rhythm before, but let us say that I had treated it more as a kind of breathing, as for example in my work *rust* (2010), in which I worked more on beatings and oscillations than rhythm and pulse. This time, with *Qi*, I wanted to make short rhythm the central point of my research, especially because one of the key elements of the instrument is the natural harmonic series and the movement from one harmonic to another. Also, since the instrument requires a lot of air to sustain tones for long periods, it seems natural to make short attacks that allow for a longer performance. Rhythmic playing thus becomes a natural aspect of the instrument. Moreover, since the installation stages 35 *Tubes* that need to play for several hours a day, the choice of short sounds allowed me to use a single air compressor to feed the whole set of 35 *Tubes*, an important detail that influences the final cost and technical complexity of the installation.

With this idea of rhythm in mind, I experimented with different types of electro-valves before finding the one that corresponded to my needs. I finally settled on little electronic valves made by Dynalloy (USA). This valve has the advantage of being very small (and therefore light), inexpensive (in the range of \$45 rather than similar products by Bürkert that come in around \$250), and able to work at fairly high speeds (up to around 40-50 ms). These found, I equipped each of the 35 *Tubes* with an independent valve, and controlled them all with a Max patch. This technology allowed me to achieve my goal of working on rhythm as primary material. With a precise enough calibration between the air pressure and the valve opening, I had the possibility of determining both the length of each attack and its strength, with the latter responsible for the choice of harmonic that is excited. In order to refine this calibration process, I tested the system empirically with a number of experiments with the controls that I had developed in Max with Benjamin Thigpen. We had written the control patch specifically for the electronic valves we had decided to use in the project. In this case, it is a voltage-controlled electro-valve, and we are able to control the size of the valve's opening and its duration. Obviously, the quicker the opening/closing of the valve, the

more staccato a sound is generated, and vice versa, the longer it is, the more sustained sounds become. I thus had both the possibility of a variety of attacks as well as layers of sustained sounds at different moments (see the video documentation).

The Max patch was created for the Plateforme Numérique creation project to allow five composers to perform works using several instruments running on compressed air such as *Jonas dans la baleine* (2014a).

For the *Qi* (2014c) installation, I created a number of sequences that then run on a timeline that I predetermined. This results in a kind of custom sequencer that allowed me to compose a sequence inside which are aleatoric parts that loop for the duration of the exhibit.

This extremely precise interface allowed me to explore different possibilities related to rhythm and the combination of harmonics, and in the end led to the choice of two different lengths of *Tube* (132 and 150 cm). The longer tube's fundamental frequency is A: 113 Hz, and the second, shorter tube's is Bflat: 124 Hz. I chose these two lengths of *Tube* based on the natural harmonic series they produce. The *Qi* installation has 18 A and 17 Bflat *Tubes*. The two harmonic series possible with the two fundamentals allowed me to compose music that passed from one pitch to another continuously, and therefore to work on the polyphony of 35 *Tubes* playing the same fundamentals and creating chords much like a consort of natural trumpets.

I thus worked on the rhythm by creating several layers that are in constant movement across the 35 instruments. I use a matrix that allows me to send the sound to any one of the flutes, which often gave the impression that the sound matter was swirling around the listener. To accentuate that whirling impression and the play of space that is so important to me, I mainly use very short, staccato sounds. Since the durations are so short, I multiply the rate of occurrence and thus construct polyrhythms that are in constant transformation while at the same time continuous. This creates the bouncing effect of repetitive music, which we find in Steve Reich's *Six Pianos* (1993) or certain parts of *Drumming* (1987), for example. It differs in its non-systematic repetition.

Finally, to keep a certain form of unpredictability, I opted for the construction of defined musical sections that follow one another, but that always have some aleatoric or random element, within certain predefined limits. The music heard during the installation seems to be the same but never is. For example, I use a matrix to determine the attacks across the 35 *Tubes*, and at any time, I can choose the number of active *Tubes*. If I choose 9 *Tubes* for example, the matrix sends information to 9 randomly chosen *Tubes*, which means listeners hear the sounds bouncing all around them but never in the same way. I use this kind of process to keep the evolution of the music captivating and always refreshed. The result is a continuous rain of splutters that comforts listeners, bringing them to a state of contemplation (see the video documentation, as well as the control patch).

I trace this influence back to living in Zaire in Central Africa in 1988. In these distant memories, I remember there was always the sound of percussion coming from somewhere. It seemed at once to be the same thing but also somehow different, and since it was omnipresent, we managed to become somehow familiar with it and it became very relaxing for me.

For the visual aspect of this installation, I made a big effort for the staging. The goal was to create a perceptual game between the space created by the impeccably aligned *Tubes* and the architectural lines of the exhibition space. There are clear influences from works such as *Light and Space II* (2013) by Robert Irwin or *L'Avalanche* (1996) by François Morellet. The back and forth between the inside of the work (the installation) and the outside (the exhibition space) transforms continually as we move around. The meticulous alignment of the instruments in space, both horizontally and vertically, allows for the presence of multiple lines of architectural perspective that shift in tandem with our movements. In addition, my goal was to create a relaxing and inspiring space, and so I added blue neon lights in each corner, giving the installation and the space a particular character. This calming light also creates a kind of intimacy, a personal space despite the presence of others in the exhibition.

Moreover, using extruded polycarbonate in the construction of the instruments gives the tubes a crystal-clear quality that accentuates the lighting and creates all kinds of

reflections (of the light sources, the other instruments, one's own presence in the space, etc.). This choice of ambience points is similar to artists such as James Turrell in his work *Rondo Blue* (1969), or Anish Kapoor and his *Untitled* (2001). Such conceptions of space stage dynamic interactions between the audience, the instruments, the space and the lighting. In addition to an immersion in a buzzing of highly active pizzicatos, audience members see lines drawn and transformed around them at the rhythm of their movements, very progressively and naturally. The result is a constantly transforming perception of music and space.

4.2.0 Analogic Feedback – musical instruments

Since starting my doctorate in 2013, I developed instruments based on the feedback principles described by Davies (1968). I was also influenced by Steve Reich's *Pendulum Music* (1968), which uses a type of acoustic feedback. In my case, the instruments use different configurations of prepared piezo microphones, short-range acoustic feedback (achieved by coupling piezos with small speakers / excitors), vibrating objects (miniature vibrating motors) and computers (MaxMSP). In all cases, the instruments are intentionally placed at the limits of human control, preserving, despite their extreme sophistication, primitive organic elements similar to natural processes. These basic elements (see the video documentation *Feed1*) reveal a richness of colour, texture and incredible forms that allows for the creation of a varied and sophisticated music.

In the evolution of these different instruments, I did a lot of experimentation, including with liquid plastic made by Plasti Dip, that allowed for different layers of material to cover the contact microphone piezo capsules in part or entirely. In testing various degrees of thickness, I realized that each acted like a filter transforming the instrument's response (here the contact microphone) to the same stimulus. This offers the possibility of choosing a different type of microphone for one or another type of sound or vibration desired. Changing the resistance, the weight and density of the piezo capsule excite different frequencies, producing different types of feedback (see video *Feed1*).



Fig. 4.5 Different *Contact Mic* used for the *Analogic Feedback* instruments (2013-).
Photo : Frederic Chais © 2014.

In contexts where I use the piezo capsules to make rhythms (by placing them on top of an exciter), the thickness (therefore the number of liquid plastic layers) allows me to obtain different kinds of bounces (from smaller to wider) as well as different sonic colours (the thicker the membrane, the deeper the resonances). I can thus have an instrument that bounces much more or less depending on the plastic covering it. The latex cover also allows for controlling the nature of the feedback by sometimes filtering undesirable resonances (especially in the high-frequency range) (see video *Feed1*).

Covering the piezo with a latex membrane also allows for its manipulation without an electric buzz (the famous hum) when holding both piezo elements (see video *Feed1*). I learned a great deal about electronics and electric circuits from Nicolas Collins' *Handmade Electronic Music: The Art of Hardware Hacking. Second Edition* (2009). The instrument becomes increasingly playable, which is one of the most important criteria in my process. Touching and manipulating sounds at their source are part of my contact with sound, which is a fundamental part of all my research and practice. Still related to liquid plastic; I tried entirely dipping a small exciter in it, which allowed me to generate high frequencies at a low volume, once the membrane's resistance to the

vibration attenuates the exciter. Once again, the plastified exciter acts differently, not better or worse, just offering more variety (figure 4.6, video *Feed1*). And that is exactly one of my goals in creating these instruments: to have many different possibilities to construct ever more varied and refined music. As a performer, more possibilities mean a greater freedom expression, allowing the material to vibrate and sing in creative hands for attentive ears.



Fig. 4.6 An exciter dipped in liquid plastic.
Photo : Frederic Chais © 2014.

During my doctoral research around the *Analogic Feedback*, two other ideas emerged when dealing with contact microphones. The first case when using contact mikes to amplify various bell sounds made by striking different springs fixed to a metal plate. When striking each spring, the vibration is transmitted to the metal plate and amplified by the contact microphone. I also hang these metal plates (figure 4.7, video *Feed1*) on springs so as to extend the length of the vibration. The second idea was to use contact microphones as objects of frictions. I amplify different types of rubbing and scratching directly on the contact mike itself (figure 4.8, video *Feed1*). To improve function, I developed a turntable system that allows me to control the speed of rotation and thus the intensity of the rubbing.



Fig. 4.7 Metal plates (amplified with contact microphone) hung on springs for longer vibration and different kinds of springs fixed on them to generated different kind of bell sounds.
Photo : Frederic Chais © 2014.

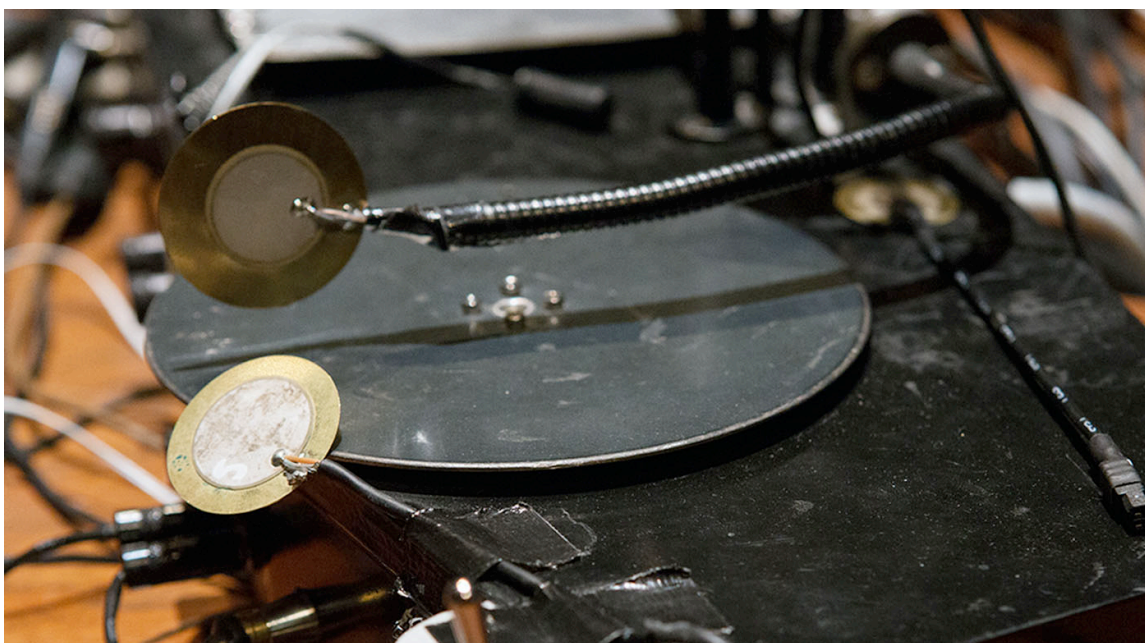


Fig. 4.8 Contact microphones used as objects of friction's put in contact with a disk turning at different speeds.
Photo : Frederic Chais © 2014.

As always in my construction work, I paid particular attention to the physical appearance, the aesthetic considerations of the instruments, which are developed alongside the technical ones – all the power supplies and amplifiers are housed in a box (see page 87) that doubles as a stand for other instruments like the rhythmic piezo, the turntable, etc. In my experiments, I strive to assemble groups and instruments that are visually striking and beautiful while still retaining their optimum sonic possibilities.

This relates to works such as *frequencies (a)* (2012), an installation by Nicolas Bernier that uses tuning forks and a lighting interface.

Aside from working on the materials with the use of liquid plastic and the aesthetic appearance of the whole, I also explored the numerous ways of generating different states of feedback (figure 4.9, video *Feed1*). Invariably one of the important considerations was balance: balance between rich sonic states that teeter cyclically between one or more states of feedback continuously. The instruments stage natural physical phenomena thanks to electric signal, resulting in a rich, organic and fluid sonic matter. The cycles evolve in a hyper-natural manner, seeming at times to be living organisms in their abundance.



Fig. 4.9 Contact mic suspended with magnet over a small exciter and hung in front of a small exciter.
Photo : Jean-François Laporte © 2014.

What is most stimulating in these different states of balance is their possibilities of evolution and transformation. Working with the settings of the different sonic parameters (dynamics, triple-band filters (thus frequencies), distortions), it is possible to push the sonic result in many different ways, while still keeping some control and staying within the inherent coherence of the matter. This often creates hypnotic cycles of sound, enveloping and inspiring sonic worlds.

Another example of the axes of my doctoral research is an experimentation with how different types of magnets can induce other types of balance. In such cases, the magnets are used to hold the piezos in balance on top of and in contact with the vibrating membranes of the small exciter. The principle is that the microphone's disk is in a position to resonate and vibrate at more frequencies. The less constrained the piezo membrane is, the more it is free to vibrate at different frequencies, which themselves in turn become more chaotic and unique, rich and extremely organic, since varying the different control parameters (volume, filtering, distortion, etc.) creates floating and continuous states that are based on real physical phenomena and are therefore reproducible.

4.2.1 *Le chant des machines*

le chant des machines (2014b) is a poetic exploration of the singing of machines. The song of the actual machine is at the origin of the piece; it is sonified, processed and presented directly in the music. Benjamin Thigpen uses inductors to make the magnetic fields generated by his electronic equipment (computer, hard drive, power supplies, mouse...) audible. Meanwhile, I use piezo microphones to amplify small physical vibrations and to generate layers of quiet feedback, while also using miniature motors to excite a set of tuned metal rods rhythmically, and inductors to sonify the activity of the motors themselves.

And yet, the piece might just as well be named *le chant des planètes*. For as we listen to the singing, following the interweaving of the different voices, it leads us far from anything we know of as mechanical. The purely electronic activity of machines - singing as they always do, all around us - opens onto an immense realm of strange otherworldly beauty, and a strange human-yet-not-human coherence.

The idea for *chant des machines* appeared gradually during our duo experimentations. We first did a 10-day residency in August 2014 in Bergen, Norway, to work on the development of our Analogic Feedback. I worked on the physical construction of my instruments during that stay. It was also a very important period in the development of the control surface both in terms of the Max/MSP patch as well as the Lemur interface

on iPad (figure 4.10, 4.11). Since the beginning of the RUST duo project, we decided that each of us should develop our own Max patch in order to take different paths and reach different goals and results. That facilitates the development of different approaches to playing, control and processing. Then, by combining our different sound result, our music becomes richer.

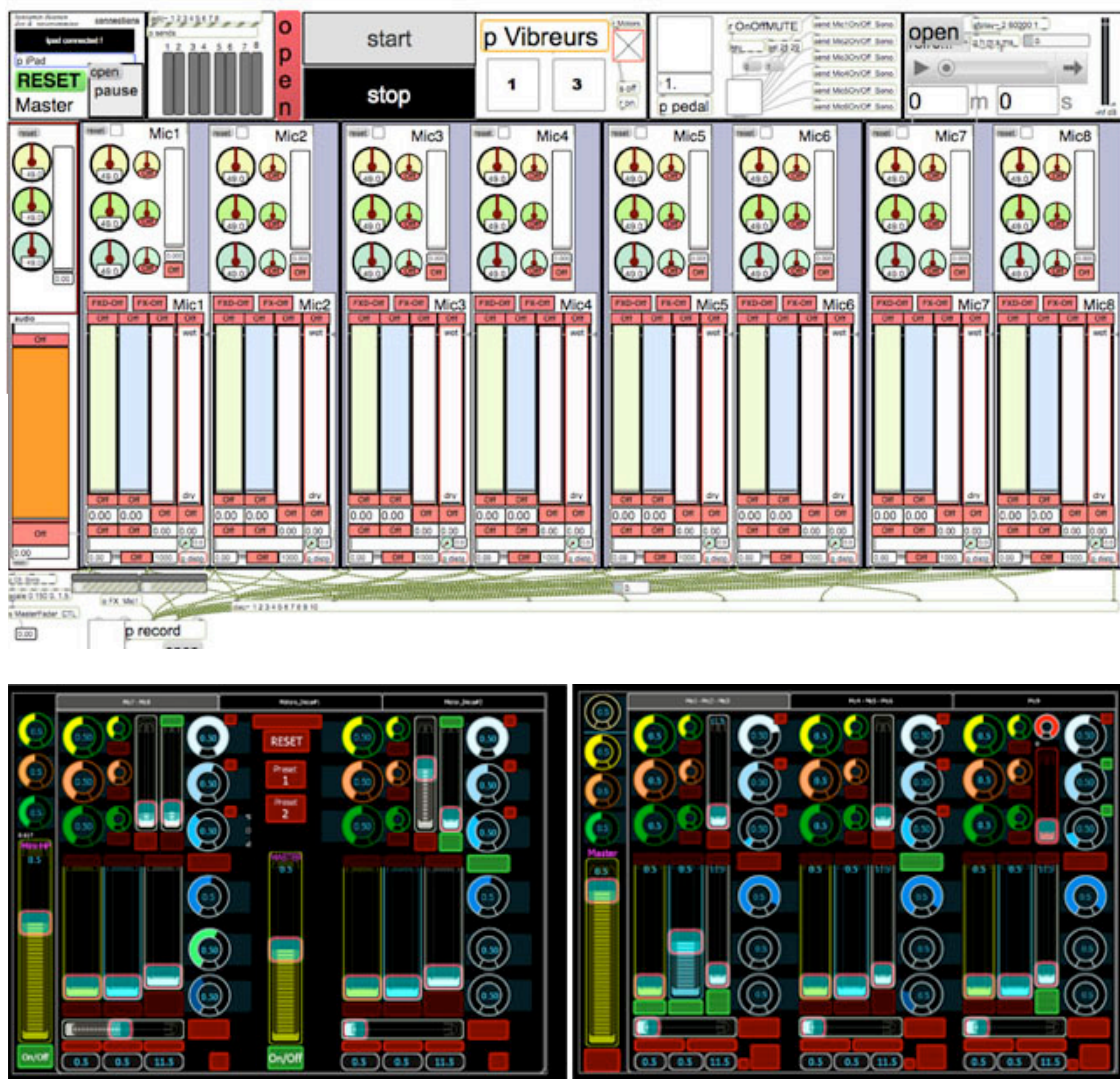


Fig. 4.10 & Fig. 4.11 Max & Lemur Patches to control of each *Analogic Feedback* line.
Photo : Jean-François Laporte © 2016.

Once our instruments were evolved enough to use, we began playing together. We recorded and listened back to a number of improvisations to see what might make sense to us. A certain improvisation with a long progression that staged different types of continuous sounds was particularly captivating. Some of the material made us think about the sounds of the motors and gave us the idea for the title of the work, *le chant*

des machines.

In this piece, Benjamin mainly uses the inductors with which he amplifies and processes the electromagnetic field of his devices. In the first version of the piece I used four different sound makers. The first is an ensemble of three strings activated with an ebow adjusted to allow me to control the intensity from 0 to 12 Volts (figure 4.12). The second is a box with four metal limbs that I vibrate once again with my

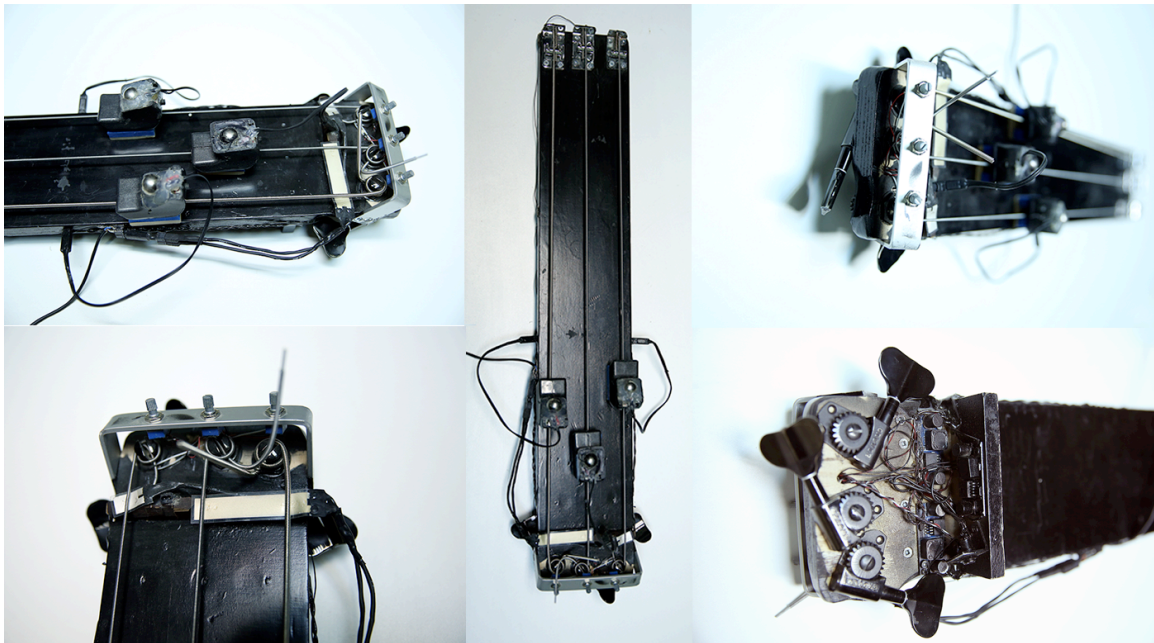


Fig. 4.12 Three basse string instrument activated with eBow controlled with a 0-24V electronic card.
Photo : Jean-François Laporte © 2014.

adapted ebow (figure 4.13). The third is a large glass disc that I turn on top of the motor of a turntable and on top of which I rub different objects or piezos (figure 4.14). The last is the coupling of a contact microphone and an exciter, which allows me to create feedback of different intensities (see figure 4.9).

As often occurs' in my research, after the initial developments, I take some time to reflect and see if I can improve the systems or even want to keep them in the work. That is what happened with *le chant des machines*. After some listening, I came to the conclusion that the grinding sounds of the turntable didn't really fit the piece, so I eliminated that sound-making system from the work. I thus retained the vibrating bass strings, the feedback system and the rebounding limbs with their ebows.

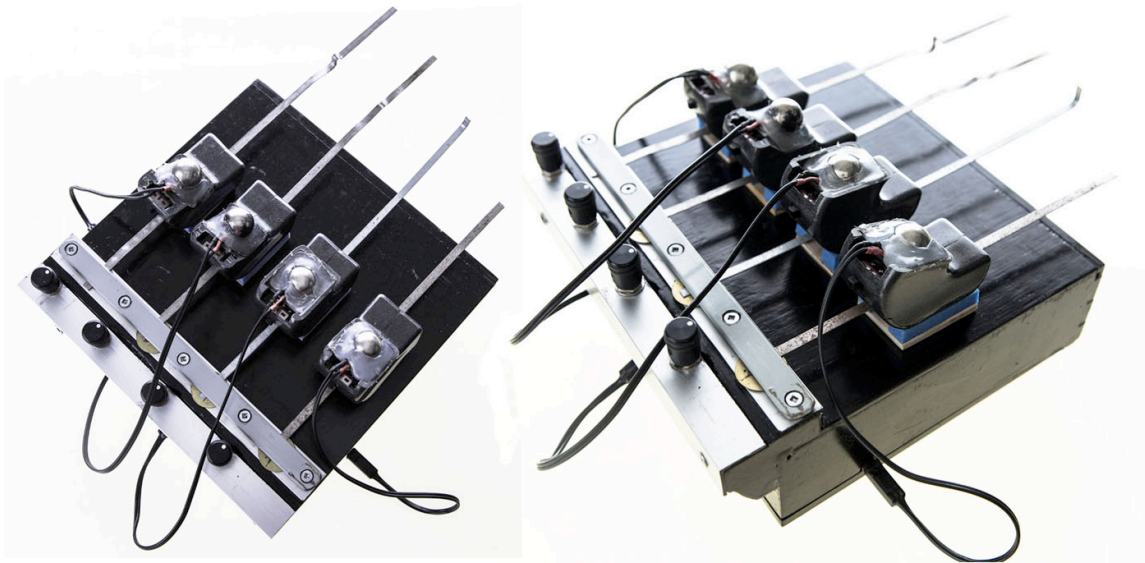


Fig. 4.13 The box with the four metal limbs that vibrate once again with my adapted ebow.
Photo : Jean-François Laporte © 2014.

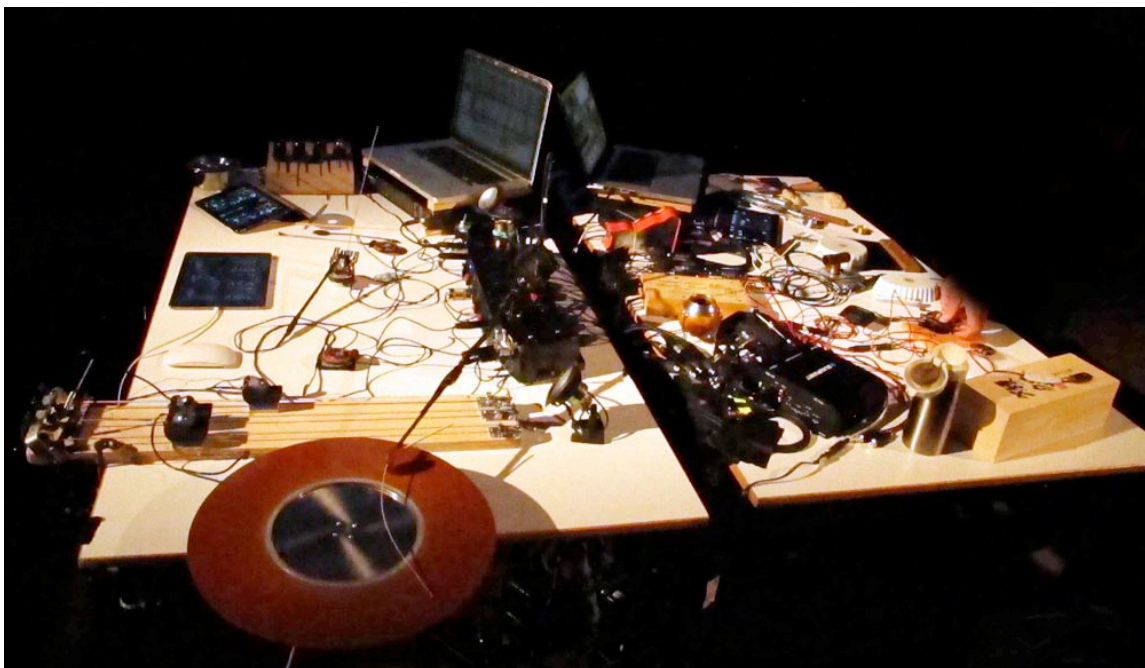


Fig. 4.14 The first version of the *Analogic Feedback* instruments: the spinning disk, the bass strings, the first control box model, the box with the metal limbs and many different configurations of piezo element.
Photo from the artistic residences in Bergen - Norway: Jean-François Laporte © September 2014.

With these materials, we worked on the form again and fixed a sonic path that we now apply each time we replay the work. The idea behind the structure, minimal as it is, is to allow us to think as little as possible during the performance, in order to keep as much energy as possible for concentrating on the materials to set to music and for the

communication between us. The structure is most important in the succession of sound material and for musical meeting points; we have decided that Benjamin would start the piece with the electromagnetic song of his hard disk, and that I would follow with high-frequency feedback created by coupling a small piezo with a Plasti-Dipped exciter. Then, when I strike one of my bass strings, Benjamin moves on to the more aggressive and intense sounds of the electromagnetic song of the Apple Computer power supplies. The durations are felt but not measured precisely, which allows us to let the music breathe naturally from one performance to the next. Regardless, we aim for *le chant des machines* to last around twenty minutes and we always seem to end up around that length (between 18 and 22 minutes).

Despite the fact that the turntable did not make the cut for *chant des machines*, I wanted to continue developing it. I worked with a different and much smaller type of motor that I was able to integrate into the control box, whereby I avoided having to set it up for every concert (see figure 4.14). Moreover, this small motor makes less noise at

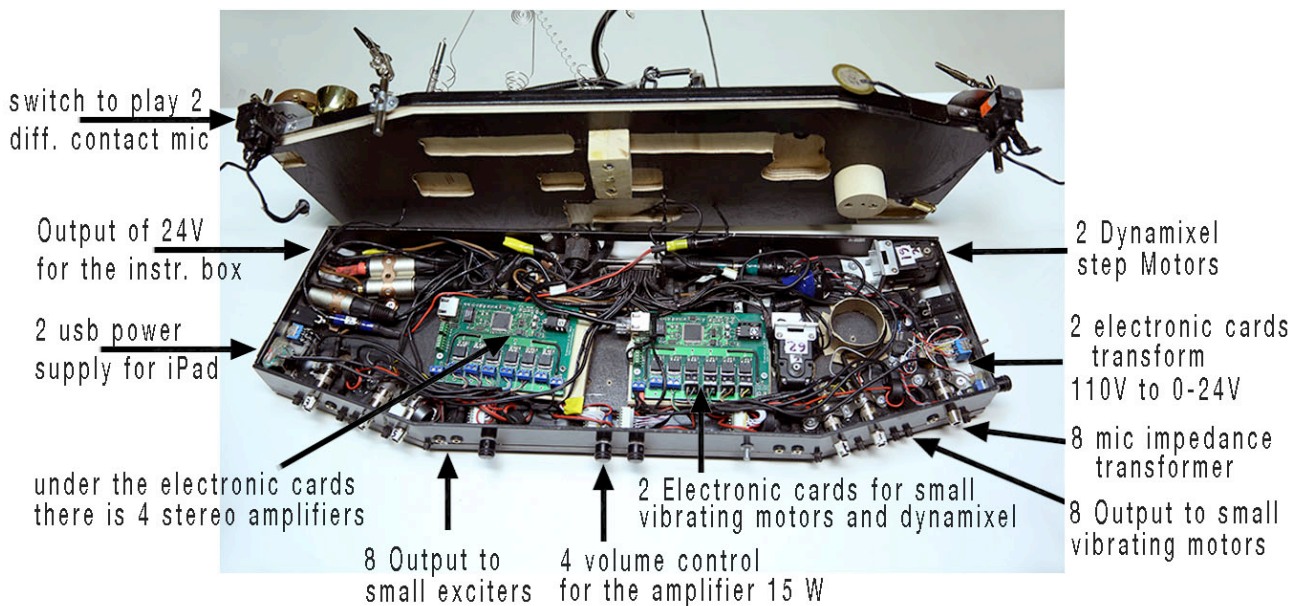


Fig. 4.15 The control box with all the integrated devices as the two Dynamixel step motors.
Photo : Jean-François Laporte © 2016.

low speeds and is more easily controlled through OSC, which allows me to predefine speeds and therefore always return to the same ones, which was not possible with the turntable motor. I also swapped for a much smaller disc that does the same job. I was

able to integrate this new disc permanently in the control box since there was space on the right-hand side of the box. It is only a small detail, but in the end, not having to set it up and take it down for a concert allows me to save quite a bit of time on tour.

Likewise, the question of setup/breakdown time is one of the driving factors behind my exploration of feedback produced by coupling contact microphones and small exciters. When I work with the compressed air instruments, I often require a lot of set up time before a show. For a piece like *corrosion* (2013b), for example, I need around 6 hours to set up the 18 *Acoustic Oscillator*, their air supply, the compressor and the main air pipes, the electro-valves and finally the latex membranes and their tuning. After the show, it takes 2 hours to break down. This means that playing the work requires concert situations and conditions that are not always possible to negotiate. And that's not even considering the weight of the materials I'm transporting. See the Tech Rider in the Appendix.

With the *Analogic Feedback*, I spent quite some time in the conception, the realisation and the construction of the instruments such that I could be ready to play with only an hour of set up and I would be able to break down and stow the lot in less than 30 minutes. To this end, during my doctorate, I tried three different versions before achieving my goal (figure 4.16a & 4.16b). It also allowed me to dive into a musical scene, that of improvisation, with which I had only marginally been involved before my doctoral studies. Thanks to my *Analogic Feedback*, I was able to develop these new musical instruments and accept a number of concert opportunities that only allowed for minimal technical setup. Moreover, with these multifunctional instruments, I can play with a large range of musicians, which has brought me opportunities to expand my listening, interplay with and sensitivity to others.

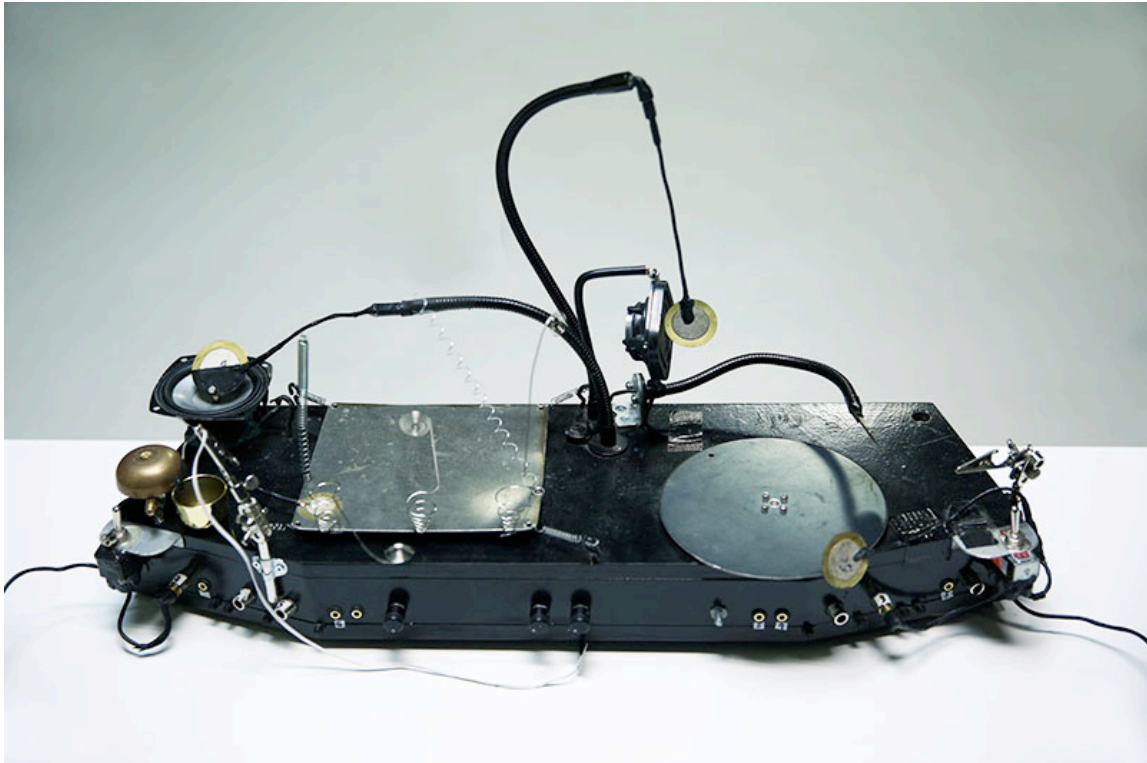


Fig. 4.16a The new control box for the *Analogic Feedback* instruments. It takes now 45min. to set up for a sound check and it takes about 30 min. to pack everything up.
Photo : Jean-François Laporte © 2017.

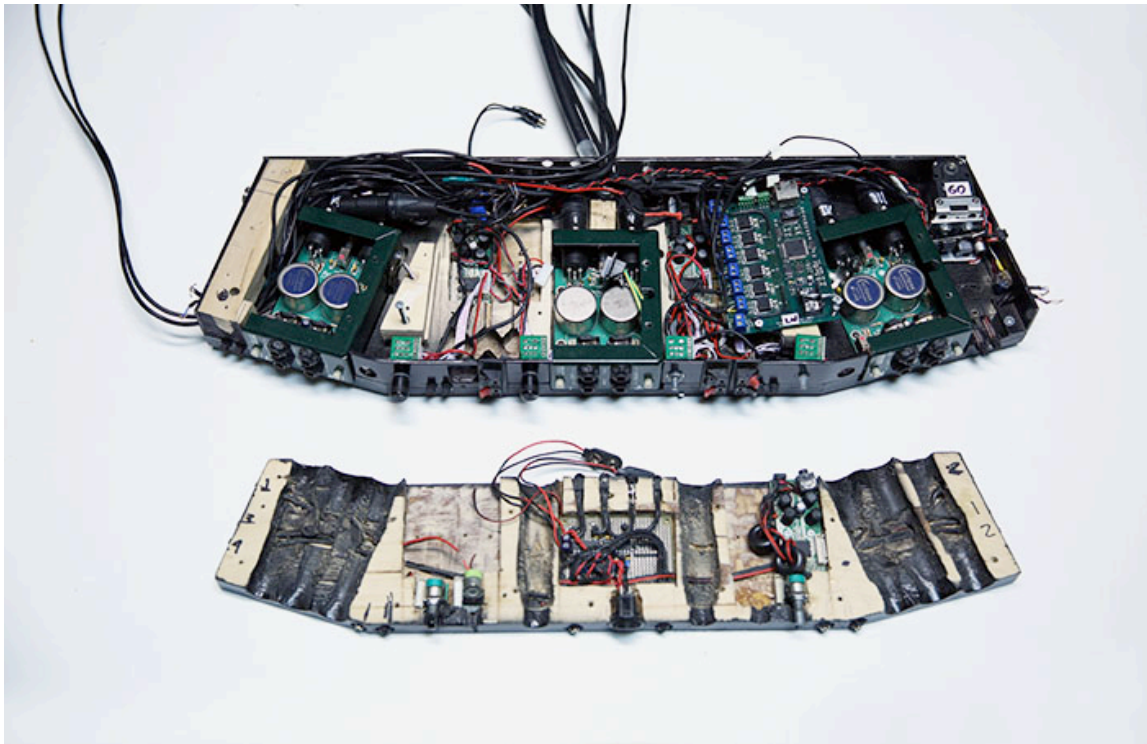


Fig. 4.16b The two old models of the control box that I built during my doctorate research.
Photo : Jean-François Laporte © 2016.

4.3 *Inner Island*

Inner Island is the title of a 32-minutes improvisation from October 26, 2013 as well as the name of my duo with Virgile Abela, a guitar player from Marseille (watch the video submitted with this thesis). Our first duo performance, *Inner Island*, took place in an empty old video-projection space without seating. The ceramic walls and ceiling had a reverberation of around 4.5 seconds, perfect for the ambient drone music we wanted to make. We had the space for an entire day.

For the purposes of the concert, we set up in the center of the space with the audience around us. Virgile Abela arrived with his electric guitar and a Korg MS-10 synthesizer. I brought several of my compressed air instruments. For the occasion, I used a dozen *Acoustic Oscillator* (2013) as well as six *Vibrating Membranes* (2010) that I suspended all around the listening space. I also equipped my chair up with a *Tu-Yo* (2000) duo (see figure 3.1), which might act as solo instruments, with all of the controls under my chair. From my position, I could therefore control and play all twenty pneumatic instruments.

Our initial idea was to work with the resonance of our instruments in the concert space in such a way as to integrate the hall acoustic in the ultimate experience. Another idea that guided my instrument choice was that of working with extremes of register and intensity.

At the opening of *Inner Island*, I use the *Acoustic Oscillator* to create a sonic ambience that is at first hardly perceptible but that settles in steadily with a shimmering sonic layer in the high register. Once that is present, Virgile adds a soft and constant pulse in the low register. This creates two distinct acoustic spaces that complement each other to create an ensemble of coherent and harmonious elements.

Then progressively, layers of high frequencies cross two low frequencies, sometimes at the unison, sometimes creating beatings, that I generate using the two *Tu-Yo*. The high frequencies eventually disappear to leave the stage for the growling of the two *Tu-Yo*. Meanwhile, Virgile joins me with his guitar and starts floating different chords that are themselves made of beating frequencies and feedback. Together, we orchestrate a

slow and long crescendo that is increasingly more intense and noisy. The confrontation of the sonic texture I produce with my pneumatic instruments and the electric / electronic signal of the guitar and the MS-10 creates a unique vibration that is not only acoustic but also spatial, with the entire space seeming to vibrate and breathe. Once at the apex of the full acoustic, a slow descent materializes where each musician takes the time to bring this music back down to earth and slowly evaporate. This descent also allows the audience the time that is necessary to return to reality after these thirty minutes of immersive vibration.

We set the form of the work in the afternoon as we tried various options; the beginning, the long crescendo section based on low beatings and the finale. It was the simplest cue list, but just enough to situate us during the concert. For myself, this was a way to create a framework within which I feel free. Once again, this allows me to give the most energy and attention to the musical action at hand, without having to keep anything in mind other than to be absorbed in the music that is taking shape in the moment of action.

The *Tu-Yo* (2000), is one of the very first instruments that I invented and has been integrated in a number of musical works such as *rust* (2010) and *At the Discretion of River* (Beland, 2017). It is therefore an instrument with which I feel a particular mastery. Using it for *Inner Island* was therefore not a coincidence: in improvisation projects, I always try to use instruments that I play with ease so that I can express myself more freely and musically. It also allows me to be more attentive to the musical exchange with other musicians since I do not have to deal with the technical difficulties of the instrument anymore. This is an example, then, of how continuing to play my old instruments can contribute to my thoughts and playing as a performer.

5. Conclusion

This text explores the principal concerns addressed in the works I submitted as part of this doctoral thesis, specifically from the perspective of feedback as an iterative creative process between myself as instrument-builder, composer and performer. This approach, which gives pride of place to sound, emphasizes the organic and bidirectional relationships of internal influence among these three creative poles. This text also draws out connections outside the process itself, especially the influence of other artists (composers, musicians, other instruments), and older pieces / works.

This flows from the particular approach that led me to conceive and realize my own instruments, which better suit my own needs and which I then place at the heart of multiple projects where I act as composer or performer, or sometimes both. Throughout this unique approach, we can witness that sound is at the heart of the process of research and creation, that it is the initial spark, the origin of all that is made. It can be found in all three poles of influence (instrument-building, composition, performance) within the feedback process of creation. Important consideration is also given to time, slowness, contemplation and space, and particular attention is paid to aesthetic concerns in the realization of not only my new sound generators but also my musical works or sound and visual installations.

I have shown that the works are not predefined or conceived in advance, and that they come to life through concrete experimentation with sonic matter, inside the sound itself, in fusion or even in vibration with it. I explain that this relationship to sound is very physical, natural, and that it flows through the body, bringing the two in communion. From these moments of connection with sound are born the ideas, forms and guiding principles of each project.

This thesis also suggests that music has allowed me to understand the world in which I live. Music brings insight, opens doors of understanding and allows me a spiritual approach as described in the second half. Regular instrumental practice is a form of meditation for me, a visceral and transcendental experience that allows me to observe and be in touch with my deepest nature, constantly going beyond everyday consciousness.

Music is one way I connect with the world, to perceive and vibrate in harmony with it. It transforms ordinary and difficult moments of life into profoundly inspiring human experiences. Music, as means of creation and philosophy of life, requires total and deep engagement that enriches my spirit and wakes my higher goals. It allows me to liberate myself, to keep advancing and has a positive effect on my everyday life. In the words of Coltrane (cited in Nisenson, 1993),

To be a musician is really something. It goes very, very deep. My music is the spiritual expression of what I am — my faith, my knowledge, my being.

Furthermore, I demonstrate how my approach includes collaboration with other musicians, not only in the context of some of my compositions, but also in terms of improvisation projects. With this in mind, during my doctoral research, I established two duo projects (*RUST* and *Inner Island*) and a trio project (*L.B.B.*), where my new instruments are staged within new contexts.

The requirements of this text create a somewhat artificial and schematic outline to this thesis, which is in fact much more integrated. The feedback loops model, as experienced in real life, is built of extremely complex relationships between the different elements that are at play in the creative feedback loops among the performer, the composer and the instrument builder. Below is a much more complex model than the one presented at the beginning of the thesis (figure 5.1).

Simplifying the model allowed me to make it more abstract and gave me an opportunity to reflect on it. This effort of schematization allowed me to deepen different problematic relating to the feedback between the three poles of activity of my artistic practice. We can see in the more complex model that there is a multitude of things in life that influence the creative process discussed in this thesis.

The questions raised in this thesis prompted a number of reflections about my artistic practice, which in turn crystallized the epiphanies I had all throughout my doctoral research. This thesis thus offered the opportunity to define, describe and specify my creative practice since I began making music.

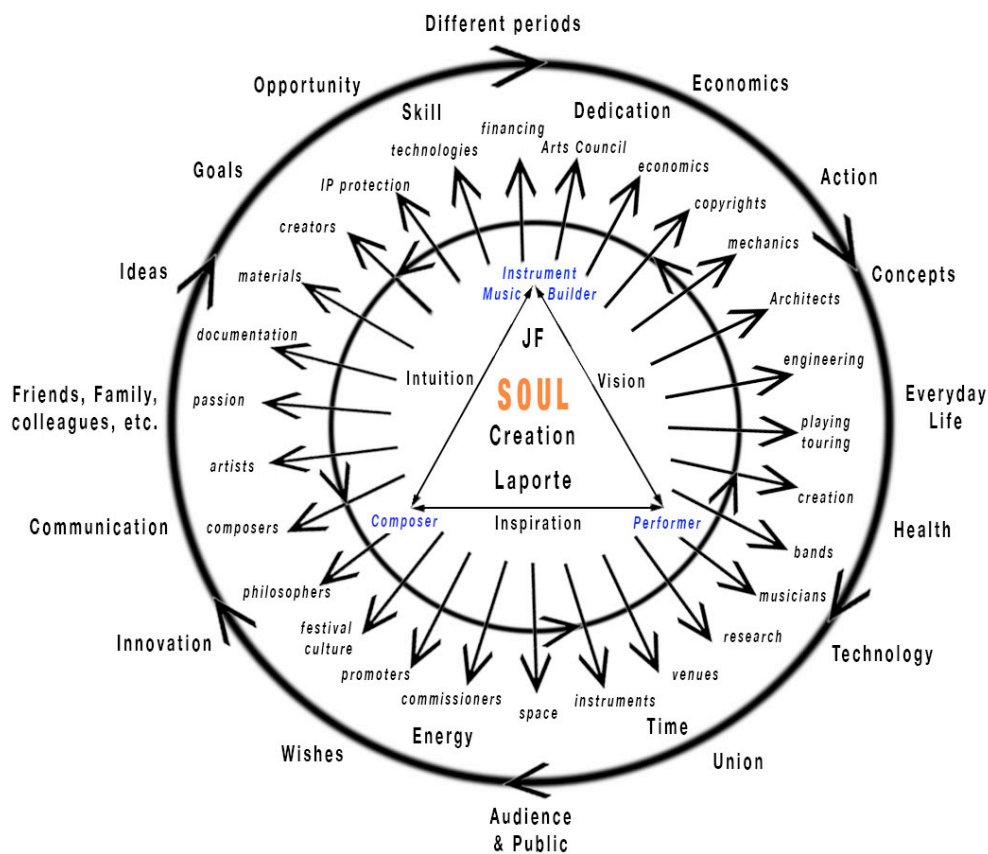


Fig. 5.1 Here, a much more complex model of the feedback loops that are at play in the creative feedback between the performer, the composer and the instrument builder. J-F Laporte © 2018.

I have obviously not reached the end of my ideas and will continue to use the instruments I developed in the context of this doctoral research in a number of new projects. For example, the *Tube* used in the *Qi* installation has found its place in a new installation project for now entitled *CUBE* (figure 5.2), which will stage 2000 *Tubes* within two fairly imposing cube shapes. My intuition is that this future installation project will take me out of music and towards a more sculptural understanding of the work, where I will deal with sound in terms of sonic masses rather than musical phrasing. I have also started to imagine inverting the placement of this new instrument: rather than hanging it, I've thought of planting it in the ground! This would allow me to present it completely differently, to create new visual forms and again work with groups of several instruments. I also want to start working on an accumulation of the sonic layers of several – at least 16, perhaps 24 – *Analogic Feedback* instruments, such as to create extremely organic sonic masses. Clearly, I seem to be headed towards working with masses, to realize my monumental ideas, both of which might be

more suitable for museum spaces.

If I had to sum up my approach with a quotation, I would choose the following:

"Caminantes, no hay caminos, hay que caminar/You who walk, there are no paths, there is only walking." ²²

It is inscribed on the wall of a cloister in Toledo, and when Luigi Nono (cited Petazzi, 1999) discovered it in 1987, he suggested it to be

"an invitation, in the absence of sure and proven paths, to refuse dogmas and predefined tracks and open oneself to utopia, to constant research, that of the wanderer or Prometheus." "It is Nietzsche's Wanderer, the perpetual quest, Prometheus of Cacciari. It is the sea we embark upon, inventing and discovering one's journey." ²³

This inscription is an illustration of my approach that is based in attentive listening to the world at the present moment. Such spontaneous and willing attention allows me to discover what is wandering through my concrete action, which does not cease to astonish me and allows me to feel useful and alive.

22 - " Vous qui marchez, il n'y a pas de chemins, il n'y a qu'à marcher ». (Translation: T. Hron)

23 - " une invite, en l'absence de pistes avérées et sûres, à refuser les dogmes et les parcours préétablis pour s'ouvrir à l'utopie, à la recherche incessante, celle du wanderer ou de Prométhée. « C'est le Wanderer de Nietzsche, de la quête perpétuelle, du Prométhée de Cacciari. C'est la mer sur laquelle on va en inventant et en découvrant sa route », disait Nono en 1987 à propos de cette inscription. " (Translation: T. Hron)

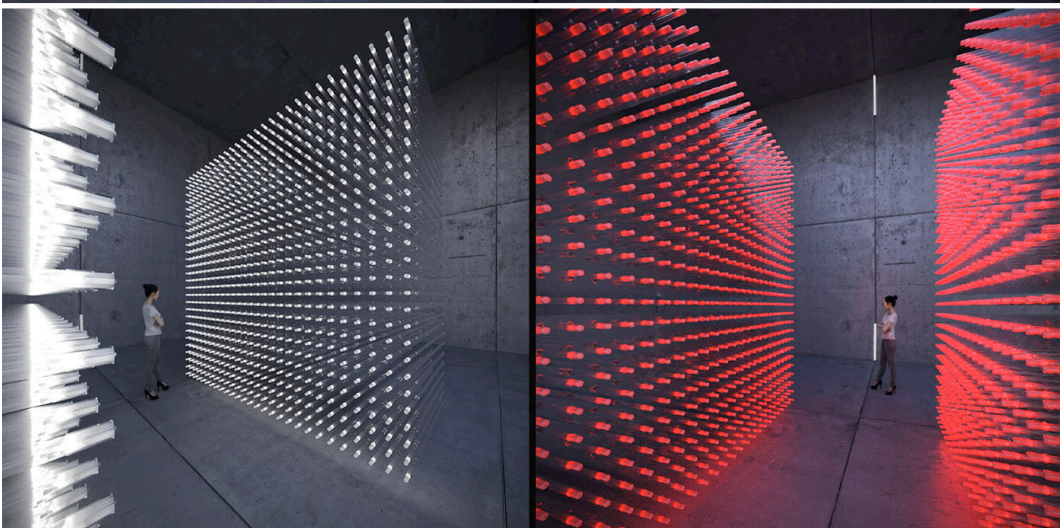
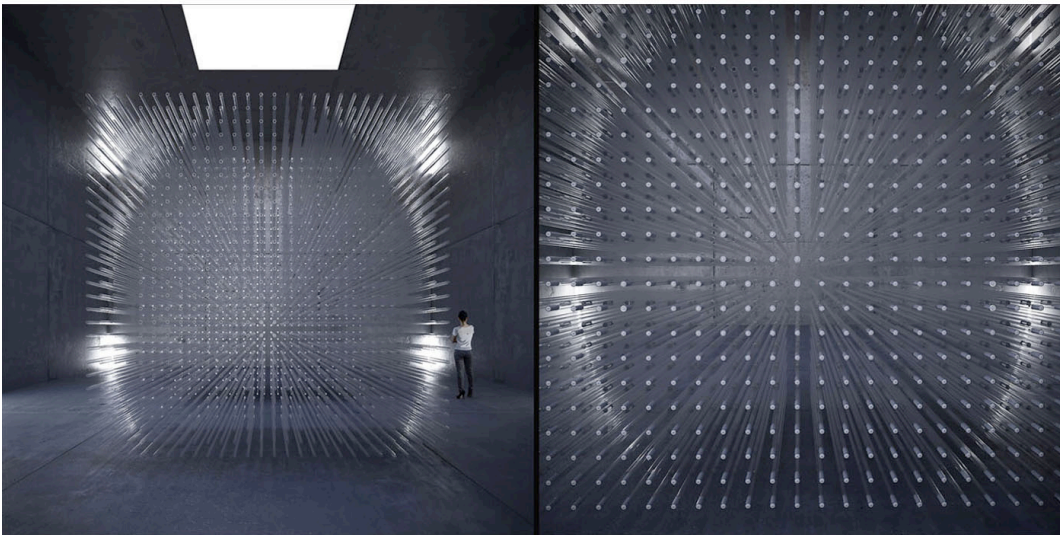


Fig. 5.2 *the CUBE*, an idea for a future visual and sound installation staging 2200 Tubes. Photo : 3D model, Roger Rives © 2017.

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APPENDIX 1 - other works done during the PhD research.

Comprovisation (where I play with my *Analogic Feedback* Instruments)

1 - RUST duo

- *explosion* (Nov. 15th, 2014, musical comprovisation, 8 minutes)
1 concert video file (Krakow - Poland), Quicktime H264, 8.22 minutes
1 concert video file (Medellin - Colombia), Quicktime H264, 10.38 minutes
1 Folder with photos of the concert.
- *excavation* (April 26th, 2016, musical comprovisation, 18 minutes)
1 concert video file (Medellin - Colombia), Quicktime H264, 17:24 minutes
[Note: those video capture of the pieces should be experienced live]

2 - Inner Island duo

- *Traces de poussières* (2015, sound installation, variable length)
1 concert video file (GMEM - France), Quicktime H264, 6:50 minutes excerpt
1 Folder with photos of the concert.
[Note: these video capture of the piece should be experienced live]

3 - L.B.B. trio

- *Improvisation #1* (Oct. 24th, 2015, improvisation, 26 minutes)
1 AIF audio file, 16bit 44100 khz, 26 minutes version
[Note: these music recording should be experienced live]
- *L.B.B Live at Turino* (Oct. 25th, 2015, Live Performance, 10:38 minutes)
1 concert video file (Torino - Italy), Quicktime H264, 10:38 minutes excerpt
- *L.B.B Italian tour 2016* (March 2016, Live Performance, 9:53 minutes)
1 Teaser - concert video file, Quicktime H264, 10:38 minutes excerpt
[Note: those videos capture of the pieces should be experienced live]

4 - duo with Cal Lyall

- *Improvisation #1* (May. 21th, 2016, improvisation, 20 minutes)
1 concert video file (Tokyo - Japan), Quicktime H264, 10:38 minutes excerpt
[Note: these video capture of the piece should be experienced live]

Music and Dance project

1 – Memory of a shadow

- *Memory of a shadow* (March 20th, 2015, Music/Danse project, 60 minutes)
1 video file (on show – Part 1, Montreal), Quicktime H264, 4:45 minutes excerpt
1 video file (on show – Part 2, Montreal), Quicktime H264, 5:15 minutes excerpt
1 Folder with photos of the show.
[Note: these video capture of the show should be experienced live]
* I made the music, scenographie, lighting and choreographie of this project.

Other documentation

1 – Numeric Platform of Creation

- 1 pdf text that explain what is the Totem Platform (staging 40 new musical instruments).
- 1 Tech Rider for traveling with *Analogic Feedback* Instrument

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