Entrainment, Participation and Speech
A Rhythmic Approach to Electroacoustic Composition

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Abstract

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This dissertation deals with means to implement rhythmicity in electroacoustic composition. It is done by drawing inspiration from the free-jazz concept of groove and from the rhythm of speech and language. In the first section the musical characteristics and sociological implications of groove, as well as the rhythmical features of speech are discussed, alongside possible means to implement them in musical compositions. The second section discusses four electroacoustic pieces which were written as a part of this research, each of them implementing the aforementioned concepts in different ways.

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Introduction

Beginning my musical career as a jazz performer, the term "groove" was one of the most overused words in my professional environment. Groove was generally considered as something that a musician either had or didn't have, (although one could also "have it" one day and "not have it" another day). It also came in different flavours ("He has a very strange groove"). It was clear that this term had something to do with rhythm and it was also clear that it was not about *which* notes or patterns one played but about *how* they played them. It was the thing that gave music its perpetual force, its drive, its forward motion.

Perhaps the most interesting thing about groove was that even though the term was related with rhythm, the usage of it was not any less frequent when dealing with non-pulse-based free jazz or free improvisation. It was taken for granted that John Coltrane was *in the groove*, no matter if he played 4/4 in "A Love Supreme", or in free time in "Meditations". To put it more generally, playing in free time was not considered to be an excuse for playing without groove.

The musical neighbourhood of free time is a meeting point for musicians who come from jazz, from contemporary music and from electronic music. At this meeting point boundaries of these different genres blur and many times it is impossible to guess the tradition from which a certain musician originates. Still I have noticed that musicians who do not come from a jazz background are much less inclined to use the term groove in regards to ametric music, or to take it into account with their music making.

Encouraged by the electronic composer Paul Berg who suggested to me that rhythm is "under discussed" in the discourse of electronic music, I decided to research the concept of groove and especially of non-periodic groove, and to see if I can explore it within the framework of electroacoustic composition. More specifically, I have decided to explore this concept through the use of speech, as I believed that the same principles of groove in free-timed music, also apply to the rhythmicity of speech.

Most academic discourse on groove refers mainly to equal timed, repetitive, dance oriented music (see for example Madison, 2006 and Janata, 2012). The first objective of this thesis is to broaden the definition of groove to include music which is non-pulse-based. This is done in chapter A.1 by

using ideas put forth by Steven Feld in his article on the music of the Kaluli tribe of Papua New Guinea (Feld, 1988), and by Brian Massumi in his article on relational thinking (Massumi, 1997).

In the subsequent chapters of this thesis I will review and discuss the concepts of participation and entrainment which I consider essential for the formation of groove. In chapter A.2 I review the concept of entrainment, or synchronisation, which is currently discussed extensively in the scientific community, mostly in the field of cognitive science and psychology. In chapter A.3 I discuss the concept of participation and present a gradient definition to this term.

I will then begin to review speech and speech rhythm, a wide phenomenon which I examine a narrow aspect of in chapter A.4. I divide the features which contribute to speech rhythmicity into five layers and discuss each one of them. I then describe the features of each layer and suggest a possible means to extract these features and use them as a rhythmic base for a composition. I later discuss further aspects of speech rhythm and suggest more ways to incorporate these features in electronic music, thus sealing the theoretical section of the thesis.

In the practical section of the thesis I review the music which I have composed in regards to this research. First, in chapter B.1, I examine the general principles I have set while writing the music. Next, in chapter B.2 I review the piece *Variations on a theme by Martin Luther King* for two percussionists and six self-playing drums. It is a percussion piece that its rhythmic pattern is based on the onsets of a phrase from Martin Luther King's famous speech at the Lincoln Memorial.

In chapter B.3 I review the piece *La dialectique de la durée* for two vocalists and live electronics which is based on a text by the French philosopher Gaston Bachelard. This piece explores concepts such as rhyme, heterophony, echo-polyphony, and uses techniques of live sampling and processing. In chapter B.4 I review the piece *Talking Trash* for ensemble, which makes use of the prosodic features of a spoken-word poem by the boxer Muhammad Ali.

In chapter B.5 I discuss *Aquifer*, a system for live electronic music performance and improvisation, built in the Supercollider programming environment. *Aquifer* is a system which combines techniques of real-time sampling and processing with an algorithmic sequencer. It also implements several ideas that were inspired by speech rhythm and by the study of non-periodic groove. These include use of actual speech patterns, the construction of events in a rhythmic structure inspired by phonemes and syllables, and some more general notions of local isochrony and entrainment by clues.

It is my hope that this thesis will shed new light or offer new possibilities for the construction of rhythm in electroacoustic composition, and specifically the possibility to use speech rhythms or speech inspired rhythms to create entrain-able musical flow without confining to the traditional conventions of meter and pulse.

A. THEORY

Groove

A.1.1 Origin of the term

The term "in the groove" was first coined around the 1930's in the US, perhaps as an analogy to the grooves of the vinyl record. In the 1930's and 1940's, "in the groove" was a widespread description for jazz performances which were "excellent" or "sophisticated" (Gold, 1975, cited on Kernfeld, 2016). Groove is sometimes synonymous with "Swing" and is commonly used to describe music which is based on "accompanimental ostinatos drawn from African-derived dance music" (Kernfeld, 2016).

A.1.2 Participatory discrepancies and the Kaluli groove

The first discussion of groove in an academic context was made by ethnomusicologists Keil and Feld. In a series of articles dating from 1966 to 2010, Keil and Feld describe groove as a significant musical and sociological phenomenon which is a key element in the interpretation and understanding of non-western music, as well as in many genres of African derived music from the 20th and 21st centuries (Keil, 1966; Keil, 1987; Feld, 1988; Keil and Feld, 1994; Keil, 2010).

A key concept in their thought is the term "Participatory Discrepancies" (Keil, 1987). It is a term that first and foremost, offers an alternative to traditional musicologist musical apprehension, which was based primarily on structure and progress (harmonic and melodic). The field of musicology, which emerged from the tradition of western classical music and was shaped in its image, inherently included a hierarchy in which a complex harmonic progression, as expressed by Beethoven, Wagner or Schoenberg, was the peak of artistic expression, leaving all other forms of music inferior or "primitive". Looking at participation was a new way to appreciate music which contained very little to no harmonic progression.

> *But isn't this involvement more analytic, sequential, conscious, rather than "participatory" in the sense described below? Even in these civilised musical systems, syntax does not invite the listener to participate in the phenomena with the same powers that process and texture have. It is really only in relatively recent historical periods of Western music that syntax and peculiarly rationalist approach to it (Weber, 1958) have managed to squeeze the mysteries of musical participation to the furthest corners of our awareness.* [Keil, 1987: 275]

Participatory discrepancies address not only the concept of participation but also an "artefact" of participation, that being the slight deviations which occur every time more than one person is playing music (together). For Feld and Keil these "artefacts" are in fact a crucial part of the music. The deviations are not arbitrary but rather specific and precise, and are an essential characteristic of many musical genres (Feld, 1988). Moreover, they give the music its "groove": "It is the little discrepancies within a jazz drummer's beat, between bass and drums, between rhythm section and soloists, that create "swing" and invite us to participate." (Keil, 1987: 277).

One of the most cited articles of the series was Feld's "Aesthetics as iconicity of style, or 'Lift-up-over Sounding': Getting into the Kaluli groove" (Feld, 1988), in which he describes the music of the Kaluli tribe from Papua New Guinea. Feld makes a comparison between the term "groove" and the Kaluli term "dulugu ganalan" which he literally translates to "Lift-up-over sounding". He defines groove as "an intuitive sense of style as process" or even more vaguely as "an unspecifiable but ordered sense of something that is sustained in a distinctive, regular and attractive way, working to draw a listener in." (Feld, 1988: 74-76).

According to Feld, "lift-up-over sounding" means two or more things sounding at once: two voices; a voice and a drum; a drum and the sound of the rainforest, where one of them is "lift-up-over" the other, or both of them "lift-up-over" each other. "The essence of 'lift-up-over sounding' is part relations that are simultaneously in-synchrony while out-of-phase." (Feld 1988: 82)

> *Sometimes the term 'echo-polyphony' seems most appropriate, given the overlapped repetition of identical or similar melodic and textual elements just split seconds apart. For Kaluli, all of these things are dulugu ganalan, 'lift-up-over sounding.'* (Feld 1988: 81)

For Feld this 'echo-polyphony' or 'lift-up-over sounding', along with the strong participatory element in the Kaluli music, form the Kaluli version of Keil's participatory discrepancies. In other words, it's "getting into the Kaluli groove". However, unlike most music which is usually referred to when discussing groove, the Kaluli groove is not based on a pulse. Feld does not discuss the rhythmic structure of the Kaluli music but when listening to the recordings which he made and which he uses to analyse 'lift-up-over sounding', perhaps the most striking characteristic is the absence of any perceivable isochronous pulse. Indeed there are some repetitions and local isochrony but in terms of rhythmic organisation this music is much closer to free-timed music than to any form of western or non-western metric music.

A.1.3 Microtiming deviations and contemporary research

Following the ideas of Keil and Feld many researchers attempted to measure and quantify the participatory discrepancies of different genres. It was analysed between the different members of a jazz rhythm section (Progler, 1995), in a performance of jazz pianists (Busse, 2002), in a salsa ensemble (Washburn, 1998), in Brazilian percussion (Gerischer, 2006), and in Hip-Hop drumming (Greenwald, 2002).

During the years the wide psychological-sociological-philosophical term "participatory discrepancies" was gradually replaced with the more narrow and measurable term "microtiming deviations" or "microrhythm". The book "Rhythm in the Age of Digital Reproduction", for example, was published in 2010 consists of articles which measure and analyse microrhythm effects in (mostly but not only) popular metric dance-oriented music. Other researchers crafted carefully planned experiments in order to scientifically measure the effect of microtiming deviations on the perception of groove - so far no r,elation has been proved between the two (Madison, 2011; Davies, 2013; Janata, 2012; Fruhauf, 2013).

At the same time, music production software became widely popular and microtiming effects shifted from being something that musicians do more-or-less intuitively and musicologists measure in the lab, to something that each producer can experiment with in their own studio. The production of beats where microtiming plays a deliberate, at times exaggerated role became an earmark of many producers, especially in the Hip-Hop / R&B genres (Danielsen, 2010).

Other aspects of groove have been researched. Madison (2006), discovered that groove is a term that people are familiar with and feel comfortable to rate It is a separate quality from swing and it is not related to tempo nor to genre. Witek, Clarke, Wallentin, Kringelbach, and Vuust (2014) found a reversed U-shaped relation between syncopation and groove - more syncopation results in higher groove ratings up to some point and then results in lower groove ratings. Janata, Tomic and Haberman (2012) found that "high-groove stimuli elicit spontaneous rhythmic movements, and that quantifiable measures of the quality of sensorimotor coupling predict the degree of experienced groove."

A.1.4 Defining groove

The meaning of the term "groove," and the question of wether or not it is present in a performance, is every bit as arguable and qualitative as "swing," and if possible even more elusive, because it applies so far beyond the world of jazz. (Kernfeld, 2016)

During the years there have been numerous attempts to define groove. Feld defined it as "an unspecifiable but ordered sense of something that is sustained in a distinctive, regular and attractive way, working to draw a listener in" and also as "An intuitive sense of style as process, a perception of a cycle in motion, a form or organising pattern being revealed" (Feld, 1988: 74-76). Madison, Gouyon, Ullén and Hörnström (2011), were more straightforward with "music that makes people tap their feet and want to dance.", but also as "Wanting to move some part of the body in relation to some aspect of the sound pattern". Pressing (2002) defined it as "A cognitive temporal phenomenon characterised by perception of recutting pulses, perception of a cycle of time, effectiveness in engaging synchronised body responses.", and Iyer (2002) as "something that induces motion". Keil (2010) claims that groove is all about participatory discrepancies and that it is synonymous with entrainment.

If we try to summarise and categorise the various definitions, the most reoccurring notion is a connection with dance, or embodiment. Since a movement in regards to the music is a form of participation I will unite all relations to movement, along with Keil's "Participatory Discrepancies" under the category of *participation*. The other frequent notion is that of synchronisation. "A cycle of time", "cycle in motion", "move some part of the body in relation to some aspect of the sound pattern", are all terms which imply synchronisation. For these I will use the term *entrainment* which will be discussed further on.

An interesting question that arises is whether groove is a quality of music or a perceptual phenomenon. It seems that most definitions include both music and the listener in the definition, for example: "wanting to move some part of the body in relation to some aspect of the sound pattern" (Madison, 2006) - but which is the subject and which is the object? In the previous definition by Madison it is obviously the listener, meaning that groove is a perceptual or a psychological phenomenon. However in that same article Madison also defines groove as "a quality of music that makes people tap their feet, rock their head, and get up and dance". Other articles relate to groove as more of a psychological, cognitive phenomenon (Feld, 1988; Pressing, 2002), while some more as a quality of music (Witek, 2014; Danielsen, 2013)

A possible solution to this dilemma could be taken from Massumi and others' concept of *Relational thinking*. Relational thinking considers that at times it might be more useful to look at relations between subjects or objects as if these have an ontological meaning of their own which is prior to that of the subjects which they relate.

> *What would it mean to give a logical consistency to the in-between? It would mean realigining with a logic of relation. For the in-between, as such, is not a middling being, but*

rather the being of the middle – the being of a relation…. It may seem odd to insist that a relation has an ontological status separate from the terms of the relation. But as the work of Gilles Deleuze repeatedly emphasizes, it is in fact an indispensable step toward conceptualizing change as anything more or other than a negation, deviation, rupture or subversion… It is not possible to speak of individuals and society as two different things. They are strictly simultaneous and consubstantial. If they are not two different things they can be seen as products of a relation. (Massumi, 1997: 3)

Keeping this in mind it might be useful to address groove as neither a perceptual / psychological phenomenon nor as a quality of music but as a relation between music and a listener (who can also be the performer themselves). I therefore suggest a working definition which will be used as a point of departure for this research and will be expanded in the following chapters: Groove is a relation between music and a listener which involves entrainment and participation.

This definition explains why different people experience different music as having or not having groove and why sometimes the *same* people experience the *same* piece of music as having or not having groove in different situations. It explains why bands of skilled musicians who have been playing together for years can get off stage saying "There was no groove tonight!" and why it is a common statement in the techno scene that "You cannot really understand the music until you hear it in a club." It brings forth the subjective nature of the phenomenon and its complexity, but at the same time eliminates the option to ever measure it objectively. If thats what groove is about, any attempt to measure it in the physical properties of the sound, as some have tried, could at most get you half way there. If a tree falls in a forest and no one is around to hear it, does it groove? Apparently not.

According to this definition groove has to come from both ends. The music must be entrain-able, (for example - randomly dispersed clicks or slowly evolving drones do not answer to this criteria) and the listener must participate. Entrainment and participation will be discussed in more depth further on in this thesis. I personally believe that depending on the circumstances, people can experience groove with any music which is entrain-able, yet I wouldn't go as far as saying that this sums the part of the music in the process. It seems that still, certain pieces of music are more likely than others to induce groove, and that ratings of groove are relatively consistent among different listeners, at least in the context of a common cultural background. (Witek, 2014; Madison, 2006). Thus, in order to describe the quality of music which tends to induce groove, I will use the term "rhythmicity".

Rhythmicity is defined as "Rhythmical quality or character." (Oxford Dictionary: rhythmicity). In his article "Time Rhythms and Tension, In Search of the Determinants of Rhythmicity" Povel (1985) writes: "Good rhythms may produce a feeling of tension in the listener or elicit tendencies to move or dance. This psychological attribute of rhythmical patterns will be referred to as *rhythmicity*." Unlike groove, rhythmicity is also used in phonetics to describe the rhythmical qualities of speech. For example, Kohler (2009) addresses rhythmicity of speech throughly and claims that it is an important factor which determines the ease of speech decoding. Since speech and the relation between speech rhythm and musical rhythm are a fundamental part of this thesis, the term rhythmicity seems to be an adequate pivot.

To conclude, *groove* describes a relation between music and listeners whereas *rhythmicity* describes the quality of music which tends to induce this relation. *Entrainment* and *participation* seem to be key factors in that process and discrepancies or microtiming deviations might also play an important role. *Speech* is a rhythmic phenomenon which might shed some light on the ability to "groove" to free-timed music. *Entrainment, Participation* and *Speech* will be discussed in the following chapters.

Entrainment

"Entrainment describes a process whereby two rhythmic processes interact with each other in such a way that they adjust towards and eventually 'lock in' to a common phase and/or periodicity" (Clayton, Sager and Will, 2005: 2). This is becoming a much discussed topic in contemporary research, especially where synchronisation is expressed physically, then it is sometimes referred to as "sensorimotor synchronisation". Entrainment in humans can be biological (as in circadian rhythms - entrainment of a person to daylight hours), sociological (entrainment of a person to the society), musical (entrainment to music or to an auditory rhythm) and linguistic (entrainment to speech).

It appears that people's ability to synchronise with an external pulse is an innate ability (Honing, 2012). When tapping along with an external click the tap is almost always *before* the click, which demonstrates that synchronisation is anticipatory rather than reactive (Mates, 1992). Entrainment to an external source is an ongoing process which requires continuous cues from the auditory source in order to sustain it. Jones created a three stage model to describe this process:

> *(1) perception, which primes the listener to form expectations; if expectations are met, (2) synchronization; and if expectations are not met, (3) adjustment or assimilation. Perception and the priming of expectations are nearly instantaneous occurrences. Cues from events unfolding around the attender are taken as indicators of where to focus attentional energies in order to 'catch' upcoming events. Anticipation of future events is facilitated by the presence of highly coherent (i.e. regularly patterned) temporal events, such as a steady beat. Synchronization follows priming and occurs as our expectations are met. As such, synchronization is itself a verification of the correctness of our expectations. If our expectations do not match what happens next, then synchronization has not occurred. It should be noted, however, that the discrepancies between our expectations and the actual unfolding of events can cause arousal that in turn heightens attention and results in learning* (Clayton 2005, adapted from Jones and co-researchers series of articles between 1976 and 2002 and mainly from Jones & Boltz 1989 and Barnes & Jones 2000).

According to Large and Jones's Dynamic Attending Theory (DAT), entrainment is oscillations over time in the energy of interactive attention. Attention first rises towards the next expected similar event in order to better interpret it, and then decays (Large & Jones, 1999). Some research

supports this theory, for example by showing that events taking place at an expected time (i.e. at periodic intervals) are better interpreted (Jones, Johnston & Puente, 2006). Despite the relatively complex process described above it is important to note that entrainment is mostly effortless, and in fact synchronisation can be spontaneous and unintentional (Witek, 2014).

As entrainment involves the ongoing process of expectancy and affirmation, there has been numerous claims that certain violations of these expectancies, even when they are recurring periodically, create surprise and elicit pleasure. Gebauer, Kringelbach and Vuust (2012), claim that "expectation is fundamental to musical pleasure, and that music can be experienced as pleasurable both when it fulfils and violates expectations." (Gebauer et al., 2012). Huron, in his book "Sweet Anticipation" (2006), links anticipation and violation to evolutionary mechanisms of reward and assigns them a key element in music creation and perception. Witek et al. (2014) link this mechanisms to groove and demonstrate the relation between syncopation (i.e. violation of expectancies), pleasure, movement and groove.

An important question which arises is whether or not entrainment is limited to periodic signals. Fortunately there is at least one generally agreed upon, non-periodic, entrain-able source: speech. Speech is a non-isochronous auditory signal which people can entrain to. For example, it is extremely easy for different speakers to synchronise their speech without any special practice (Cummins, 2003). People can tap along with a heard text (Lidji, Palmer, Peretz & Morningstar, 2011), and skilful speakers are known to entrain their speaking rate to that of their partner (Jaffe, 1979). Buxton (1983) showed that participants tapped along with an isochronous sequence of monosyllabic words more accurately than to any deviations from isochrony. However, they were just as accurate tapping to a naturally spoken sequence of the same words, even though they were not equally spaced. "Clearly listeners are making good use of the temporal predictability of natural speech in understanding." (Buxton, 1983: 122).

Since so far the only animals that have been found to be able to entrain to an external rhythm are humans, and parrots that can imitate human speech, it has been hypothesised that there is an intrinsic relation between the two abilities and that entrainment plays a crucial role in the development of language and communication (Patel, 2008). Supporting this theory is research from 2006 which shows that complex rhythms activate an area of the brain which is usually related to language interpretation (Vuust, Roepstorff, Wallentin, Mouridsen & Østergaard, 2006). "Entrainment and prediction seem to be fundamental requirements for successful interactive communication." (Hawkins, 2014).

A.2

To conclude, entrainment is an innate ability which allows people to synchronise to an external source. Entrainment is based on expectation, anticipation and attention and is mostly effortless. It is essential in order to perceive and interpret music or speech properly, and it plays a role in mechanisms of pleasure.

Participation

While conducting this research I tried asking myself "What makes me groove?". As this was something I was constantly reflecting upon, reading about and exploring with my music, I became aware that it is indeed an elusive concept. I realised that I can listen to the same piece of recorded audio and think that it is "groovy" in the first time and "not-so-groovy" in the second time. An even harder task was to try and find music which definitely had no groove. I thought this could be a positive step towards a definition, but by trying to define that limit my concept of groove gradually expanded. Indeed, I could say that music which had no attacks or transients but only long sustained sounds was definitely not groovy but other than that I felt that with the right intention I can perceive almost any other sort of music as having some degree of groove.

I tried examining the factors that make people get "in the groove" and eventually realised that they include a lot more than just music. I realised things like the arrangement of the venue; the "atmosphere" in the place; the prior opinions one has on the performer; the percentage of psychoactive substances in one's blood; the reaction of the people around and the social relations one has with them; all of these factors make a difference in regards to whether the music would be perceived as having or not having groove. Obviously, none of these factors has any effect on the music itself, they only influence how much the audience will *participate* with it. This realisation links back to Keil and Feld's concept of participation.

Many researchers discussed aspects of the participation between the various musicians in the ensemble, but I believe that the participation that matters most is the one between the listener and the music. When Keil speaks of participation, in his article "Participatory Discrepancies and the Power of Music" (1987) he quotes Barfield to define participation: "Participation begins by being an activity, and essentially a communal or social activity. It takes place in rites and initiation ceremonies resulting in collective mental states of extreme emotional intensity…" (Barfield, 1965:32) And later on: "Participation is the opposite of alienation from nature, from society, from the body, from labor…" (Keil, 1987: 276). However, I would like to define participation in regards to music in a more inclusive way.

It is generally agreed upon that groove does not always results in dance or movement. "Even though the term 'groove' seems to carry with it some sort of embedded appeal to corporeal

movement, groove-directed music can display ambiguity toward this goal." (Danielsen, 2010: 11). The response to groove is often much more subtle and a desire to move is usually considered a sufficient evidence to its presence (Madison, 2006). Therefore, I would like to define participation as a gradient, in which dance is on one end of it, involuntary head bobs and foot taps are in the middle, further on there is the desire to move, without any physical expression and at the other end of the line even a strong involvement can be considered as a form of participation.

strong involvement   wanting to move   foot tapping   dance

Figure 1: Participation gradient

Music participation has existed since the beginning of music itself and its significance has not declined, as it is possible to see in dance clubs and festivals all around the world each day. Research shows that at least non-musicians synchronise better with music when they move than when they are still (Su and Poppel, 2012), and that they tend to move more and synchronise better in a group (De Bruyn, Leman & Moelants, 2008).

More generally on participation, it was shown that people tend to spontaneously synchronise with other people at sight (for example Schmidt & O'Brian, 1997). There is a reciprocal relation between synchronised-participation and emotion. By manipulating tapping experiments Valdesolo and DeSteno (2011) showed that participants who managed to tap in synchrony with each other were more likely to show compassion and altruism in a subsequent group dynamics experiment. The power of synchronised participation might even lead people to prefer social cohesion over moral standards: Wiltermuth (2010) found that individuals who had engaged in a joint activity, such as singing or walking synchronously with an experimenter, were more willing to follow an experimenter's instructions to lie or to destroy insects" (quoted from Repp, 2013). On the other hand, negative emotions towards a person reduces the chance of a spontaneous synchronisation (Miles, Griffiths, Richardson & Macrae, 2010).

Various research shows by means of brain imaging that listening to auditory rhythms activates the motor system even when participants don't move. (For example: Bengtsson et al., 2009). Gallese and Goldman (1998) showed that when animals watch other animals act, mirror neurons that relate to that action are fired in sympathy, and the same mirror neurons fire when an associated sound is heard (Kohler et al., 2002). These findings support the claim that participation does not necessarily have to be related with action.

In relation to groove, Janata et al. (2012), held a study which touches the concept of participation and the link between groove and sensorimotor synchronisation. In their experiment participants

were instructed to listen to musical excerpts with either the instructions to do nothing, to tap in isochrony with the music or to tap freely. They were later asked to rate the perceived groove in the music and their enjoyment of it. The strongest predictors for both enjoyment ratings and for groove ratings were prior groove ratings of the music, made in an earlier survey. However, a 'no tapping' instruction resulted in a slightly higher enjoyment ratings than when participants were instructed to tap, and a free-form tapping instruction resulted in a slightly higher ratings of groove - when the musical excerpt was one which was previously rated as having groove. This experiment seems to reduce the importance of participation in regards to the perception of groove, but it also might just mean that people don't like to be told to participate. On the other hand, a positive correlation was found between high ratings of groove and spontaneous foot-taps and head-bobs in the participants. The implications of this will be discussed in the theoretical conclusions. (chapter A.5).

To conclude, participation can be voluntary or involuntary. It is affected by emotion and it affects emotion. It can take place between different people or between one person and music and it can be expressed physically or experienced only by the participator. The relation between listener participation and music is still an understudied complex psychological phenomenon which is hard to measure in research, especially since it is difficult to reproduce it in a lab. Still, it seems evident that participation is related with groove and that there is a reciprocal effect between the two. The only question is - what is the significance of the effect in each direction?.

Speech

A.4.1 Overview

When I first approached this research I had an intuitive notion that the quality of groove which I found in certain types of free jazz, was similar or identical to a rhythmic phenomenon which I recognised in the way certain speakers talk. After completing this research I can now say that this statement is far from being ungrounded. The relations between music and language have been discussed for many years and have their grounds in perception and cognition. In this chapter I will try and describe the rhythmic qualities of speech and why it might be used as an interesting rhythmic source in electroacoustic music.

Patel, in his book "Music Language and the Brain" (2008) discusses the long history of comparisons between music and language, beginning from Plato, and proceeding through Darwin, Rousseau, Wittgenstein and Bernstein. In the field of groove and rhythm Feld (1988) claims that the Kaluli tribe's musical aesthetic precisely matches the way in which they communicate and talk. Pressing (2002), claims that 'black atlantic rhythm' is founded on two main approaches to time: groove and speech, and he goes on to show how they interrelate.

Speech and music both deal with the perception and interpretation of complex auditory signals. They are also related in the fact that they are based on the division to accented and unaccented events (Patel 2008). Patel (2003a) demonstrated using statistical analysis that there is a positive correlation between the type of grouping which is common in a certain language (short-long vs long-short) and the rhythmical phrasing of composers from that language. This finding was later confirmed by Huron and Ollen (2003) who found the same correlation in numerous languages.

However, there is a major difference between the rhythm of speech and the rhythm of metric music: the rhythm of speech is not based on an underlying isochronous pulse. For many years researchers have attempted to analyse speech in comparison to an imaginary flexible grid or tactus, yet in the past years this approach has been mostly abandoned: "…periodicity, which plays such an important role in musical rhythm, is not part of the rhythm of ordinary speech" (Patel, 2008: 122). On the contrary, speech that is perceived as having an underlying pulse immediately grasps our attention as being unnatural. Still, until one actually tries to measure the rhythm of a given speech our intuition tells us it is somewhat isochronous. This was shown in a research by

Buxton (1983) who demonstrated that people perceive speech as being more isochronous than it actually is.

Musical rhythm is usually based on a periodic pulse and equal subdivisions and multiplications of it. One might call that approach top-down. In opposed to that, speech rhythm is a bottom-up approach - the duration of the syllables and vowels is derived from the time it takes to physically articulate them. The rhythm of a phrase is a function of the durations of the syllables and vowels which formulate it. Still, interestingly, it is somehow possible to entrain to speech (See chapter A.2 on entrainment and A.4.1 on entrainment to speech).

Even though the mechanism of entrainment to music is far from being understood, intuitively it "makes sense" that we can anticipate isochronous beats, especially since it is not that difficult to build a machine that can do it. However, the mechanism of entrainment to speech is a much less obvious one. If entrainment is indeed related with attention, as Large and others assume (Large and Jones, 1999) it might be possible to draw conclusions from visual perception. In a recent study Baruch, Kimchi and Goldstein (2014) showed that attention has a key-role in visual object recognition. Prior knowledge and prediction on the identity of the perceived object direct attention to where significant information is expected to be found.

Drawing from that, it is possible to hypothesise that prior knowledge of a language creates rapid predictions and anticipations. These direct our attention towards specific points in time in which we expect to find significant information regarding the identity of a spoken word, just like in Large's Dynamic Attending Theory (Large & Jones, 1999). Supporting this hypothesis is research from 2011 which shows that native speakers of a language entrain better to that language than non-native speakers (Lidji et al., 2011). In addition to this, as perception and production of speech are complimentary skills, humans have an embodied notion of speech, and indeed it has been suggested by many that the interpretation of speech is processed through the same mechanisms that produce it (Klatt, 1979).

A.4.2 Layers of speech rhythmicity

Speech is a highly complex auditory signal which creates a hierarchal multi-layered rhythmic structure. In order to artistically explore the rhythmicity of speech I would like to categorise and divide it into five somewhat overlapping layers which roughly extend from micro structure to macro structure: *articulation, pattern, prosody, rhyme* and *content*. I will hereby define these terms and discuss ways to analyse them and use them for the creation of electroacoustic music.

1. **Articulation** - In phonetics, Articulation refers to the physical production of a sound - the shape of the mouth, the location of the tongue and so on. In the context of this research articulation will refer to the microstructure of syllables and vowels. If we consider each syllable as an event, articulation is its internal structure. Usually each of these events is a conjunction of sonically different sounds and transitions between them. These transitions a complex network of inter-related fast changing envelopes which are responsible not only for the distinction between different phonemes but also for the manner in which they are perceived. Do they sound harsh or soft? Are they foreign or local? Is the speaker a woman or a man?

Rhythmically, the most interesting part of a syllable is its onset. Syllables usually begin with a fast modulating attack phase followed by a more slowly modulating sustain phase. It is the onset which gives the syllable its character, its identity and its articulative quality. Among the various acoustical instruments speech has the most complex onset, and the highest level of variability between the different onsets that it can produce. It is so complex that when dealing with speech many times the term P-centre is used instead of onset, since the perceptual start of a syllable can be quite different than the physical point where the event starts (see chapter A.4.3 on *pattern*).

Speech onsets have a long internal rhythmic structure. For example the syllable "sa" is a conjunction of two different sonic characteristics: a short "s" which has an unvoiced noise-like quality and the vowel "a" which is a sustained voiced sound. The syllable "pa" begins with a short unvoiced explosive consonant that is created by a rapid formant movement. The syllable "spa" is a conjunction of three different sonic events, and so on. In common speech these conjunctions occur so rapidly that they are perceived as a single event, yet this single event has a long complex attack. The P-centre, the perceived onset, of the syllable "spa" would probably be slightly after the beginning of the "a" sound and not on the "s" or on the "p".

In the tradition of electronic music the most notable analysis and resynthesis of speech articulation is manifested in the vocoder. Peter Ablinger's series of pieces for voices and piano (dating from 1998 up to the present day) are also a sort of an unconventional "acoustic vocoder" and are based on the analysis of speech spectrum and a resynthesis using a piano. Since they too deal with microstructure of speech they might be considered as a very unconventional approach to articulation, and indeed it is almost possible to distinguish the words of the spoken phrase through the playing of the piano. Another example is the in-depth approach to articulation in many of Trevor Wishart's pieces, as well as in the several books which he has published. The pieces *Tongues of Fire* from 1994 and *Globalalia* from 2004, deals with articulation in a particularly extensive way.

When exploring the rhythmicity of articulation I attempted to craft synthetic sounds with a structure that is inspired by the structure of different syllables. I analysed short fragmented syllables, measured the duration of their various sections and created sound moulds which manipulate arbitrary sounds and reconstruct them to have the rhythmic structure of phonemes and syllables. This became a part of the *Aquifer* system which is described thoroughly in chapter B.5.

2. **Pattern** - Pattern is the sequence of durations between consecutive onsets in an auditory signal, in this case onsets of syllables and vowels. Pattern is perhaps the first feature that comes in mind when discussing speech rhythm, and indeed most references to speech rhythm and rhythmicity, as well as to musical rhythm, deals with inter onset intervals (IOIs). IOIs were studied extensively in tapping experiments and in a wide range of cognitive, musicological and phonetical research. In regards to groove, starting with theories on participatory discrepancies in the 1980's and continuing with research on microtiming deviations in the 2000's, IOIs have been measured and analysed in numerous experiments with often contradictory results.

Still, it is a common belief that subtle changes in IOIs from a metronomic grid are an important factor in the production of groove, and the deliberate creation of IOI shifts is a popular practice for electronic producers. For example, in the music production software Abletone Live, a feature called "Groove templates" allows the user to apply a timing template to his programmed drums that creates slight shifts from the grid in onsets position. These templates are created by an analysis of a human-drummer's drum pattern, and applying these templates is intended to make "square" beats sound more live and more "groovy".

When dealing with speech it is important to note the complexity of the term "onset". Indeed, onset is always a debatable term, but when dealing with speech it appears that it is far more ambiguous than it is with musical instruments. Morton Marcus and Frankish (1976) discovered that the onset location of a syllable or a vowel is a non-linear function of various features such as the structure of the phoneme and the attack time, as well as the offset of the phoneme and the offset of the previous phoneme. Since then it is more common to speak of P-centres (perceptual centres), which are the perceived onsets of the phonemes, rather than the physical ones.

As a part of this research I created the piece "Variations on a theme by Martin Luther King", a piece which uses the IOI pattern of a phrase spoken by Martin Luther King as its rhythmic base. This piece will be discussed in chapter B.2.

3. **Prosody** - If articulation deals with the event-internal modulation envelopes, Prosody deals with super-segmented modulation envelopes. Since modulation in filtering usually consists of faster

envelopes that do not form structures which are longer than one syllable, prosody deals mostly with modulation in pitch and amplitude, but also with modulation in voice quality and timing. It is a basic tool for the expression of emotion and attitude (Genetti, 2014). Prosody also distinguish between stressed and unstressed syllables and thus holds a key role in the formation of speech rhythmicity.

Prosody is the "melody of speech". In a musical culture that is preoccupied with pitch, prosody is the most obvious link to music. It is also relatively easy to analyse, either with an algorithm (as f0 analysis) or manually by ear. Emphasising the pitch of a spoken phrase by doubling it with a synthesiser or an acoustic musical instrument seems to have an intrinsic comic effect, and so it is often used in parodies and in Youtube culture (see for example: http://goo.gl/pZtVhs).

Speech melodies have been used in composition at least since the early 20h century. Janáček, for example, has been known to use notated speech melodies for the composition of Jenufa from 1904 (Vainiomäki, 2012). A notable example for the use of prosody in electroacoustic music includes Steve Reich's *Different Trains* from 1988, in which he extracted the melodic lines from fragments of interviews he held with various people, and notated these lines to a string quartet. The repetition of speech fragments in a minimalist manner brings out the musical aspect of them and creates the perpetual force which drives the music forward. Another example is Paul DeMarinis's album *Music as a Second Language* from 1991, which is based entirely on the analysis and resynthesis of prosodic features of speech.

To explore the aspect of prosody I composed the piece *Talking Trash* which is based on a the spoken-word poem "I am the greatest" by Muhammad Ali. In this piece I transcribed the pitches of Muhammad Ali's speech and notated them to an electroacoustic ensemble. This is discusses further in chapter B.4.

4. **Rhyme** - A rhyme is a "correspondence of sound between words" (Oxford Dictionary: Rhyme). The word rhyme and the word rhythm both come from the greek word *rhuthmos*, and indeed, rhymes produce a strong rhythmicity in a text. Rhymes are by nature musical. They deal with sound rather than with content and they deal with repetition, which is usually a substantial element of music, while rudimentary in common speech.

Rhymes and especially tail-rhymes, distinguish a text from everyday language. Skilled rhetorics like to make use of the rhythmic qualities of rhyme and the attention that it draws to their speech, however using tail rhymes often lends the speech to become too unnatural or poetic. Therefore, in public speeches it is a common practice to use other sorts of rhymes. Alliteration, or head rhyme, is

a sonic similarity between the beginning of different words. Assonance is a match between vowels, consonance is a match between consonants. Parallelism is a rhythmic repetition of sentences or parts of sentences, which bear a similar meaning or a complementary meaning and so on (Lanham, 1991).

In a musical context, speech rhymes can be found in countless songs, arias, lieder and rap verses. More generally - rhyme as in a "sonic similarity between events", is an inherent part of any music. For example, one might say that a 'period' in classical music (a phrase that repeats twice with a different ending), is a musical form of a rhyme.

When exploring the concept of rhyme I composed the piece *La dialectique de la durée* for two vocalists and live electronics. Rather than using an accurate analysis and resynthesis, I interpreted the concept of rhyme in a more intuitive way. I manipulated a spoken text to include unequal repetitions and emphasised the rhyme effect by bouncing the repetitions between the vocalists and between the vocalists and the electronics. This will be discussed in chapter B.3.

5. **Content** - A basic assumption of this research is that groove is a function of both music and the listener, and requires the listener to participate. (see chapter A.1 on groove). Therefore it is only logical to assume that listeners have a role in the creation of "speech groove". According to a study by Condon (1979), there is a tendency of people to move in synchrony with the articulatory structure of skilled speakers. Another example can be seen every Sunday in African-American churches across the US, where participation to speech and to music are blended together.

It is therefore possible to assume that the content and context of a given speech is a significant factor in the perception of the listeners as to how rhythmic it is, and how likely they are to participate with it. When listening to a speech in a familiar language, it is usually impossible for people to ignore the content of the speech, whereas the context of the speech is affecting the reaction of the listeners even before the speaker began speaking. Is it a man or a woman? Where does it takes place? What is it about? Does the listener knows the speaker? Does he or she have negative or positive feelings towards the speaker? It seems that in order to *participate* with a speech one has to, at the very least, not disagree with the content.

I believe contextual information is an inseparable part of musical groove and of "speech groove" or of speech rhythm. I did not write a piece that explores this topic specifically but in a way, all pieces written as a part of this research take use of this quality of speech. Whether it be Muhammad Ali, Martin Luther King, or the text by Bachelard - even though musically most of these pieces hide their textual source, the context is always given by the name of the piece and in the program notes.

For example, in "Variation on a theme by Martin Luther King", the original speech is hardly heard during the piece, yet this speech is so iconic that the name and description of the piece is sufficient to make the audience imagine the historic scene at the Lincoln Memorial. The memory of that historic participation is intended to engage listeners to participate themselves when they hear the piece.

A.4.3 Speech rhythmicity - from analysis to synthesis

Up to this point, this chapter suggested mostly direct means for analysis and resynthesis of speech rhythm. However, I believe that more general conclusions can be drawn as well, ones that can be implemented in electronic music without being analysed directly from speech. Derived from many hours of analysing speech, the following section includes my insights on factors which makes speech rhythmical and that I have implemented in my music.

Entrainment by Clues - As discussed in chapter A.2, entrainment to speech seems to be a more complicated phenomenon than entrainment to an isochronous pulse or to metered music. Whereas in musical entrainment one's perception might draw its expectancies from the regularities in the signal, entrainment to speech is based on expectancies that comes from our familiarity with a language or from our familiarity with our mechanisms of speech production. A constant stream of auditory clues is perceived and processed by our brain, producing temporal expectancies and oscillations of attention.

When dealing with free-timed music it is interesting to consider the option to deliberately create those expectancies by some sort of an in-piece semantics. In other words, it might be possible to "train" during the piece the perception of the listener to expect a certain event. This general approach is discussed in Huron's book "Sweet Anticipation" (2006), and in a way it is a common problem to all contemporary music, not just when dealing with entrainment and rhythm. Can you really create true anticipation, something which is usually learned over a life-time, within the course of a single piece?

I believe that under certain conditions this might be possible. For example, in one of my *Aquifer* patterns (see chapter B.5) I created a sequence of "Snare" -> "Bass drum" which repeat in various time intervals. Yet, it was made in a way which causes the snare to be perceived as the upbeat of the bass drum, and thus at some point, each snare hit evokes the anticipation for the downbeat of the bass drum.

Onsets - The significance of onsets has been discussed in section A.4.2, in regards to articulation. The long complex attack of speech syllables reminds me of prior research on microtiming

deviations which were discussed on chapter A.1.3. These studies measured the slight discrepancies between various members of the rhythm section, showing how the onset of the double bass is always slightly before the onset of the hi-hat or the other way around and so on. However, acoustically the result of those microtiming deviations, is a combination of a few sonically different sound events with very short time intervals between them, which are perceived as a single event with a complex onset, just like syllables in speech.

It might be possible that long or complex attacks provide a better entrainment when the rhythm of the audio is ambiguous. If entrainment is a mechanism of attention, the length of the onset, and especially the part of the onset which we perceive as sounding before the P-centre (see A.4.2 for information on P-centres) provides attention a clue to lock in. Wether or not this is the case, it seems that complex onsets produce a strong rhythmic effect. In my system *Aquifer,* I implemented a part which attempts to imitate this sort of complex onsets by drawing inspiration from the rhythmic structure of various syllables (see chapter A.5.4).

Local Isochrony - A part of the reason that speech is perceived as being more isochronous than it actually is (see chapter A.4.2) is that it is indeed semi-periodic. Unlike metered music, there is no tactus, or an underlying pulse that all durations refer to, but rather a conjunction of a series of local periodicities. It is very common to find within a spoken phrase a few syllables that are isochronous, or a few accented syllables that are isochronous, whereas the unaccented syllables create some sort of a subdivision of them. Many times those local periodicities are not equal but are rather accelerating or decelerating.

These local periodicities might improve the ability to entrain to the auditory stream, as they offer some clear expectancies. While they are accelerating or decelerating they create a movement by pointing towards a certain point in future time. In Aquifer I created a system which allows a hierarchical sequencing of sequences. The lower-level sequences (which are usually "hi-hat" sort of sounds) are either equal, or accelerating / decelerating, and the upper-level sequence can be unequal (based on some aleatoric timing) or based on speech rhythm. This way it is possible to create local isochrony without a global pulse or time-grid.

Accented vs unaccented events - Speech is a stream of accented and unaccented auditory events. After listening and analysing speech, speech rhythms and rhythms produced by normal algorithms, I can say that any stream of accented vs unaccented events in the rate of around 4hz, has a strong resemblance to speech rhythm, and might be perceived by myself as rhythmical. I did not conduct further research to thoroughly examine this insight but it seems to me that the division between the two sorts of events cause the weak events to sound as though they are leading

towards the strong events, thus creating a rhythmical motion. Does any sort of accent and any sort of timing produce this rhythmicity? Perhaps not, but this is potentially an interesting insight for further study at a later date.

Conclusion

In the theoretical section of this thesis I tried setting the ground for the artistic research. I have attempted to define the concepts that would lead me in my artistic research and to map what is known and what is still in question in regards to these areas. I intended to raise questions that would guide me through my compositions and that may yield some interesting results, even if not hard answers. A major part of this section had to do with defining concepts. I have defined *groove* as a relation between listener and music which includes participation and entrainment. I have tried to describe the scope of the concept of participation and I have divided speech rhythm into 5 layers of rhythmicity.

I believe that defining concepts in a clear and precise way is a good starting point for a research. First of all, the process of finding the definition was an interesting study in itself, which lead me to new thoughts and ideas on the matter, opening new questions to explore. A definition, wether it be narrow or wide, already contains the questions that emerge from it and sets the course for the entire research. A definition, when dealing with such vague concepts, also includes the cracks and contradictions which at some point might tear it apart. Thus the main purpose of this chapter is to discuss the discrepancies and contradictions of the theoretical part.

The first contradiction is the use of the concept of entrainment. The point of departure for this research was groove in free-timed music, and the attempt to create a definition for groove that will include both the music which is commonly described as having groove (i.e. dance oriented music) and, for example, free jazz. Since entrainment is considered elementary in any dance oriented music, I included it in the definition of groove and attempted to show that entrainment is not restricted to periodic music. Still, a few questions arise:

1. Is entrainment to speech really the same phenomenon as entrainment to a regular rhythm?
As far as I could see, in the relevant research they are described as categories of the same phenomenon (for example Repp in his review on sensorimotor synchronisation lists entrainment to speech as another kind of sensorimotor synchronisation: Repp, 2013). I attempted to link these phenomena via attention (see chapter A.4.1) but I have to admit I still have doubts.

2. Even if entrainment to speech is indeed possible, how can one entrain to free jazz?

A possible answer is that free jazz musicians don't play completely random rhythms. There is still some rhythmical consistency to them. Like speech they are semi-periodic, or containing local isochrony (see chapter A.4.3). Another possible answer is that jazz musicians have a human body which restricts their timing in a certain way, which can be somewhat predicted by anyone else who has a human body. It is by this same principle that speech is interpreted by its mechanisms of production. Another possible answer is that it is actually impossible to entrain to free jazz or to non periodic music.

3. If entrainment isn't possible with non-periodic rhythms, what does this say about groove?

It might say a few things. It might mean that entrainment should not be a part of the definition of groove. Perhaps groove is made by other things, or that entrainment is just an option when perceiving groove but it is not a requirement. Another option is that groove in free-timed music is the "shadow" of real groove. "Real" groove, the one which is usually discussed when in regards to the term, is metered and regular. However certain kinds of free-timed music, like for example free-jazz, reminds the listener of a music which has real groove, in this case jazz. Since the sound, the gestures and the aesthetics are somewhat similar this reminds the listener of groove. In this case the reason that Coltrane's Meditations sounds with groove is *because* he made A Love Supreme a year earlier. It might also mean that what I call "groove" in free-timed music, and what people call "groove" in metered music is not really the same phenomenon.

Other doubts come from the use of participation. In this thesis participation receives a substantial role in the formation of groove. However, several studies raise questions over its significance or influence on the subject. Janata et al. (2012) was already quoted in chapter A.3 on participation, with his study which suggests that music perceived as "groovy" might evoke participation but participation does not significantly influence the perception of groove. Madison (2006) also showed a high correlation in groove ratings, suggesting that the assessment of groove might not be as subjective as I have described.

A possible middle-ground between these seemingly contradicting findings could be that this research does not deal with the obvious, straight-forward groove, but rather with the fringes of the phenomenon. It is in fact looking for the places where it is ambiguous and vague. It compliments the musical question - how far can we stretch groove until it ceases to exist? It might be possible that the further one goes in this direction, the less clear the concept becomes, and the more it requires the participation of the listener to still perceive it as such.

A.5

In any case I believe that the validity of theoretical claims in the context of artistic research does not comes from wether or not they are "true" or "real". In the end, definitions and claims in this thesis are valid if they inspire good or interesting art, and this will have to be judged by the reader in the next section of this thesis.

B. PRACTICE

Introduction - General approaches and aesthetics

When I approached the practical part of this research, my aim was to compose music which explores the ideas portrayed in the preceding theoretical section. I believe that this exploration might shed some new light over the aforementioned concepts and create realisations which might not be literal but aesthetic. While doing so I made a few assumptions that would function as an opening point for the creation of the pieces.

Evoking participation - It is a basic assumption of this thesis that participation is a key factor in the experience of rhythmic music. Even if it is not essential, the artistic exploration of participation is in itself a topic of this research. Participation is even more interesting to explore in the context of contemporary music, since in my opinion it is one of the genres which displays the highest ambiguity towards this goal.

Participation affects participation - It is evident from countless sociological studies that the actions of our peers affect our participation (for example: Schachter & Singer, 1962). The greater the number of our Facebook friends that share and like a pos, the higher the chances are that we will also participate. The audience's laughs in the soundtrack of a comedy show might cause us to laugh as well, or to appreciate it less if we feel the effect is too corny. While everyone around us is participating, it might cause alienation if we feel awkward or uncomfortable, or more likely, it will cause us to join in. In any case it is almost impossible to remain uninfluenced.

If this is true it might be possible that the cause for the participatory discrepancies effect (see chapter A.1.2) is not the discrepancies but the participation. The discrepancies, which are an inevitable outcome whenever musicians are playing together, are separating the different sounds and thus subconsciously signalling to us that a few musicians are participating here. If the discrepancies are just right we realise they are participating well and it makes us want to join in.

In order to create this effect I included multiple performers in almost all of my pieces. This means that there is already some participation happening in front of the audience's eyes, inviting the viewers to participate.

Participation requires an aesthetic value - The music created as a part of this research is "experimental" in the sense that it is exploring theoretical ideas and concepts, yet it is not an experiment. An experiment should be minimalist, focusing on as few as possible features at a time so that it will be possible to draw clear conclusions out of it. Yet it seems hardly likely that people will participate with such a "technical" piece of audio. I believe that aesthetic appreciation is a key factor which affects participation, therefore even though these pieces explore rhythm they can not just be "about rhythm", they have to be complete works of art which have an aesthetic value.

Participation is contextual - The context of this research is the field of electroacoustic music and the pieces are written to be performed in a concert hall. Funk or Techno music are genres which generally evoke much more active participation than contemporary concert music, yet played in a situation like that they might feel out of place and therefore cause alienation instead of participation. It is also important to realise what kind of participation one might expect in these circumstances. The chances that the audience of such a concert will stand up and start to dance are very slight regardless of the music at hand and any attempt to create such an imaginary scenario is most likely to, again, cause exclusion. In such a context participation is subtle and mostly intrinsic. But since this thesis explores the fringes of groove and participation, eliciting this subtle participation is perhaps not any less interesting than directing a more active participation in a dance club.

Emotion affects participation - And participation affects emotion. I have discussed it briefly in chapter A.4.2 on the affect of speech content on its rhythmicity. All pieces in this thesis use a speech source, and in most of them the implemented speech becomes completely unintelligible and unrecognisable. This raises the question, does the origin of the source matter or is it just about the rhythm?

When I wrote *Variations on a theme by Martin Luther King* (discussed in chapter B.2) I felt that I could not ignore the origin of the speech, by which I mean that the content and context of the original speech directly affect they way I compose the music. Therefore I revealed its identity in the title. Looking back I felt that doing so added another layer of meaning to the piece and completely changed the amount of involvement of the audience. Whilst composing *Talking Trash* (discussed in chapter B.4), I tried to make the relation between the music and the historic context of its speech source even more obvious by incorporating video of Muhammad Ali into the piece. However, in *Aquifer,* Even though it also contains an analysed speech pattern, I did not reveal its origin, since in that case it is really just about the rhythm.

Participatory discrepancies / heterophony / echo-polyphony - Inspired by Feld's article on the music of the Kaluli tribe and by Keil's concept of participatory discrepancies (see chapter A.1.2) I attempted to use heterophony and echo-polyphony, two textures that exaggerate participatory discrepancies, as the main textures in my compositions. In ethnomusicology, the term heterophony is used to describe a texture where one melodic line is played by a several people in different variations, each of them producing a slightly altered version, with different ornamentations, timing and pitch (Cooke, 2016). It is a common characteristic of many styles of non-western music such as classical Arab music and Jewish prayer. Echo-Polyphony was defined by Feld as an "overlapped repetition of identical or similar melodic or textual elements just split seconds apart" (Feld 1988: 81). *Talking Trash* and *La dialectique de la duree* both use these textures as a main organising principle and in *Variations on a theme by Martin Luther King* it is also prominent.

In the following section you will find detailed descriptions of the pieces written as a part of this thesis, ordered by their date of completion. I will attempt to describe how I implemented the ideas presented here and in the theoretical section of this thesis into music. I will do so by describing methods of analysis, compositional processes, motivations and techniques.

Variations on a theme by Martin Luther King

for 2 percussionists and 6 self-playing drums

B.2.1 Overview

When I approached my first attempt to create music which is based on speech rhythm, I decided to begin with the feature which is most associated with rhythm: pattern. Pattern is the duration of the event and the time gap between the preceding events (in this case - syllables), also referred to as I.O.I. - Inter onset interval. IOIs have been the topic of countless researches dealing with rhythm, groove, speech rhythm and entrainment (see chapter A.4.2 on pattern*). Another aspect of pattern is grouping which is a more complex feature which can partially be described by categorising the events into accented versus un-accented syllables, or stressed versus un-stressed.

The first stage in composing this piece was to find a a spoken phrase that can be used as the rhythmical base of the piece. After a long search I chose a paragraph from Martin Luther King's "I have a dream" speech:

> *But we refuse to believe that the bank of justice is bankrupt. We refuse to believe that there are insufficient funds in the great vaults of opportunity of this nation. So we have come to cash this check - a check that will give us upon demand the riches of freedom and the security of justice.*

This paragraph has a rhythmic and poetic beauty. It consists of three sentences in the form A A' B, similar to blues form. Each sentence is longer than the previous one, which forms a directional asymmetry, producing a movement that peaks at the end of the paragraph. There's parallelism between the first two sentences but also between "riches of freedom" and "securities of justice", and there are various forms of rhyme, like alliteration ("come to cash this check"), assonance ("riches of freedom, insufficient funds") and so on. (See chapter A.4.2 on rhyme). Apart from the poetic text, King, with his remarkable rhetorical skills, manages to entrain the audience to his speech not only by the powerful message he is delivering but also by his inspiring use of articulation, intonation, and of course, time.

For me it is obvious that the forward-motion indulged by this speech, and specifically of this paragraph, is the same sort of motion which is present in groove based music. My question was: is the durational-pattern of this paragraph enough to deliver this motion? Can an electronic piece

based on the same duration of events create the same sort of movement in the listener as the movement that is induced by the original speech?

B.2.2 Analysis

The next problem was how to analyse the data. I quickly realised that speech segmentation or syllable detection is a very difficult computational problem. The problem gets even more complex when taking into account P-centres, the perceived onset of a syllable. P-centres are not directly related to any physical property of the sound, but are rather influenced by many different parameters, such as loudness, attack time, syllable duration, as well as the syllables before and after it (See chapter A.4.2 on speech patterns).

Given the above I realised that it might be easier and more accurate to analyse the speech manually using my own perception, rather than analyse it with an algorithm. I used the software REAPER, a standard DAW, to align a MIDI event of white noise to each syllable. I used first visual cues, aligning the event to the onset of the waveform (at times where it was evident) and then listened and fixed the position by trial and error.

I realised that indeed, even for a human, it is quite a difficult task. Isolated syllables allowed quite a wide threshold for "right" alignment: about +-~50ms for the white noise to sound in-sync with the onset of the syllable. However, the alignment of a stream of noise bursts that would produce the same perceptual pattern as the speech required precision within the range of approximately 10 milliseconds.
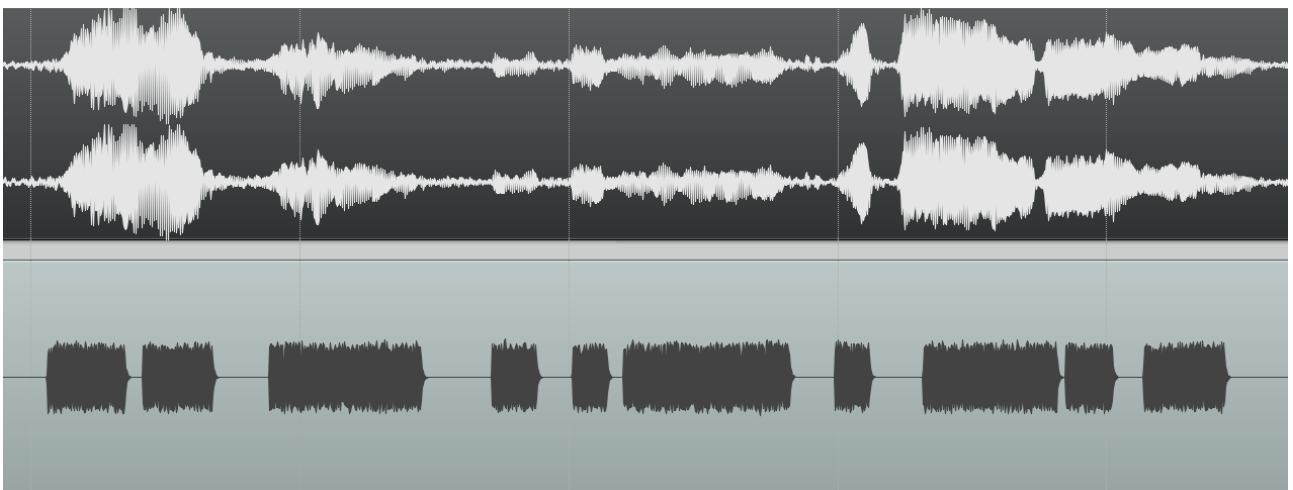
Figure 2: REAPER screenshot: Speech waveform (top) vs events of white noise (bottom).

Besides syllable start and end points I extracted for each syllable the binary feature "stressed" or "unstressed", as I considered it to be a part of the description of the rhythmic pattern. Once I had

the data the next step was of course to figure out how to use it as a basis for an electronic piece. I imported the data into Supercollider and began to resynthesis and manipulate it.

B.2.3 Implementation

Even though the analysis was was a very high level of abstraction (the entire data was just a few hundred numbers) It still had a very distinct speech-like quality, which proved to me that this is indeed a good analysis. On the other hand, I still had to figure out what would be the musical material that will take place within those time intervals.

Starting out I tried using relatively simple waveforms such as basic periodic waves and different kinds of noise, as I thought that using more complex sounds with an internal rhythmic structure might overshadow the speech-rhythm. I used mostly noise and clicks and tried to manipulate the data by changing the duration of the noise bursts and stretching and compressing time. Inspired by western notation, where each quaver is divided and subdivided again to equal measures, I tried to divide and redivide the time between the events, to create "semi-quavers" of the basic durational pattern. I also realised that in order to create the experience of movement with this rhythmic material I had to create a strong emphasis on the accented events, in order to evoke the perception that the unaccented events lead towards the accented ones.

After a long struggle I composed a short piece from the materials stated above but I was not satisfied with it. Indeed there was something interesting about the rhythm of the piece and I also liked the repetition of that 3 sentences pattern but still I felt that the thing that I was trying to aim for - the rhythmicity, or the feeling of movement of the speech - was lost somewhere along the way.

Following a percussion workshop with Hugo Moralles Murgia I decided to re-introduce humans into this piece, and to turn it into a percussion piece. I used the same paragraph by Martin Luther King as the rhythmic grid of the piece and wrote the percussion score in relation to the text. During the piece I played the original speech in the percussionists' headphones. I discovered that after some practice they had no problem synchronising with the heard speech.

In addition to the percussion part I attached transducers to 6 different drums and created an algorithmic pattern that played the rhythm of the speech as clicks and noise-bursts through the transducers on the drums. The audible result sounded at times as if someone is playing the drums.
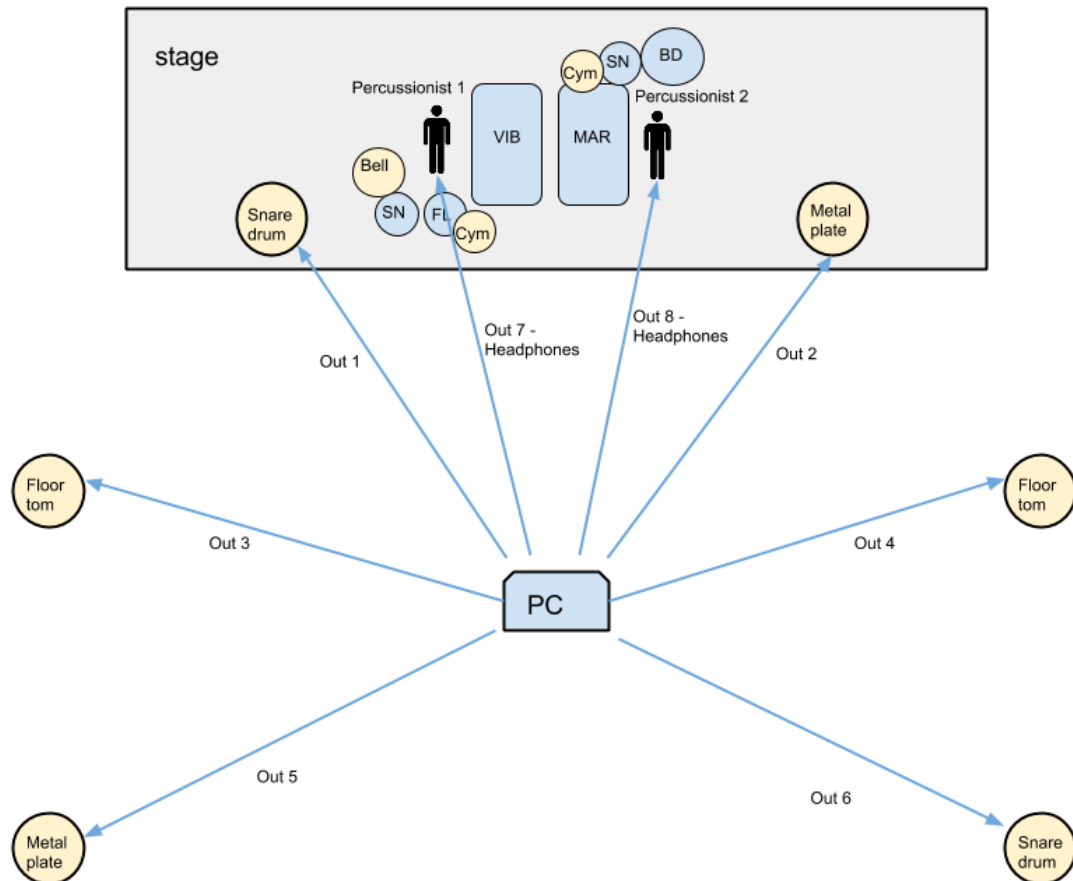
Figure 3: Setup diagram for Variations on a theme by Martin Luther King

The resulting texture of the first movement was that the computer-controlled drums were playing the entire event stream of the speech with an alternating timbre (by gradually shifting from clicks to noise bursts) and with varying distributions, while the percussionists were emphasising the accents of the original speech on different drums. The original paragraph was about 27 seconds long and thus the rhythmic structure was repeating itself every 27 seconds, each time with a different variation of the drums and the percussions, similar to a classical variations form.

In the second movement of the piece I decided to explore what would occur if I took away the computer controlled drums that were producing the full click-stream and leave only the accents, played by the percussionists. The result would of course be a much lower density of events, or tempo-wise, something closer to a "half-time" feel. For me this resulted an interesting rhythmic phenomenon, where the percussionists are playing rhythms that do not correspond to any distinct meter, yet play them precisely in sync, thanks to the synchronisations with the speech in their headphones.

In order to re-connect with the context of the original speech the sound of the audience cheering for Dr. King was played in this movement through the transducers that were attached to the drums. Coming from the different drums that were spread around the hall, this created a spatial effect that

is somewhere between a drum rattle and a filtered audience sound. Occasionally fragments of the original speech were also played through the drums, creating a distant echo to the source of the piece.

Figure 4: An excerpt from the score of Percussion I, Variations on a theme by Martin Luther King. The rhythmic structure is based on a spoken paragraph by King.

In the third movement of the piece I used the same rhythmic pattern as a theme for a canon. The drums that were spread around the room had different timbres. There were two snare drums, two floor drums and two metal plates. I used the different materials, as well as the different spatial locations and the use of different kinds of clicks and noise bursts, to create 6 distinct "voices", each of them beginning the pattern at a different time. Finally the percussionists join in while the played pattern gets shorter and shorter to accentuate the effect of the canon. This use of a canon also refers to Feld's "echo-polyphony" as discussed in chapter A.1.2.

B.2.4 Conclusion

To conclude I believe that the two most interesting ideas presented in this piece are the ability to re-create the "feel" of an iconic speech with a very minimalist extraction of information, and the usage of speech as an alternative, unmetered "click track". Even though I didn't use this technique in my next pieces I believe this might be useful in other pieces and for other composers, as a good speech can yield very precise synchronisation and at times can be much easier to follow than a very complicated click track.

La dialectique de la durée
For two vocalists and live electronics

B.3.1 Overview

The piece *La dialectique de la durée* was written to explore several concepts that I have encountered during my research on speech rhythmicity, the first of which being the attempt to create a piece that will include live speakers and live electronics. Other concepts include rhyme, synchrony vs. asynchrony, phase and accent, and the concept of participation.

Inspired by the ideas portrayed in Steven Feld's iconic article regarding the music of the Kaluli tribe from Papua New Guinea (Feld, 1988), as discussed previously in chapter A.2.1, I attempted to create contemporary music that corresponds to the Kaluli concept of "Lift-up-over sounding" (as presented by Feld). "Lift-up-over sounding" deals firstly with participation and more specifically with participatory discrepancies. Something has to be "Lift-up-over" another thing. In order to achieve participation and participatory discrepancies the piece was written for two vocalists. The notion of participation was also the reason why I wanted to make the piece a live piece, as I believe that experiencing live participation on stage has a higher chance of evoking participation in the audience (this is discussed in the introduction to section B, chapter B.1).

For the libretto of the piece I extracted a few paragraphs from Gaston Bachelard's book "La dialectique de la durée" (Bachelard, 1934). It is a book that revolves around the concept of duration, or rhythm, making it the pivot of human consciousness. In Bachelard's thought the dialectic movement of thesis and antithesis creates the rhythm of life. In addition to the content of the text, which seemed to be appropriate to the piece, this book is also written in a somewhat poetic way, or even rhythmic. for example:

> *"De cette banalité : « La vie est harmonie » nous oserions donc finalement faire une vérité. Sans harmonie, sans dialectique réglée, sans rythme, une vie et une pensée ne peuvent être stables et sûres : le repos est une vibration heureuse."* (Bachelard, 1934)
>
> [english: "In the end then, we would venture to turn the platitude 'life is harmony' into a truth. Without harmony, without a Well-ordered dialectic, without rhythm, life and thought cannot stable and secure: repose is a happy vibration." (Bachelard, 2000)]

As with Martin Luther King's speech (see chapter B.2.1) it is possible to see the use of sonic repetition as a rhetoric technique. The triple repetition of "Sans" on the second sentence as well as

the numerous alliterations on this short paragraph (“**f**inalement **f**aire une **v**érité”, “**u**ne **p**ensée <u>ne</u> **p**euvent”, “**s**tables et **s**ûres”) all create a rhythmic flow to the paragraph, before it is even spoken.

B.3.2 Work Process

I edited the text and divided it between the two speakers of the piece in order to create more repetition and irregular repetition. Again this was influenced by Feld's article of the Kaluli tribe (Feld 1988) and the concept of participatory discrepancies, where he described the Kalulis' sense of groove and music making as a texture similar to heterophony, or as he called it “echo-polyphony”, where different voices are simultaneously producing different versions of the same melody or phrase, thus creating a rich rhythmic complexity, which is very different from the common western idiom of rhythm and synchronicity.

C'est que les **phé**<u>nomènes de la **du**rée sont construits avec des **ryth**</u>mes;
C'est que les **phé**nomènes de la **du**rée sont construits avec des **ryth**mes;
les **phé**<u>nomènes de la **du**</u>rée;
C'est que les <u>**phé**nomènes</u> de la **du**rée sont construits avec des **ryth**<u>mes</u>;
avec des **ryth**<u>mes; des **ryth**</u>mes; des **ryth**mes;
C'est que les **phé**<u>nomènes de la **du**</u>rée sont construits avec des **ryth**mes;
C'est que les **phé**nomènes de la **du**rée sont construits <u>avec des **ryth**mes</u>;
sont construits avec des **ryth**mes; des **ryth**mes; des **ryth**mes; des **ryth**mes;
des **ryth**mes; des **ryth**mes; des **ryth**<u>mes; des **ryth**mes</u>;
des **ryth**mes; des **ryth**mes; des **ryth**mes; des **ryth**mes;
<u>avec des **ryth**mes</u>; des **ryth**mes; des **ryth**mes; des **ryth**mes;
des **ryth**mes; des **ryth**mes; <u>avec des **ryth**mes</u>; des **ryth**mes;

Figure 5: "La dialectique de la durée", Vocal 1, excerpt

C'est que les **phé**<u>nomènes de la **du**rée sont construits avec des **ry**</u>thmes;
C'est que les **phé**nomènes de la **du**rée sont construits;
les **phé**<u>nomènes de la **du**r</u>ée;
les **phé**nomènes de la **du**rée sont construits <u>avec des **ry**</u>thmes;
les **phé**nomènes de la **du**rée;
les **phé**nomènes de la **du**rée;
C'est que les **phé**nomènes de la **du**rée;
C'est que les **phé**nomènes de la **du**rée sont construits <u>avec des **ry**thmes</u>;
avec des **ry**thmes; des **ry**thmes; des **ry**thmes;
des **ry**thmes; des **ry**thmes; des **ry**<u>thmes; des **ry**thmes</u>;
des **ry**thmes; des **ry**thmes; des **ry**thmes; des **ry**thmes;
avec des **ry**thmes; des **ry**<u>thmes; des **ry**thmes</u>; des **ry**thmes;
des **ry**thmes;
C'est que les **phé**nomènes de la **du**rée sont construits avec des **ry**thmes;

Figure 6: "La dialectique de la durée", Vocal 2, excerpt

It is possible to see in the excerpts of the score (figures 5 and 6) how the text of the two vocalists is slightly different in a way which was intended to artificially cause them to go in and out of phase with each other. However, in practice it was not that simple. While my estimation was that a different number of syllables or words will cause the speakers to go out of phase, it turned out that there is a strong tendency to speak in phase. The result was that every time the text was identical, and even in most cases when the text was just similar, the speakers immediately synchronised and continued speaking in-phase until their text was significantly different again. Opposite of what one might expect, synchronisation was happening unintentionally and unconsciously, wheres maintaining an out-of-phase texture required the performers' deliberate effort and awareness.

B.3.3 Analysis

In addition to preparing the parts for the vocalists I designed the computer part. As I was creating a live piece I was trying to design a program that would accentuate and enhance the rhythmic flow of the piece - this was not such an easy task. Computers, by default, are very good at keeping a very even metronomic time. Getting them to produce the loose rhythmic flow of speech is a bit more complicated. Up to that moment, all of the programs that I wrote were either based on offline analysis or on a manual analysis. Speech segmentation, especially when done live, is a very difficult computational problem and I still haven't found a program that manages or even tries to calculate P-centres. (see chapter A.4.2). Therefore I was trying to think of simple yet creative solutions in order to use the computer to support the rhythmic flow of the piece in real-time.

Eventually, instead of letting the computer analyse the rhythm of the speech I let the performers do it themselves by tapping a foot-switch. Tapping along the accents of your own speech hardly requires any effort from the performers and is much more accurate than any speech analysis algorithm that I know of. Hence I let most processes in the live set be controlled by the performers' foot-switches and included instructions for pressing and un-pressing the switch by marking underlines on the accents of certain words in the score (see figures 5 and 6, and appendix IV). I was also keeping track of the durations and interval of the foot-taps and using it later as a time-frame for an algorithmic process, much like in *Variations on a theme by Martin Luther King*, only this time I was getting the durations of the events from the performers themselves.

I then created various modules of sampling and processing which were designed to accentuate rhythm in different ways throughout the piece.

B.3

B.3.4 Algorithms

Loopers - Loops are associated with the notion of rhyme, which is basically a form of sonic repetition. Of course a perfect loop or a perfect repetition, wouldn't be called a rhyme but a more elaborated loop might refer to that category. Another reason to use loops would be to extend the Kaluli echo-polyphony texture, creating more layers of out-of-phase phrases. Several types of loopers were used throughout the piece, each of them responding in a different way to the performers' foot-switch taps.

- **Cross loopers**: Each performer's tap records their own voice and playing the last sound-clip recorded by the other performer. This makes sure that each sound-clip begins with an accent (since foot-taps are marked on accents) and that the accents of the speakers collide with the accents of the recording. This enhances the texture of in/out of phase. Cross-loopers can be heard at the beginning of the piece.
- **Modulated time stretched looper**: The recorded phrase is repeated in a modulated time stretched manner. This refers to the notion of repetition and change. This can be heard about two minutes into the piece on the words "uniforme et régulière".
- **Accelerated time stretched looper**: Appears in the second half of the piece on the text "C'est que les phénomènes de la durée sont construits avec des rythmes". The texture in this part is an accelerated unison and each repetition of the sentence is recorded, looped and added to the previously recorded versions of this sentence as well as to the live repetition of it. The different repetitions of the sentence are accumulated to eventually create a dense heterophony. Since the speakers are instructed to accelerate in this section, the loop must also accelerate in order to remain in sync with the performers.

Percussive Moulds - The moulds concept is taken from my *Aquifer* project (see chapter B.5.4) and is based on the idea of using an arbitrary sample (in this case, the voice of the performer) and casting it into a very crude granular pitch and amplitude envelopes, thus turning it into a percussive sound. The moulds were triggered in two ways:

- **With the tap of the foot-switch:** the program is sampling the accent of a word and immediately turning it into a percussive sound, and thus over-accenting the accent of the word. This can be heard in the second half of the piece on the sentence "C'est que les phénomènes de la durée sont construits avec des rythmes;".
- **Using the durations of the tap sequence:** The durations of the tapping sequence is stored and later used to trigger the percussive moulds. This creates a counterpoint between the current part of the speakers and the rhythm of a previous part of the piece. Can be heard after

the second half of the piece with the text "loin que les rythmes soient nécessairement fondés sur une base temporelle bien uniforme et régulière".

<u>Compression and side-chaining</u> - Compression with a side chain (either positive or negative) is used throughout the piece in order to accentuate the interplay between the live performers and the electronic part. When the side-chain is positive, the amplitude of the vocal part compresses the level of the electronic part and thus accentuates the interplay between the acoustic and the electronic section. When the side-chain is negative ("side-gating") the amplitude of the vocal part expands the level of the electronic part. The electronic part is resonating with the amplitude of the vocal part and accentuating its rhythm.

<u>Granulator</u> - Granular processes are used in the piece mostly as a textural contrast to the overall rhythmic notion of the music. With the use of feedback the granular process allows the sampled speech to be morphed into sustained sounds. In some places in the piece the granular process is accentuating the timbre of certain syllables spoken by the performers, emphasising the "echo-polyphony" effect.

B.3.5 Conclusion

To conclude, I believe that the vocal part of this piece is an interesting interpretation of the "Kaluli aesthetic" of rhythmicity. Indeed, the textures of multiplicity of a sampled source and of fragmented repetition are not particularly rare in electroacoustic music, especially since they are almost idiomatic to algorithmic composition. Still, I believe that the inspirations drawn from echo-polyphony, from participation and from rhyme leave a distinct trace, both in the compositional process and in the end result, which sheds a new light over these techniques.

Talking Trash

for ensemble

B.4.1 Overview

Talking Trash was initially written to explore the element of prosody in the context of speech rhythmicity. To do so, I needed a recorded speech that was both rhythmic and that prosody played an important role in. I found that speech in a spoken-word poem by Cassius Clay (Muhammad Ali) titled *I Am The Double Greatest!*, a track from the LP *I Am The Greatest*, which Clay recorded and published in 1963 (Hauser, 1992).

Clay makes an impressive use of prosody, creating emphasised dynamic accents and pronounced speech contours. At times he dictates almost as if the text is a melody, creating hierarchical levels of melodic progression. In figure 7 it possible to see an example of implied polyphony, as is commonly used by J. S. Bach. One melodic line is the arpeggiated downwards movement while the other is formed by the accented notes which creates a falling tetrachord. Figure 8 shows a deliberate "artificial" repetition of the same tone which theatrically creates the feeling of a mechanical, alienated speech.

Figures 7 and 8: Melodic movement in excerpts from "Talking Trash". The notes are transcribed from the pitches of the original speech by Cassius Clay.
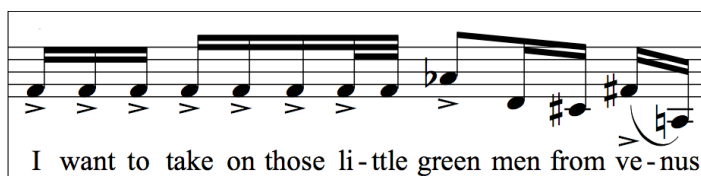
The poem itself is four and a half minutes of witty, joyful bragging, concerning mostly the predicted victory of Clay over Sonny Liston, the heavy-weight champion boxer at that time, a habit of Clay / Ali which later became known as "trash talking". Columbia records, who produced this album, apparently understood the importance of *participation* and therefore brought to the recordings an audience that can be heard laughing and cheering to Clay and a small ensemble to accent key

points in the text. The album was released when Clay was only 21 years old, 6 months before he actually fought Liston and became the world champion for the first time.

However, the story of Ali is far from being joyful. Ali is a modern era Icarus. A protagonist which his pride brought too close to the sun when he could not recede from boxing even when it was obvious to all that his time was up. Being perhaps the most iconic boxer of all time, it is now impossible to witness the rise of Ali without thinking of his fall. In Ali's case, the most symbolic metaphor for this rise and fall is without doubt his speech. Ali was without any question the fastest talking boxer ever. The transformation of his speech from the fast, arrogant bubbly trash talk of 1963, to the slow stuttered mumblings of his 80's and 90's interviews is a tragic allegory of irony.

The piece is therefore divided into two movements, which roughly corresponds to the rise and the fall. The first movement is a musical interpretation of the poem, following its original pitch and time structure and expanding it, making it even more frenetic than it is. The second movement is a lament, based on broken excerpts of the speech slowed down, a technique that brings forward their melodic richness. Yet, in order not to fall into sentimentality, the second movement is accompanied by a video track which shows the last round of the match between Clay and Liston, the one which Clay predicts in his poem.

In the video we see Clay dominating the ring, moving around and punching Liston with hardly any resistance. We hear the sportscaster saying "The champion has slowed down a bit, the tempo has slowed down" - but he is talking about Liston not about Clay. Clay is at his peak - fast, strong and unstoppable, yet we realise that the moment of his victory already encapsulates the moment of his defeat. One can only hold the peak for so long. At some point a younger, stronger, faster challenger must arrive and dethrone the champion, exactly as he once did to his predecessor. It is inevitable, yet we see none of that in the video which ends at Clay's moment of triumph shouting "I shook up the world!", almost touching the sun.

B.4.2 Instrumentation

The piece was written for Stoka Ensemble, an electroacoustic noise jazz / afrobeat ensemble which I have been working with for the past year. It consists of a trumpet, a baritone sax, drums and three laptop artists (myself being one of) each of whom has developed their own digital instrument in either the Max/MSP or Supercollider programming environments. Each digital instrument is based on a different principle and therefore has its own characteristics and idioms.

Theo Horsmeier (PC 1 in the score) has developed a feedback based instrument, which he associates to non-standard synthesis. He is sending pulses, tones and noise through a series of

digital delay lines while changing the delay times. By doing so he is able to produce a wide variety of noises, textures, and drones which all have a distinct digital character to them. Adam Juraszek's instrument (PC 2) is sample based. He implemented various techniques of granular sample processing with very immediate control possibilities which allow him to manipulate the samples in real time, creating elaborated swells, ambient textures and gritty chopped up loops. In this piece the samples he is using are excerpts of Clay's original poem. My instrument (PC 3) is based on live sampling and processing and its input is the sound produced by drums and the horns. With this instrument I can process the drums and the horns, extend their sounds, layer them and manipulate their pitch. This bridges the gap between the electronic section of the ensemble and the acoustic one.

Since at the time of the handing of this thesis I do not have a recording of the piece, I included in the attached CD a recording of Stoka Ensemble playing Canon by Charles Mingus, in order to let the readers hear the mentioned instrumentation.

B.4.3 Analysis

After selecting the material and the instrumentation for this piece I started extracting the prosodic features from the speech. I wanted to transcribe the poem, as Clay performed it, so that the horns could play it back. I analysed the pitches manually by aligning synthetic tones to the speech in REAPER, and again discovered that it is no less a perceptual task than it is a technical one. The notated pitches are quantised to semitones - a rather necessary step in order to allow a saxophone and a trumpet to play them. Speech, on the other hand, has a continuous gliding pitch and when notating it I had to constantly decide which one of the quantise semitones it is passing through sounds most "correct".

After aligning the pitches (An example of that can be heard in the attached CD) I began transcribing the notes and the rhythm. I have already attempted to notate speech rhythm while working on the piece "Variations on a theme by Martin Luther King". However, on that piece the musicians heard the original speech in their headphones and only had to play the accents, therefore I wrote them an extremely simplified version of the speech rhythm, using it as a reference to the speech they heard in their headphones. In *Talking Trash* I wanted the musicians to play the entire speech, as close as possible to the original, without hearing it in their headphones. I therefore had to be much more accurate with my notation.

I realised again, that it is impossible or at least incredibly difficult to accurately notate speech rhythms with standard western notation, while keeping the score readable. I realised how much of my perception has to be involved in the process of transcribing the speech. I tried to notate the

speech the way I perceived it, as a succession of local periodicities, equal and unequal subdivisions, rapidly changing meter and tempo and so on, while keeping it simple enough to read. Eventually I had to make many compromises in the rhythmical notation. I wrote the words of the speech under the matching notes, and made it clear in the score that the notated durations are just a reference to the original timing of the speech, which the players have to listen to and memorise by heart.
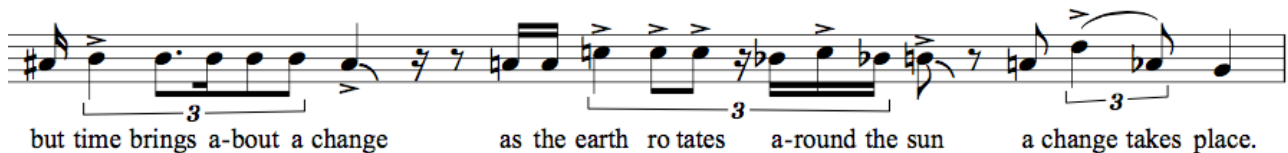
Figure 9: Excerpt from Talking Trash: When notating the rhythm I tried limiting myself to using mostly subdivisions of twos and threes to keep the score reasonably readable.

B.4.4 Implementation

After completing the analysis the composition of the first movement was relatively straight forward. I defined the overall texture as heterophony (discussed in the chapter B.1) which means that there is in fact one musical line leading the music. That line is played by one of the horns or both of them, while the rest of the ensemble creates alternations and decorations of that line, improvising around it. The result is a dense and blurry line that bears the same prosodic features of the original speech. In the first movement I instructed the computers and the drums to play articulative, percussive sounds that follow the lead of the horns. PC 2, which runs a sample based instrument is using the recording Clay's speech as his material, mostly transforming it so much that it is hardly recognisable, yet at times letting the original nature of the sample come forth.

For the horns I gave three modes of playing. The first of which means that only one of them plays the line while the others accompany or improvise around it. The second mode is a unison, and the third is to play the same line "out of sync". This asynchronous mode means that they should both play the same line but somehow differ in rhythm, either by starting slightly out of phase and keeping that time gap, or by starting in phase but somehow drifting apart. Once again I noticed the phenomenon I first witnessed in *La dialectique de la duree* (see chapter B.3.2), that playing out of phase is much more difficult than playing in unison, even when the rhythm is complicated or ambiguous.

The last section of the original poem is written in a poetic meter and rhyme, therefore I allowed myself to turn this part into a "song". I changed the timing structure to a traditional 4/4 meter and transcribed the notes according to their syntactical durations rather than their actual durations. In order to have three voices of harmony I used a MIDI keyboard to produce bass sounds which was

added to the voices of the two horns. This gave a slightly sarcastic tone to the ending of the first movement, capturing some of the light spirit of the original recording. The "song" is followed by an abrupt free improvisation section which ends with the bell sound which opens the tape part. That bell being the bell which announces the beginning of the 6th and last round between Clay and Liston.

Figure 10: An excerpt of the "song" section at the end of the first movement

The second movement is lead by the video part. The video is a slightly edited version of the 6th round in the Liston vs Clay match of 1964 and of Clay's moment of victory. In this movement the drums play according to the timing of the original speech, keeping their own time and driving the music forward. The horns are playing slowed down excerpts of the transcribed speech and PC 2 is now "freezing" moments from the speech, while slowly fading them in and out. PC 3 is stretching and layering the horns' lines and PC 1 is following the drums, as if it is another percussion instrument. I chose the excerpts played by the horns partially according to the text that they represent but mostly by the aesthetic of their melodies. Slowing down the playing rhythm brings forward the melodic beauty of these lines and creates a poetic contrast between the ensemble and the video.

Towards the end of the video things begin to accelerate. Clay is carried around in a swirl of people and the commentators begin to speak rapidly. In response to this the ensemble slows down further, matching the video in dynamics but minimising any rhythmic expression. Instead the ensemble is forming dense layered textures of sound which now have no resemblance to the original source. It halts abruptly just before Clay's last sentence "I shook up the world", which seals the piece.

B.4.5 Conclusion

At the current moment I still have not heard the piece played. The score and the video part are finished and are attached to this thesis and there have been a few rehearsals, but there is still a long way to go before I would be able to hear the piece and and make the full conclusions. It is also possible that during the rehearsals I would realise that some adjustments would have to be made so it may be that the attached score is not yet the final version.

However, I have already learned a few things from writing the piece and from the few rehearsals we did have. For once, I learned that it is indeed possible for musicians to memorise the timing of a spoken text and to relatively accurately reproduce that timing. I also learned that when the lyrics are written under the score and when the players are asked to play as if they are saying the words, their articulation, dynamics and rhythmicity are completely different and much more accurate in regards to the original speech.

I have also witnessed again the fact that, at least for western musicians, it is very difficult to sustain the out-of-phase texture described by Feld in his article of the Kaluli tribe (See chapter A.1.2). When I started writing the piece I thought that due to the ambiguous nature of the rhythm in this piece playing the parts that are not supposed to be in sync will be easier for them, but the opposite turned out to be true. They could play out of sync but it was very unnatural for them and required much more effort and concentration than just playing in sync.

As for a more general conclusion on using speech as a rhythmic source for this piece, from what I heard it seems very promising. Clay's rhythmic approach has a very "jazzy" characteristic and the transformation to jazz instruments sounds natural and further accentuate this sound. The first part of the piece sounds like an elaborated free-jazz piece. Due to the speech-like lead it has a clear focus and a sense of direction but it is not metric. It is still too soon to judge but I am hoping the end result would be successful and support my claim on the advantages of using speech rhythm as a driving force in ametric music.

Aquifer

A sampling and processing platform for live electronic music performance and improvisation

B.5.1 Overview

Aquifer is a Supercollider program based on a simple principle. There is a buffer: a piece of digital tape (in fact there are two buffers to allow more flexibility). It is possible to record external sounds into this buffer and playback this buffer in various methods. When the program starts the buffer is empty and nothing can be played. Only by recording an external sound can the system be triggered in to action, which means that there is a very high degree of "liveness" to the performance. Sounds are actually generated from that arbitrary source each time again and are therefore different in every performance.

On the other hand many parts of the program are written as an attempt to reduce the unpredictability of the produced sounds. The program uses extreme compression and granulation, and casts the incoming sound into "sound moulds" which shape it in a predetermined way. At the end of the process, what is left of the original sound is mostly its timbre, whereas other features such as articulation, duration and gesture are determined by the system itself. Perhaps the most challenging principle in the design of the system is the tension between the "liveness" of the system to its reliability. The balance between its flexibility to sound different in every performance, and between the ability to control and predict the outcome. If the that balance is set right it should be possible to *plan* a performance or a composition on what is essentially an "unreliable" system.

Another factor in the design of the system was the implementation of ideas from my research on speech rhythm. These implementations include the use of analysed speech rhythms as the time frame for various events in the system, as well as the inspiration for some of the sound moulds and sequences. More on that on chapter B.5.4.

B.5.2 Structure

The program consists of three main sections: the recording section, the playback section and the control section.

- *Recording section* - This section contains two buffers and a recording function. The recording function receives two input sources: an external input and a feedback loop, and decides wether to

record either of them, both of them or nothing, according to a level threshold. This function ensures that once the buffer is filled with sound it will always stay full. Each buffer's length can be dynamically changed during the performance.
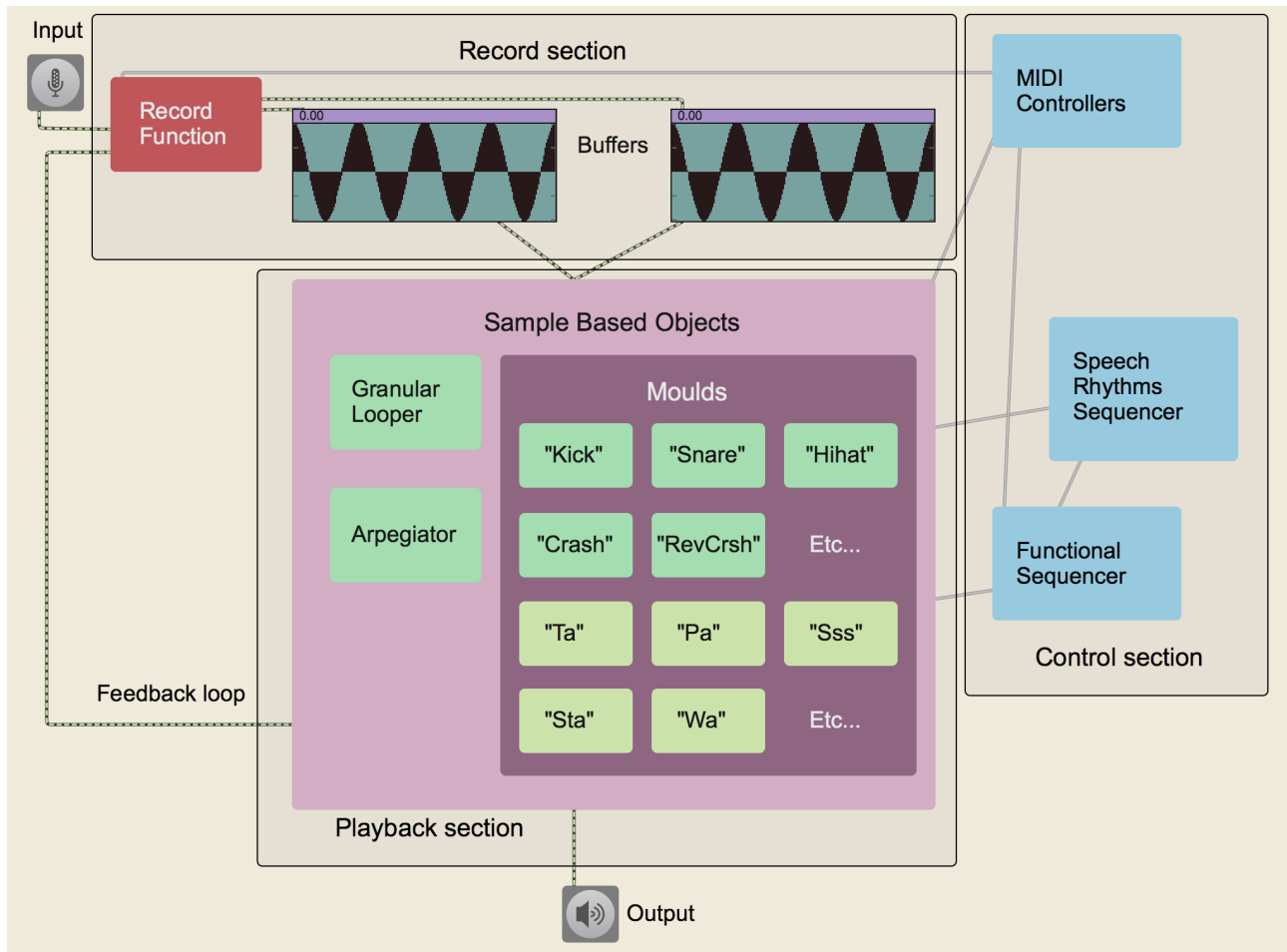
Figure 11: *A diagram of the Aquifer structure. The diagram is made in Max but the program runs on Supercollider.*

- *Control section* - This section consists of external MIDI controllers such as keyboards, drum pads, sliders and knobs, as well as internal controllers, such as various sequencers. The sequencers and the MIDI controllers control objects in the playback section. The MIDI controllers also control objects in the control section (the sequencer) and in the record section (the record function).

- *Playback section* - This section consists of various objects, all of which are in fact different methods for reading the buffers. The methods includes a granulator, an arpeggiator, percussive moulds and phoneme-based moulds. It is triggered and controlled by objects from the control section and produces an audio output as well as an output that goes back to the record section through a feedback loop.

B.5.3 Interface

In order to avoid looking at the computer display during a live performance, Aquifer has no graphic user interface. Instead, all control and visual feedback is done through the connected MIDI controllers. This choice narrows down the possibilities for control, yet it contributes to the immediacy and tactility of play, making the system feel more like an instrument.

Still, this sort of a system requires quite a few controls and some sort of visual feedback. In order to minimise the number of MIDI controllers in use, I decided to use as the primary controller a controller with 16 modifiable backlit pads. Those pads can display 7 different colours, thus providing a very basic yet very effective 16 pixels graphical user interface. Different arrangements of the lights makes it easy to distinguish different states and modes of control. This also helps to clarify possible key-combinations, increasing the number of possibilities.
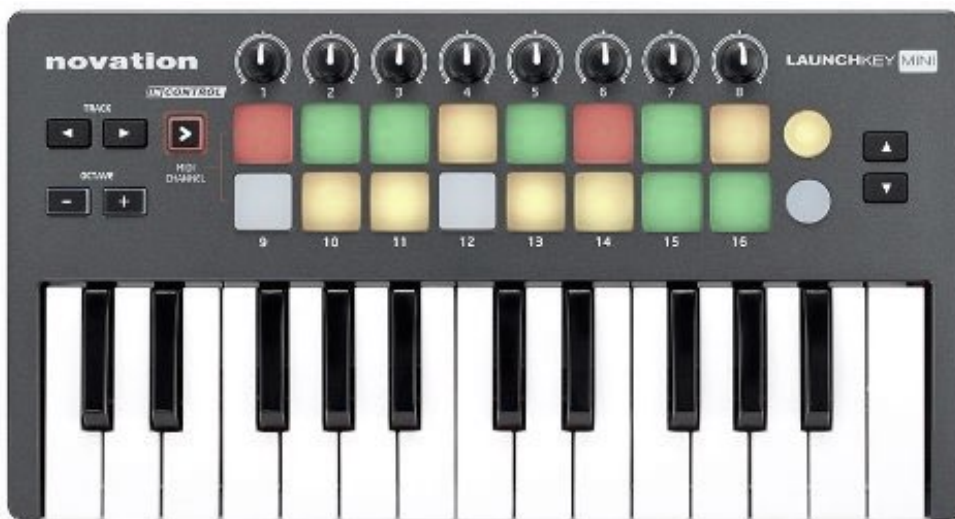
Figure 12: *Novation Launchkey mini. Main MIDI controller for Aquifer, with backlit modifiable drum pads.*

MIDI Controllers
- *Backlit pads* - The backlit pads can be used to trigger the various sound moulds, with a velocity parameter. They can also start and stop the sequencers and the granulator and by using different key combinations, switch between presets and playback modes of different modules, load different sequences and change the target of the various knobs.
- *Keyboard* - Responsible mainly for triggering the arpeggiator.
- *Knobs* - Effect the various modules parameters. Their target can be changed by different combinations of the pads and buttons.

- *Mixer* - All output of the different sound objects is routed into an in-program software mixer. An extra MIDI controller (in this case a KORG Nanokontrol II) is controlling the software mixer in a way which emulates that of a traditional mixer, with level control over the different channels as well as bus sends and side-chaining.

Control Modules

- Functional sequencer - The functional sequencer is similar to a traditional sequencer, in the respect that it is a list of commands. However, while traditional sequencers normally sequence notes and parameters, each item in a sequence of this sequencer consists of two fields. The first is time, which is relative to the tempo of the system (1 being a sixteenth note) and the second being a function. This makes the sequencer incredibly flexible as it can easily contain some simple aleatoric behaviour (i.e. to randomly play one object or another). The time field can contain a whole number (1 sixteenth, 2 sixteenths and so on), a fractional number (1.2 sixteenths), or a function (randomise between 1 sixteenth and 2 sixteenth). Ultimately, I believe that this functional sequencer gives an interesting fusion of traditional sequencers and algorithmic sequencers (such as patterns in Supercollider) as it allows you to easily create and store a wide spectrum between very traditional beats and very complex algorithmic sequences, which can all be played by one simple function.

```
[
    (func: {d.chu.on; 0.3.coin.if({d.hhmech.on(0)}, {d.hhmech.off;}); d.hhmech2.off} ),
    (  ),
    (func: {d.hhmech.on(0)}  ),
    (func: {d.chu.off; d.hhmech.off} ),

    (func: {d.chu.on; 0.3.coin.if({d.hhmech.on(0)}, {d.hhmech.off;}) } ),
    (  ),
    (func: {d.hhmech.on(0)}  ),
    (func: {d.chu.off; d.hhmech.off} ),

    (func: {d.chu.on; d.hhmech.on(2.rand)} ),
    (  ),
    (func: {d.hhmech.on(0)}  ),
    (func: {d.chu.off; d.hhmech.on(0)} ),

    (func: {d.chu.on; d.hhmech.off} ),
    (  ),
    (func: {d.hhmech.on(0)}  ),
    (func: {d.chu.off; d.hhmech.off} ),

],
```

```
[
    (func: {d.sn.on},time: {rrand(0.5,0.6)} ),
    (func: {d.chu.on; temp1=[\hhmech, \hhmech2, \hhgeom].choose; d[temp1].on(1.0.rand)},time: {rrand(1,1.5)} ),
    (func: {d.chu.off},time: {rrand(0,2.5)}),
    (func: {if (temp1!=nil) {d[temp1].off}},time: {rrand(0,2.5)}),

],
```

Figure 13: *A simple four-on-the-floor beat with some randomness (top), versus a more complex algorithmic beat (bottom).*

- Speech rhythm sequencer - This module reads a MIDI files containing a sequence of notes which correspond to P-centres of an analysed speech. (Of course it can read any MIDI file, but

the ones I'm using are derived of speech). The sequencer can directly control the sound moulds or control the arpeggiator, the granulator, and the functional sequencer, which can create more complex rhythmic interactions.

B.5.4 Sound Objects

Sound objects are various modules, each of them reads and processes the audio buffer in a different way.

Granulator / Arpeggiator - The granulator and the arpeggiator both work on the same principle other than the fact that the arpeggiator uses the pressed keys of the keyboard as its rate (=pitch) structure, whereas the granulator uses other functions. These modules create streams of grains with variable duration, envelope, rate and density, from a random position in the buffer. The rhythm of the grains can be statistic (i.e. a distribution of a certain density), it can be equal and it can be derived from a speech rhythm by the speech rhythm sequencer. Short grains create the rhythmic feel of a stream of pulses whereas long grains create more of a texture, or a long sustained sound.

Two complimentary elements which are an extreme compression and a feedback loop to the record function create an ongoing modulation in sonic outcome as the content of the audio buffer keeps changing while this process takes place, without hardly effecting the amplitude of the signal. Short durations of the grains produce a gradual degradation in sound quality as the granulated material becomes closer in characteristics to noise, while long durations with a high density can cause the system to resonate, filling the buffer with harmonic material.

Sound Moulds - Sound moulds are objects which creates a specific distinguishable gesture out of an arbitrary content of a buffer. Even though the resulting outcome is always different as its source is different, the psychoacoustic gesture is similar enough so that these objects can be perceived (we can perceive these objects) as being "the same" or as having the same musical "meaning", filling the same musical role. All sound moulds apply an extreme compression in order to eliminate most of the original envelope of the sound. The following provides some examples of sound moulds.

Percussive Moulds - Imitate gestures of percussive sounds.

- Kick drum / Bass - Plays a part of the buffer with a fast rate fall in the attack phase of the sound and then sustain the low rate. This fast decrease in rate creates a percussive click and the low rate which follows produces a bass sound.

- Explosive (Snare / Crash) - Creates a granular process of short grains with an exponentially decaying density envelope and an exponentially falling rate envelope (with some jitter). This produces an explosive gesture. By changing the different parameters of the envelopes the gesture can sound more like a tight short "snare drum", a bigger longer "snare" or a "crash cymbal". Obviously it actually sounds like none of these, or at least not like their acoustic origin. However, it can definitely fill the role of these instruments in electronic music and be interpreted as one of them.

- Clap - Similar to the design of a clap in traditional drum machines, this sound mould creates three short grains and a longer one in equal time distance, all from the same position in the buffer.

- Hi-hat - Plays back a short chunk of the buffer in a higher rate and with a high-pass filter. There are various Hi-hats based on different rates, durations and envelopes. All Hi-hat moulds trigger a stream of equally spaced or accelerating / decelerating hi-hats. Thus by sequencing various hi-hats in the sequencer, it is very easy to create a non periodic rhythm with local periodicities. (see chapter A.4.3).

Syllable moulds - Imitate the gesture of syllables. Syllables are usually made from a construct of consonants and vowels and have a complex rhythmic structure. These moulds are inspired by their structure. More on that see chapter A.4.2 on articulation.

- "Sss" - Plays the buffer with a randomly changing play position, it produces a sound which is closer to noise but is still coloured by the general timbre of the buffer. This mould can be used as the consonant Ss or as a "hi-hat" gesture.

- "Aa" - This is not really an Aa vowel in the common approach, as vowels are defined by filter characteristics. This is more of an attempt to produce a general vowel sound, or actually a sustained sound, to be used in a combination of phonemes. The way in which this system works means that usually the buffer contains a series of different sounds. In order to create a sustained sound from that series, this mould takes just a very short portion of the buffer and time stretch it (with a form of a granular time stretch) and thus increase the chances that the result would be indeed a sustained sound.

- "t" - A short, high rate playback of the buffer with a percussive amplitude envelope.

- "p" - A short, high rate playback of the buffer with a percussive amplitude envelope and a rising rate envelope.

- "Ta" - Combining "t" and "Aa"

- "Sta" - Combining "Sss", "t", and "Aa"

- "Wa" - A fast rate glide upwards.

- and so on…
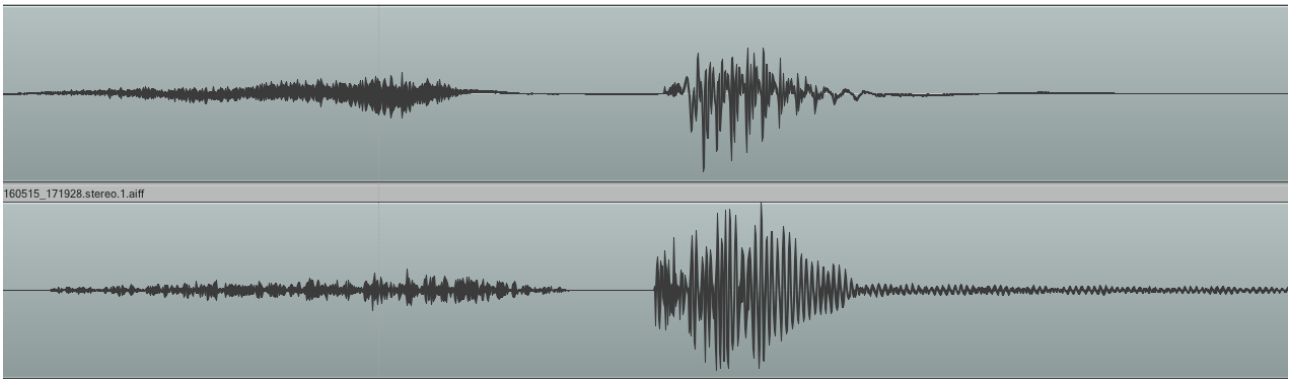
Figure 14: REAPER screenshot: A recording of the syllable "sta" spoken by me (top) vs. the output of the sound mould "sta" (bottom).

B.5.5 Aquifer, Speech Rhythms and Groove

My research on rhythm and speech has affected the development of the Aquifer system in few ways. The first and most obvious one was the actual use of analysed speech patterns as a module which can trigger other sound processes in the system, as discussed in section B.5.3 on control modules. The second was the implementation of syllable inspired gestures and rhythmic structures as sound moulds, as discussed in section B.5.4 on syllable moulds.

The third implementation was an attempt to create algorithmic processes that are inspired by the principles of speech rhythmic organisation, as discussed in chapter A.4.3. For example, the pattern demonstrated in figure 15 was inspired entirely by these principles. The process goes as follows:

```
[
    (func: {d.sn.on},time: {rrand(0.5,0.6)} ),
    (func: {d.chu.on; temp1=[\hhmech, \hhmech2, \hhgeom].choose; d[temp1].on(1.0.rand)},time: {rrand(1,1.5)} ),
    (func: {d.chu.off},time: {rrand(0,2.5)}),
    (func: {if (temp1!=nil) {d[temp1].off}},time: {rrand(0,2.5)}),

],
```

Figure 15: An algorithmic process inspired by speech rhythm. Supercollider screen shot.

1. Trigger a snare drum. wait 0.5-0.6 16th notes.
2. Trigger a bass drum, trigger either an isochronous or an accelerating stream of hi-hats with a random rate. wait 1-1.5 16th notes.
3. Stop bass drum. wait 0-2.5 16th notes.
4. Stop hi-hat stream. wait 0-2.5 16th notes.

The meaning of "16th notes" in this context is just an arbitrary constant time interval. Since all actual durations are fractions of that time interval it does not serve as a tactus of any sort. It is just a means to make this process relative and thus enable the possibility to change the overall rate.

This process first of all establishes a relation between the snare and the bass drum. The time interval between the snare and the bass drum is varying yet it is always quite short. However the interval between the bass drum and the next snare is much longer and has a range of 1 to 6.5 16th notes. Therefore the relation [Snare] -> [Bass drum] is perceptually grouped whereas the relation [Bass drum] -> [Snare] is not. This way the snare is always "announcing" the bass drum and thus creates anticipation.

This is inspired by the way unaccented syllables announce the accented ones and lead towards them. It is also inspired by the idea of learned entrainment - entrainment which is made not by periodicity but by recurring learned patterns. See chapter A.4.3 for a longer discussion on the topic.

The other part of this process is the one of local isochrony as discussed in chapter A.4.3. The hi-hat moulds produce not just a single event but rather a stream of events. Some of them produce a stream of equally spaced hi-hats while some of them create a geometrically accelerating or decelerating stream. Their rate, or initial rate in case of a changing rate, is randomised in this process therefore each time the hi-hat is trigged it plays a different rate. This creates local periodicities within this very unequal sequence, turning it from non-periodic to semi-periodic.

The last effect of my research over the development of Aquifer is related with participation. Since participation is, in my opinion, an important part of groove and of the music that I would like to make, I tried implementing elements that I thought would evoke a higher degree of participation from the audience, and first and foremost the element of "live" music.

I believe that the concept of a live performance has a positive effect on the audience's participation, and indeed as my fellow student Adam Juraszek recently said, Aquifer is based on a "live-fetish". (personal communication, May 7th 2016). Indeed when playing with computers it is always a question what is considered "live"? Does it really makes a difference if its live or not? How to make the audience *feel* that is is really live? Sonically it would have sounded just the same, and probably would have been easier and safer, to sample all acoustic sources in advance and just use their sounds, but I believe that this performance, which is based entirely on live sampling, gives the feeling of something which is truly live. A piece of music which is happening here and now, with all the fragility that comes with it.

Conclusion

The purpose of this research was to explore the rhythmic possibilities of electroacoustic music by looking at it through the prism of groove, and by taking advantage of the rhythmic features of speech. Therefore the most interesting question to be asked is: was this goal accomplished?

The answer to this question is quite subjective. Can the music presented here be defined as "groovy"? The chances are that a wide audience of random listeners will not consider it to be so, but then again, a wide audience doesn't come to electroacoustic concerts. For the audience who does come to such events, I believe this music conveys a distinctive rhythmic quality, an earmark, a particular aesthetic.

If this is indeed the case and the audience can recognise a certain aesthetic which is somewhat distinctive and which echoes through the various pieces presented here, I believe this is already quite an accomplishment. Whatever this aesthetic might be, it is obviously derived from the ideas presented in this thesis. Moreover, I believe this thesis is raising questions about the role of rhythm in electroacoustic composition, questions that, the way I see it, have not been present enough so far and are only now beginning to diffuse into the discourse.

When starting this research one of my goals was to somehow find and extract the essence of groove. During the research I realised that such a thing is impossible. It seems that groove is far too complex a phenomenon to be captured by a compact list of numbers. Disappointing as this may be scientifically, artistically it is a much more exciting result. I believe that the ideas on participation and its significance in the experience of music and groove, as well as the manifestation of these ideas in the music presented here are far more interesting than any method for analysis and resynthesis.

A part of this research dealt with possible means to incorporate speech rhythms into electronic music. For me the most interesting results were achieved by using speech patterns to trigger sonic events, such as with Variations on a theme by Martin Luther King and with Aquifer; and by emulating syllable structures in Aquifer. I believe these techniques could be further developed and expanded in the future.

From the perspective of groove research I believe this research is bringing something new to the discourse. It seems that since 1988 very few studies if any have used the term groove in relation to non-pulse-based music. This thesis attempts to create a framework in which such a discussion is possible. Even though the actual research on groove here is limited in scope and deals mostly with definitions and terms, these terms could in future be used as a starting point for further research on the topic.

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Appendix I: Contents of the attached CD

can be found online at https://goo.gl/bE0jrd

1. Variations on a theme by Martin Luther King. Recorded in a live concert at the Institute of Sonology, March 2015. With Iris van den Bos and Emil Emilsson - Percussion. (7:38)
2. La dialectique de la durée. Recorded at a rehearsal, December 2015. With Nathalie Verdon and Marie Guilleray - Voice. (9:59)
3. Aquifer. Live performance at the Institute of Sonology, May 2016. (7:25)
4. Excerpts of recordings by Steven Feld of the Kaluli tribe of Papua New Guinea. (1:52)
5. Excerpt of Martin Luther King's "I have a dream" speech from August 28th 1963 which was used as the source for *Variations on a theme by Martin Luther King. (0:35)*
6. The same excerpt from King's speech with an added synthesised white noise demonstrating the rhythmic analysis. (0:26)
7. Stoka Ensemble - Canon. Written by Charles Mingus, arranged by Tomer Baruch. With Daniel Clason - Trumpet, Emilio Tritto - Sax, Louis Portal - Drums, Tomer Baruch, Theo Horsmeier and Adam Juraszek - Electronics. (4:37)
8. Excerpt of "I Am The Double Greatest", spoken-word poem by Cassius Clay, 1963 which was used as the source material for *Talking Trash. (0:30)*
9. Excerpt of "I Am The Double Greatest" with a synthesised saw-wave emphasising the analysed pitches of the speech. (0:25)
10. Tape part for *Talking Trash*. (3:10)

Tomer Baruch

Variations on a theme by Martin Luther King

For 2 percussionists and 6 self-playing drums

Instrumentation

Percussionist 1: Vibraphone, Snare drum, Floor tom, Cymble, A big bell or a gong
Percussionist 2: Marimba, Snare drum, Bass drum, Cymble
Self playing drums: 2 Snare drums, 2 Floor Toms, 2 Resonating metal plates

Setup

The self-playing drums should be placed around the hall according to the diagram on the next page. A transducer should be attached to each drum, and connected to a different channel of the fixed media 8-channel output. The last two channels of the fixed media should be sent via headphones to the performers.

Instructions

The rhythmical structure of this piece is based on a phrase spoken by Martin Luther King in his famouse "I have a dream" speech at the Lincoln Memorial, on August 28 1963:

But we refuse to believe that the bank of justice is bankrupt.
We refuse to believe that there are insufficient funds in the great vaults of opportunity of this nation.
So we have come to cash this check - a check that would give us upon demand the riches of freedom and the security of justice.

This 27 seconds long paragraph will be played repeatedly in the percussionists headphones 16 times throughout the piece. Each repetition of the paragraph is marked with a consecutive capital letter. The notated durations are merely a reference to the timing of the speech, which the performers should memorise by heart. Whenever the performers should play along with the heard speech - a bar will represent one sentence of that paragraph. Otherwise, a bar will represent a whole repetition of the speech.

Abbreviations: SN (Snare), FL (Floor tom), BD (Bass drum), RS (Rimshot - on the snare), Cym (Cymbal),
Mar (Marimba), Vib (Vibraphone)

"x" marked noteheads should be played as mutes - notes without sustain.
Normal noteheads should be alowed to sustain freely unless stated otherwise.

Setup Diagram
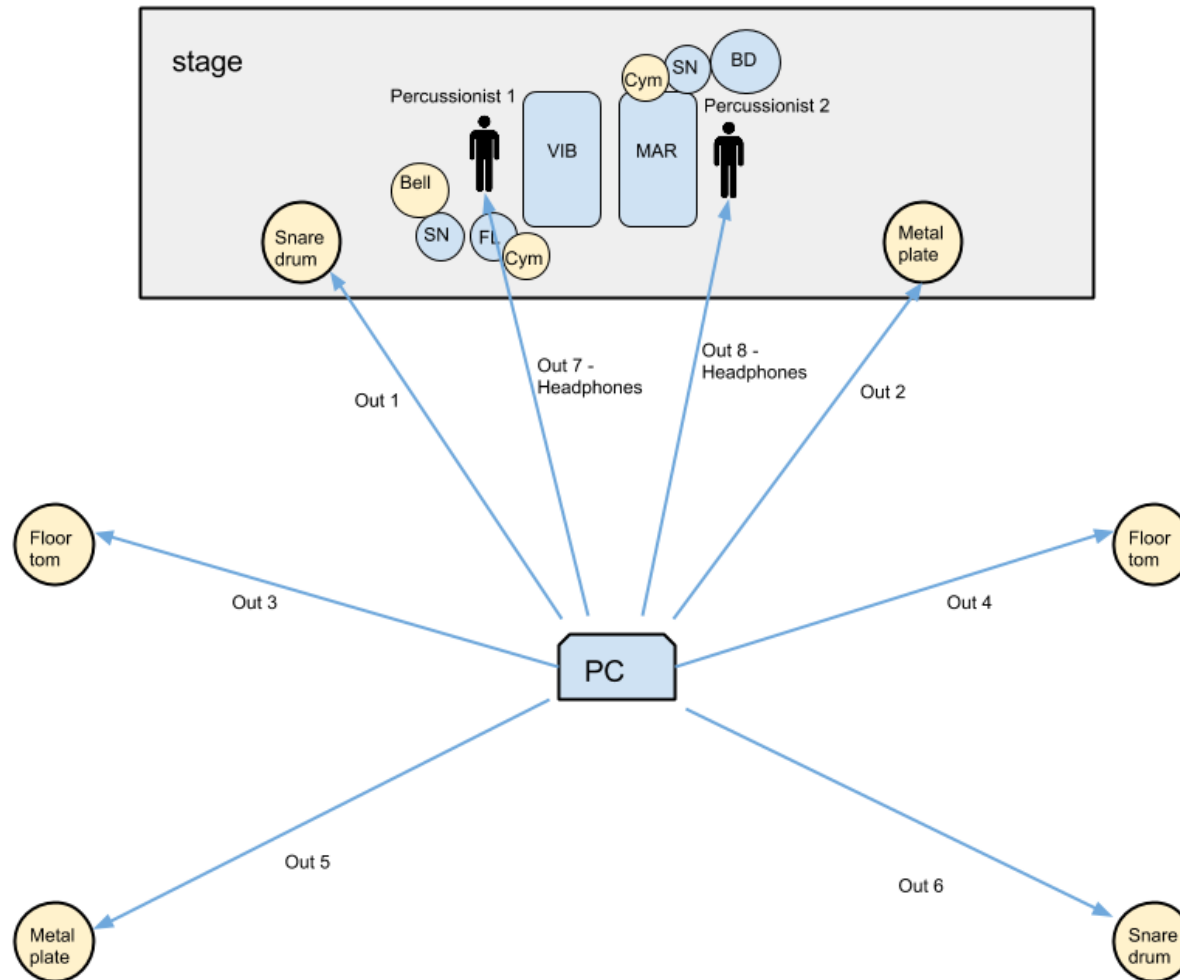
Variations on a theme by Martin Luther King

Tomer Baruch

so we've come to cash this check a check that would give us u-pon de-mand the ri-ches of free-dom and the sec-u-ri-ty of just-tice

so we've come to cash this check a check that would give us u-pon de-mand the ri-ches of free-dom and the sec-u-ri-ty of just-tice

we ref-use to be-lieve that the bank of jus-tice is bakrupt - - -

we ref-use to be-lieve that the bank of jus-tice is bakrupt - - -

we ref-use to be-lieve that there are in-su-fi-cient funds in the great vaults of o-pur-tu-ni-ty of this na-tion

ref-use to be-lieve that there are in-su-fi-cient funds in the great vaults of o-pur-tu-ni-ty of this na-tion

so we've come to cash this check a check that would give us u-pon de-mand the ri-ches of free-dom and the sec-u-ri-ty of just-tice

so we've come to cash this check a check that would give us u-pon de-mand the ri-ches of free-dom and the sec-u-ri-ty of just-tice

so we've come to cash this check a check that would give us u-pon de-mand the ri-ches of free dom and the sec-u-ri-ty of just-tice

so we've come to cash this check a check that would give us u-pon de-mand the ri-ches of free dom and the sec-u-ri-ties of just-tice

we ref-use to be-lieve that the bank of jus-tice is bankrupt we ref-use to be-lieve that there are in-su-fi-cient funds in the great vaults of o-pur-tu-ni-ty of this na-tion

we ref-use to be-lieve that the bank of jus-tice is bankrupt we ref-use to be-lieve that there are in-su-fi-cient funds in the great vaults of o-pur-tu-ni-ty of this na-tion

so we've come to cash this check a check that would giveus u-pon de-mand the ri-ches of free-dom and the sec-u-ri-ty of just-tice

so we've come to cash this check a check that would giveus u-pon de-mand the ri-ches of free-dom and the sec-u-ri-ty of just-tice

we ref - use to be - lieve that the bank of jus - tice is bank - rupt

we ref - use to be - lieve that the bank of jus - tice is bank - rupt

we ref - use to be - lieve that there are in - su - fi - cient funds in the great vaults of o - pur - tu - ni - ty of this na - tion

we ref - use to be - lieve that there are in - su - fi - cient funds in the great vaults of o - pur - tu - ni - ty of this na - tion

so we've come to cash this check a check that would give us u - pon de - mand the ri - ches of free-dom and the sec - u - ri - ty of just-tice

so we've come to cash this check a check that would give us u - pon de - mand the ri - ches of free-dom and the sec - u - ri - ty of just-tice

we ref - use to be-lieve that the bank of jus-tice is bankrupt we ref-use to be-lieve that there are in - su-fi-cient funds in the great vaults of o-pur-tu-ni-ty of this na-tion

we ref - use to be-lieve that the bank of jus-tice is bankrupt we ref-use to be-lieve that there are in-su-fi-cient funds in the great vaults of o-pur-tu-ni-ty of this na-tion

so we've come to cash this check a check that would give us u - pon de - mand the ri - ches of free-dom and the sec - u - ri - ty of just-tice

so we've come to cash this check a check that would give us u - pon de - mand the ri - ches of free-dom and the sec - u - ri - ty of just-tice

we ref - use to be - lieve that the bank of jus - tice is bank - rupt

we ref - use to be - lieve that the bank of jus - tice is bank - rupt

we ref - use to be - lieve that there are in - su - fi - cient funds in the great vaults of o - pur - tu - ni - ty of this na - tion

we ref - use to be - lieve that there are in - su - fi - cient funds in the great vaults of o - pur - tu - ni - ty of this na - tion

so we've come to cash this check a check that would give us u - pon de - mand the richesof free-dom and the sec - u - ri-ty of justice but

so we've come to cash this check a check that would give us u - pon de - mand the richesof free-dom and the sec - u - ri-ty of justice but

Tomer Baruch

Talking Trash

For Ensemble

Instructions

Talking Trash is based on the spoken-word poem "I am the greatest" by Cassius Clay (Muhammad Ali) from 1963, and on video and audio recordings from the match between Cassius Clay and Sonny Liston, February 25th 1964.

Whenever lyrics are written under the notes the meaning is that the written durations are an aproximation of the original speech by Ali. In that case the players should play as close as possible to the timing, articulation and expression of the original speech and not to the written timing. A bar in this part refers to a phrase. Each barline should be considered to be a fermata.

Ensemble
- Trumpet in Bb
- Baritone Saxophone
- Drums (standard jazz set)
- PC 1 - Digital feedback based instrument with dynamic and textural control
- PC 2 - Granular sample based instrument. The source samples are excerpts from the original speech
- PC 3 - A live sampling and processing instrument which takes the horns as input and process them. PC 3 also have a
        MIDI keyboard and can play bass sounds.
- Tape - Part II of the piece includes a tape + video part. Noticeable ques from the tape are written in the score for
        synchronisation

Part I
The general texture is heterophony. One of the horns or both of them is always playing the speech and everyone else should play around that - mostly follow the speech creating the same "musical route" or "gesture", or occasionally play an extended tail of the lead or play a response. For the horns there are two modes of playing - *in sync* - where they should play a unison, and *out of sync*, where they should try and *not* play a unison but rather play with a small offset or a slightly different timing.

PC 1 should play mostly percussive and gritty sounds, following the lead of the horns.
PC 2 and PC3 should play chopped up and granulated samples in an articulative and percussive manner

At the end of part I there is a short section where time is measured and should be played rather tradionally - as written.

Part II
In part II the tape is leading the structure and all instruments except the drums should follow it and try and remain synchronised according to the written text cues. The durations of the notes should be played as written but the spaces between the phrases, and at times the endings of the phrases should relate to the tape.

The drums in the second part are playing the timing of the speech which was played by the horns in part I. They should create a percussive interpertation of the speech and follow their own tempo - ignoring the tempo of the rest of the ensemble and of the tape. However, the drums still have to listen to the tape and follow its dynamics, regardless of the phrase that they are playing.

PC 1 should follow the drums imitating them and accompanying them.
PC 2 should play "frozen" bits of the speech - time streched or looped and very slowly fade them in and out according to the written notes. The freeze should preferably be done in a granular way rather than with phase vocoding.
PC3 should freeze and sustain notes played by the horns, creating layers of sustained horns sounds.

The drums and the ensemble synchronise when the sentence "Sonny Liston is not coming out" is heard. Since it might be possible that the drums will be more ahead within their score until the sentence arrives, there are some extra bars for the drummer to play until the sentence is heard. As soon as it is heard the entire ensemble should jump to Coda.

Talking trash

Part I

T. Baruch

Intense (part written at ♩=90)

Trumpet in B♭ — *tutti*
ff
I — am — the — grea - test!

Baritone Saxophone
ff PC2 - I am the greatest!

3 PCs
ff
10 sec. collective improvisation, decays...

Drums
ff

2

Tpt.
I'm — the — kid — who'd take — old — man — Lis - ton's — ti - tle -'way — me!

Sax.

Pc. — PC 2 + 3 - tacet

Dr. — break
f

3

Tpt.
A — little — ol' — kid — who — don't — e - ven — shave — yet

4 out of sync

Tpt.
I'm — go - nna — be champ' — of — the world — be - fore — I'm — old — 'nough — to — do — my — own — sha - ving — com - mer - cial

Sax.
I'm going to — be champ' — of — the world — be - fore — I'm — old — 'nough — to — do — my — own — sha - ing — com - mer - cial
p ———— *f*

5 ♩=♩.

Sax.
And — I'm — going — to — make — bo - xing — po - pu - lar — 'gain

4

Out of sync

beau-ti-ful co-lor-ful per-so-na-li-ty

I'm going to make bo-xing in - te-res-ting

in sync

me with my beau-ti-ful co-lor-ful per-so-na-li-ty

I'm going to make bo-xing in - te-res-ting

PC1 - play tail

In sync

bo - xing do - esn't have to be du - ll

its the fi - ghters who are du - ll

bo - xing do - esn't have to be du - ll

fi - ghters who are du - ll

I watched the fight of   the week on   t - v_____   they call that the fight of the week?

PC3 joins
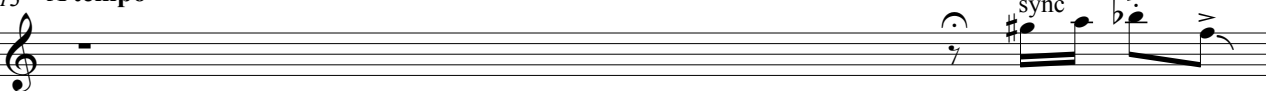
slightly accel.

It was so   bo - ring   ev' - ry time the bell - rang it woke up the re - fe - ree

PC3: tail

Drums: tail

A tempo

13
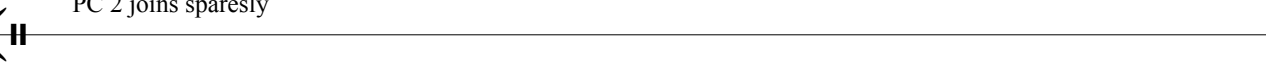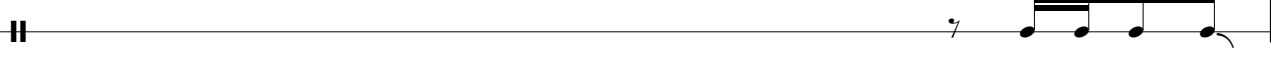
Tpt.

sync
and I like them

Sax.

It hurts me to say this be-cause I know a lot of figh-ters and I like them

Pc.

PC 2 joins sparesly

Dr.

14

Tpt.

nice gen tle guy-s

Sax.

They are nice gen tle guy-s who would-n't hurt a-ny-bo-dy break not ev-en in the ring!
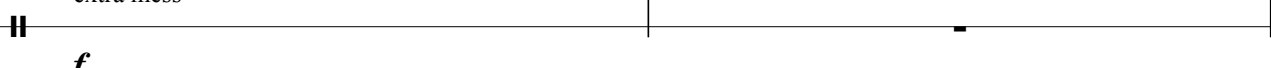
slightly faster

Dr.

mp

15

Tpt.

Out of sync

And I'm go-ing to bring back the ex-cit-ment in bo-xing I'm go-ing to be the hea-vy weight champ-ion of the world

Sax.

And I'm go-ing to bring back the ex-cit-ment-in bo-xing I'm go-ing to be the hea-vy weight champ-ion of the world

Pc.

extra mess

extra mess

Dr.

f

17

Tpt.

and I won't be sa-tis - fied with that

Sax.

and I won't be sa-tis fied with that

ff

18

Tpt. / Sax.: Af-ter be-co-ming cham-pion of the world   I'm go-ing to be-come cham-pion of the u-ni-verse!   extend tail

Pc. / Dr.: extend tail

20 Sync + drums

Tpt. / Sax.: I want to take on those li-ttle green men from ve-nus

Sax.: Those sleek shi-ny hea-ded green men

PC2 tacet

PC3 tacet PC1 play

22 a bit faster

Sax.: I can make the-m   I won't be af-raid of the way they look

23 Sync

Tpt.: they can't look no worse than So-nny Lis-ton

A tempo

Sax.: afte' all   they can't look no worse than So-nny Lis-ton

all PCs play

Play

24 Out of sync   pull back...   go on   pull back...   go on

Tpt.: Yes 'me-ri-ca   I'm the re-so-rec-tor'f the-fight-games!   I'm going to save bo-xing!

Sax.: Yes 'me-ri-ca   I'm the re-so-rec-tor'f the fight games!   I'm going to save bo-xing

mf

26

Tpt. / Sax.: I'm going to bring bo - xing back to life!

27 a bit slower

Tpt.: Figh - ting was dull un - til i came - a - long be - cause the grea - test wa - sn't a - round

Sax.: Figh - ting was dull un - til I came a - long be - cause the grea - test wa - sn't a - round

28

Sax.: But time brings a bout a change as the earth ro - tates a - round the sun a change takes place.

Pc.: PC 1 + 2 tacet

29

Sax.: There's spring su - mmer fall and win - ter bo - xing was at the win - ter's stage

Pc.: PC 2 joins

30 sync

Tpt.: But now the flo - wers are bloo - ming spring is co - ming I - am on the ho - ri - zon

31 sync

Tpt.: Lis - ton's fall will mark the a - rri - val of spring Yes, there's go - nna be a new cha - mp - ion

Sax.: Lis - ton's fall will mark the a - rri - val of spring.

Pc.: All PCs
Lis - ton's fall will mark the a - rri - val of spring.

Dr.: Lis - ton's fall will mark the a - rri - val of spring.

33

Tpt.

a cham - pion you can tell you kids   to   be like   I'm the per - fect i - dol for the kids

Slower

35 A tempo sync

Tpt.

I'm good loo-king   clean li-ving cul-ture   and I   am mo-dest

Sax.

I am so mo-dest I can ad-mit my own fault

Dr.

f

37 out of sync   Improvise

Tpt.

I don't rea-lize   how great I rea-lly am!

Sax.

My on ly fault is   I don't rea-lize   how great I real-lly am! Its hard to be hum-ble when you're as great as I am

mp   *f* PC 3 - follow Tpt

Pc.

39 Improvise (continue)

Tpt.

Sax.

I'm the new fron-tier of bo-xing and bo-xing must move a-head   I'm go-ing to win the cham pi-on-ship with vi-gor

42 ...

Tpt.

Sax.

Slower   A tempo

that's part of my phy-sy cal fit-ness prog-ram   all Son-ny Lis-ton's got is a phy-si-cal fat ness pro-gram

44 in sync

Tpt.

p

And with my vi - gor   I'm go - ing to ask con - gress to help Mis - ter Lis - ton

Sax.

And with my vi - gor   I'm go - ing to ask con - gress to help Mis - ter Lis - ton

p

Tpt.

Sax.   sync
                       me-di-care

I would ask them to pass a heath bill   be cause af ter'ol Mis-ter Lis-ton fights me   he's going to need me-di-care

Dr.

Tpt.   sync
             den-ti-care   *mf* Yes, I'm go-ing to move bo-xing a head

Sax.   3   Improvise

and if I hit him in the mouth   he's going to need den-ti-care   play a lot

Pc.

Dr.   play a lot

Tpt.   slower   A tempo

I don't ask what bo-xing can do for me,   I ask what I can do for bo-xing.

Sax.   Improvise (continue)

Tpt.   sync   Go on   Pull back..

f Be-cause I am great.   I am the grea-test.   To prove this point

Sax.   *mp*   6   6   6

And I can ev-ven tell the truth a bout the fu-ture
(don't play)

Pc.   (don't play)

Dr.

Tpt.   out of sync

mf I would like to read one of the mi - ni mas - ter-pie-cess i wrote this af - ter noon.

Sax.   3   3

Lyrics visible in the score:

Tpt. (m.52): My pro - phe - cy ___ by Ca - ssius Clay.

Tpt. (♩=60 in time, Festive): When Ca - ssius says a fight will go fi - ve rounds   the bell for the fifth just ne - ver sounds   When I

Tpt. (m.55): tan - gled with Au - drey   I pre - dic - ted four   and thats all there was ___ there wa - sn't a - ny more

Sax. (m.55): When they

Tpt. (m.57): qui rred me a - bout the coup - a - bout   I an - swered with shak - spea - ri - an thrill

Tpt. (m.57): when they

asked me what round I'd knock Hen-ry out

solo

gliss down and connect
to 20 seconds of intense
free improvisation

I an-swered Hen-ry the fifth!

intense improvisation

intense improvisation

On top of the improvisation

I am the grea - test!

Start video

<Bell>

Part II

♩ = 90 drums keep their own time

Trumpet in B♭

Baritone Saxophone

All PCs tacet

3 PCs

Tape

<Running>

Drums

Play line on different drums, start with cymbals and gradually add other drums

I'm the kid who'd take old man Lis-ton's ti-tile-'way **me!**
mp

64

Dr.

A little ol' kid who don't e - ven shave yet

65

Tpt.

mp

Sax.

Pc.

PC3 join - record and stretch end of sentences. Make layers

Tape.

Dr.

Follow tape with dynamics

I'm go-nna be champ' of the world be-fore I'm old 'nough to do my own sha-ving com-mer-cial

66

Pc.

PC2

Tape.

In round 6 we notice Sonny...(unclear). most of the time

Dr.

And I'm going to make bo - xing po-pu-lar 'gain Me with my beau-ti-ful co-lor-ful per-so-na-li-ty

I'm going to make bo-xing in-te-res-ting

Easy target!

Bo-xing do-esn't have to be du-ll

its the fi-ghters who are du-ll

PC2

Easy!

I watched the fight of the week on t - v_____

they call that the fight of the week?

Laid back

Laid back

mf

It was so bo - ring

ev' - ry time the bell - rang it woke up the re - fe - ree

It hurts me to say this be-cause I know a lot of figh-ters and I like them

They are nice gen-tle guy-s who would-n't hurt a-ny-bo-dy not ev-en in the ring!

slightly faster

PC 2

With slightly less than a minute more in the 6th round, the champion has slowed down a bit
The tempo has slowed down

And I'm go-ing to bring back the ex-cit-ment in bo-xing   I'm go-ing to be the hea-vy weight champ-ion of the world

And   I   won't   be   sa - tis - fied   with   that

Tpt. **Slower** **Laid-back**

Sax. **Slower** **Laid-back** *f*

Dr.

Af - ter be - co - ming cham - pion of the world   I'm go - ing to be - come cham - pion of the u - ni - verse!

78

Tape.

Dr.

Only 30 seconds to go in the 6th round

I want to take on those li - ttle green men from ve - nus   Those sleek   shi - ny hea - ded green men

80

Tpt. *p*

Sax. *p*

Pc.

Tape.

Sonny can't seem to slip or knock down that jab effectively

a bit faster

Dr.

I   can   make   the - m   I   won't   be   af - raid   of   the   way   they   look

81

Tpt.

Sax.

Pc.

Tape.

Cassius - Cassius throws it from all angles   Very tricky left lead, left jab

A tempo

Dr.

afte' all   they can't look no worse than So - nny Lis - ton   Yes 'me - ri ca I'm the re - so - rec - tor'f the fight games!

Lyrics under the staves:

I'm going to save bo - xing   I'm going to bring bo - xing back to life!

Figh-ting was dull un - til I came a - long   be-cause the grea - test wa - sn't a - round

But time brings a bout a change   as the earth ro-tates   a-round the sun   a change takes place.

There's spring su - mmer fall   and win - ter   bo - xing was at the win - ter's stage

Measure 88:

Pc. *cresc.*

Tape: Joe look Joe... (a lot of text)

Dr. (lyrics): But now the flo-wers are bloo-ming spring is co-ming I - am on the ho - ri - zon

Measure 89:

Sax. *cresc.*

Tape: ... What do you think is going on in Sonny's mind in this point

Dr. (lyrics): Lis - ton's fall will mark the a - rri - val of spring. Yes, there's go-nna be a new cha-mp-ion

Measure 91:

Sax. *f*

Tape: (more text)...

Slower

Dr. (lyrics): a cham - pion you can tell you kids to be like I'm the per - fect i - dol for the kids

93

Tpt.

Sax.

mp

PC 2

cresc.

Pc.

Tape.

<Bell>

A tempo

Dr.

3   *3*   *3*   *3*

I'm good loo-king   clean li-ving cul-ture   and I am mo-dest   I am so mo-dest I can ad-mit my own fault

95

Tpt.

Sax.

dim.

Pc.

Tape.

They might be stopping it that might be all ladies and gentleman! get up there Joe, get up there! ......(more text)...

Dr.

6   *6*   *6*   *6*

My on ly fault is   I don't rea-lize   how great I real-lly am! Its hard to be hum-ble when you're as great as   I am

3
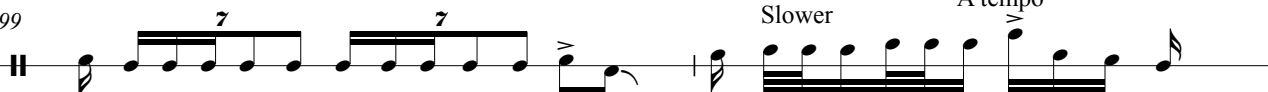
After "Sonny Liston is not coming out" go to Coda

97

Tpt.

Sax.

PC 2

Pc.

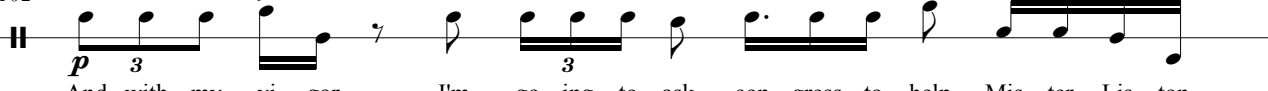Tape.

Sonny Liston is not coming out! Sonny Liston is not coming out!!!

Dr.

7   *7*

I'm   the   new   fron-tier   of   bo - xing   and   bo-xing   must   move   a - head

This section is the extra drum part - play until "Sonny Liston is not coming out" and then go to Coda

99
Dr.

I'm go-ing to win the cham pi - on-ship with vi - gor

Slower / A tempo
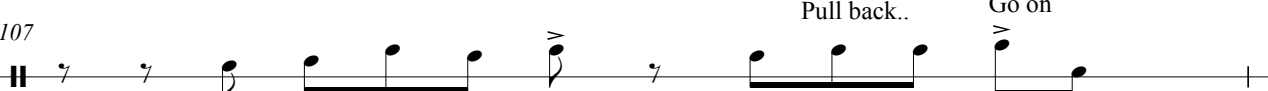
that's part of my phy-sy-cal fit-ness prog-ram

101
Dr.

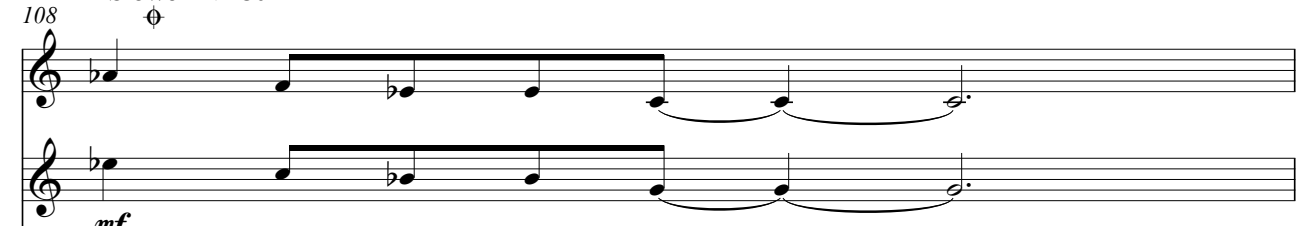all Son - ny Lis - ton's got is a phy - si - cal fat - ness pro - gram

102
Dr.

And with my vi - gor I'm go - ing to ask con - gress to help Mis - ter Lis - ton
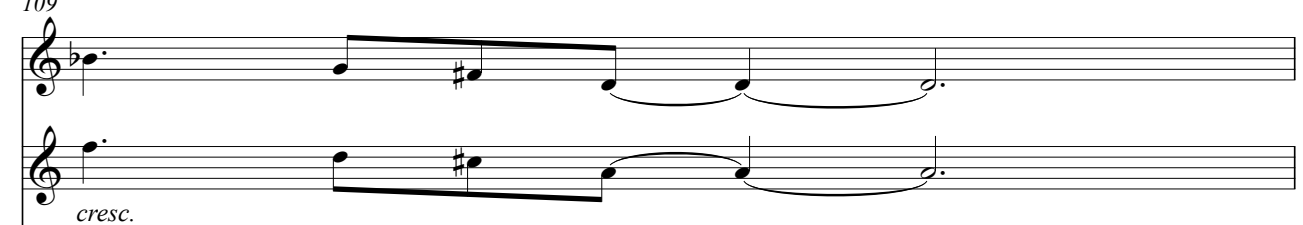
103
Dr.

I would ask them to pass a heath bill be cause af-ter'ol Mis-ter Lis-ton fights me he's going to need me-di-care

104
Dr.

and if I hit him in the mouth he's going to need den-ti-care Yes, I'm go-ing to move bo-xing a head
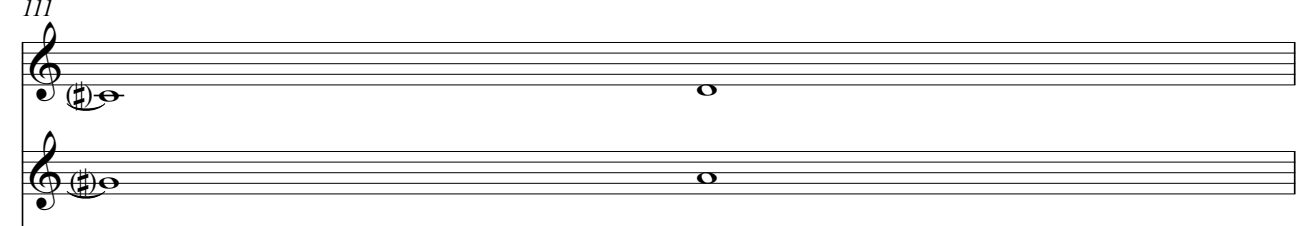
106
Dr.

slower / A tempo

I don't ask what bo-xing can do for me, I ask what I can do for bo-xing.

107
Dr.

Pull back.. / Go on

Be - cause I am great. I am the grea - test.

Slower - ♩=80

108

Tpt.

Sax.

mf

Pc.

PC1 - Improvise textures
PC2 - Layer long sustained sounds with fade in and fade out
PC3 - Record and stretch and layer horns's last notes

Tape.

He's out! The winner and the new heavy weight champion of the world is Cassius Clay....

Play tremolos on different drums, fade in and fade out. Gradually play more until the end

Dr.

109

Tpt.

Sax.

cresc.

Tape.

Alright Howard, Sonny Liston was sitting on his stool...
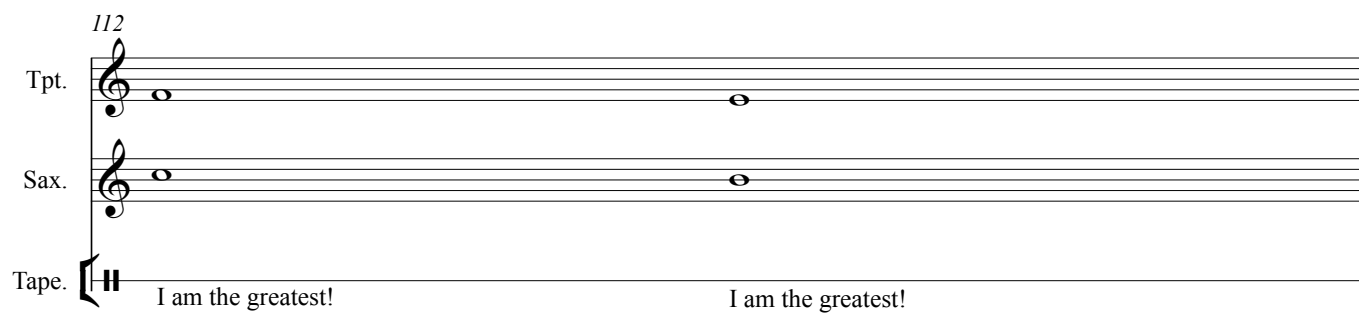
110

Tpt.

Sax.

f

3

3

111

Tpt.

Sax.

Tape.

Cassius!

Cassius!

Tpt.

Sax.

Tape.   I am the greatest!   I am the greatest!
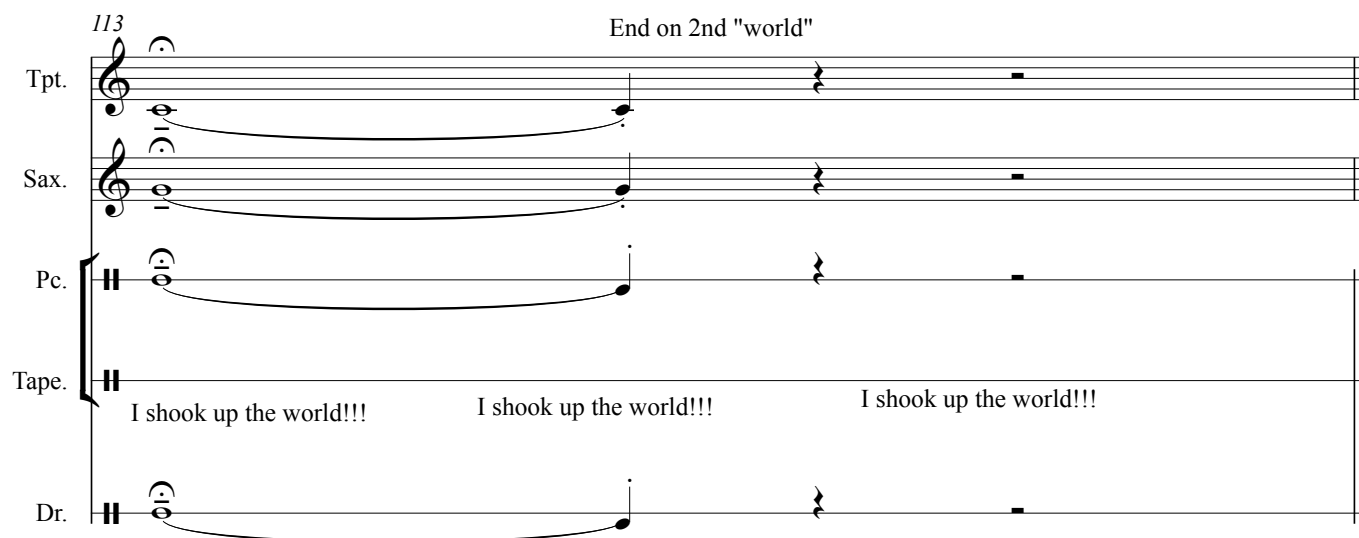
End on 2nd "world"

Tpt.

Sax.

Pc.

Tape.   I shook up the world!!!   I shook up the world!!!   I shook up the world!!!

Dr.

Tomer Baruch

LA DIALECTIQUE DE LA DURÉE

For two vocalists and live electronics

Setup

This piece is written for two vocalists and live electronics, which processes the sound coming from the vocalists.

Each vocalists should have a microphone and a standard sustain pedal. Both microphone lines and sustain pedals should be connected to the computer running the Supercollider program. The microphones should also be connected to the FOH for amplification.

The computer's processed output consists of four lines which should be distributed as following: Front-Left / Front-Right / Back-Right / Back-Left.

Instructions for vocalists

[*mf*]	- performance instructions
(*text*)	- wait for the other vocalist to speak the enclosed text
{ text }	- repeat text
<text>	- "sing" text (hold pitch)
text text	- emphasise bold syllable
<u>text</u> text	- press pedal on underlined text

LA DIALECTIQUE DE LA DURÉE

Tomer Baruch

[*mf,* normal tempo, accentuated rhythm and articulation]

Si ce qui dure le plus est ce qui se recommence le mieux, nous devions ainsi trouver sur notre chemin la notion de rythme comme notion temporelle fondamentale.

C'est que les **phé**nomènes de la **du**rée sont construits avec des **ryth**mes;
C'est que les **phé**nomènes de la **du**rée sont construits avec des **ryth**mes;
les **phé**nomènes de la **du**rée;
C'est que les **phé**nomènes de la **du**rée sont construits avec des **ryth**mes;
avec des **ryth**mes; des **ryth**mes; des **ryth**mes;
C'est que les **phé**nomènes de la **du**rée sont construits avec des **ryth**mes;
C'est que les **phé**nomènes de la **du**rée sont construits avec des **ryth**mes;
sont construits avec des **ryth**mes; des **ryth**mes; des **ryth**mes; des **ryth**mes;
des **ryth**mes; des **ryth**mes; des **ryth**mes; des **ryth**mes;
des **ryth**mes; des **ryth**mes; des **ryth**mes; des **ryth**mes;
avec des **ryth**mes; des **ryth**mes; des **ryth**mes; des **ryth**mes;
des **ryth**mes; des **ryth**mes; avec des **ryth**mes; des **ryth**mes;

[wait for effect to decay but not for complete silence (~30s)]

(loin que les rythmes soient nécessairement fondés sur une base temporelle bien u-ni-forme et ré-gu-lière; u-ni-forme, ré-gu-lière; u-ni-forme, ré-gu-lière)

Les événements exceptionnels doivent trouver en nous des <**ré-so-nances**>
pour nous marquer profondément.

[wait for partial decay]

[speak a bit faster than vocal 2 so you will eventually sync] *(De cette banalité : « La vie est harmonie » nous oserions donc finalement faire une vérité. Sans harmonie, sans)* *Sans harmonie, sans dialectique réglée, sans rythme, une vie et une pensée ne peuvent être stables et sûres :*
[unison] le repos est une vibration heureuse. [attacca]

[faster] Si ce qui dure le plus est ce qui se recommence le mieux, nous devions ainsi trouver sur notre chemin la notion de rythme comme notion temporelle fondamentale.
[unison, gradually accel…]
{C'est que les **phé**nomènes de la **du**rée sont **con**struits avec des **ry**thmes;}*5
{C'est que les **phé**nomènes de la **du**rée; les **phé**nomènes de la **du**rée;} *2
{C'est que les **phé**nomènes de la **du**rée sont **con**struits avec des **ry**thmes;}*2

C'est que les **phé**nomènes de la **du**rée; les **phé**nomènes de la **du**rée;
C'est que les **phé**nomènes de la **du**rée sont **con**struits avec des **ry**thmes;

[break syllables into equal (metered) durations]
{loin-que-les-ryth-mes-soient-né-ce-ssai-re-ment-**fo**n-dés-sur-u-ne-base-tem-po-relle-bien-u-ni-for-me-et-ré-gu-lière [, ,] } [repeat until Voice 2 finishes]

(Les événements exceptionnels doivent trouver en nous des <u>résonances</u> pour nous marquer profondément.)

[wait for decay]

[whisper]
(Être poète, c'est multiplier la dialectique temporelle, c'est refuser la continuité facile de la sensation) Être poète, c'est multiplier la dialectique temporelle, c'est refuser la continuité facile de la **sensation** et de la **déduction** ;
[poco poco cresc…]
{Être poète, c'est multiplier la dialectique temporelle, c'est refuser la continuité facile de la **sensation** et de la **déduction** ; c'est refuser le repos catagénique pour accueillir le repos vibré, le psychisme vibré. } [repeat and cresc. until Voice 2 finishes text]

[**wondering in awe**] *(Subitement, nous trouvions des passages, des accords, des correspondances toutes baudelairiennes entre la pensée pure et la poésie pure. Nous n'allions pas seulement d'un sens à un autre sens)* La poésie ne serait donc pas un accident, un détail, un divertissement de <u>l'être ?</u> Elle pourrait être le principe même de l'évolution créat<u>rice ?</u> L'homme aurait un destin poé<u>tique ?</u> Il serait sur Terre pour chanter la dialectique des joies et des <u>peines ?</u>

[wait ~15s]

[p] Si ce qui **du**re le **plus** est ce qui se **re**commence le **mieux;** Si ce qui **du**re le **plus;** qui **du**re le **plus** est ce qui se **re**commence le **mieux;** est ce qui se **re**commence le **mieux** nous devions ainsi trouver sur notre **che**min la notion de **rythme;** Si ce qui **du**re le **plus;** Si ce qui **du**re le **plus** est ce qui se **re**commence le **mieux,** nous devions ainsi trouver sur notre **che**min la notion de **rythme;** sur notre **che**min la notion de **rythme;** la notion de **rythme;** la notion de **rythme;** nous devions ainsi trouver sur notre **che**min la notion de **rythme;**
[unison, p] Si ce qui **du**re le **plus** est ce qui se **re**commence le **mieux,** nous devions ainsi trouver sur notre **che**min la notion de **rythme** comme notion **tem**porelle **fo**ndamentale.   [*fine*]

LA DIALECTIQUE DE LA DURÉE

<div align="right">Tomer Baruch</div>

[*mf,* normal tempo*,* accentuated rhythm and articulation]
(*Si ce qui dure le plus est ce qui se recommence le mieux, nous devions ainsi trouver sur notre chemin la notion de rythme comme notion temporelle fondamentale.*
C'est que les **phé***nomènes de la* **du***rée*)
C'est que les **phé**nomènes de la **du**rée sont construits avec des **ry**thmes;
C'est que les **phé**nomènes de la **du**rée sont construits;
les **phé**nomènes de la **du**rée;
les **phé**nomènes de la **du**rée sont construits avec des **ry**thmes;
les **phé**nomènes de la **du**rée;
les **phé**nomènes de la **du**rée;
C'est que les **phé**nomènes de la **du**rée;
C'est que les **phé**nomènes de la **du**rée sont construits avec des **ry**thmes;
avec des **ry**thmes; des **ry**thmes; des **ry**thmes;
des **ry**thmes; des **ry**thmes; des **ry**thmes; des **ry**thmes;
des **ry**thmes; des **ry**thmes; des **ry**thmes; des **ry**thmes;
avec des **ry**thmes; des **ry**thmes; des **ry**thmes; des **ry**thmes;
des **ry**thmes;
C'est que les **phé**nomènes de la **du**rée sont construits avec des **ry**thmes;

[wait for effect to decay but not for complete silence (~30s)]

[a bit slower]
loin que les **ry**thmes soient nécessairement **fo**ndés sur une base temporelle bien u-ni-forme et ré-gu-lière. [break syllables into un-equal duration]
[repeat until next text is spoken]
{ u-ni-forme, [wait] ré-gu-lière. [wait] }

(*Les événements exceptionnels doivent trouver en nous des résonances pour nous marquer profondément.*)

[wait for partial decay]

[*p*] De cette banalité : « La vie est harmonie » nous oserions donc **fi**nalement faire une **vé**rité. Sans harmonie, sans dialectique réglée, sans rythme, une vie et une pensée ne peuvent être stables et sûres : (*…stables et sûres*)
[unison] le repos est une vibration heureuse.

[faster]
(*Si ce qui dure le plus*) Si ce qui dure le plus est ce qui se recommence le mieux, nous devions ainsi trouver sur notre chemin la notion de rythme comme notion;
[unison, gradually accel…]

{C'est que les **phé**nomènes de la **du**rée sont **con**struits avec des **ry**thmes;}*5

[break syllables into equal (metered) durations]
{loin-que-les-ryth-mes-soient-né-ce-ssai-re-ment-**fo**n-dés-sur-u-ne-base-tem-po-relle-bien-u-ni-for-me-et-ré-gu-lière [, ,] } [repeat until Voice 1 joins]

Les événements exceptionnels doivent trouver en nous des résonances pour nous marquer profondément.

[wait for decay]

[whisper]
Être poète, c'est multiplier la dialectique temporelle, c'est refuser la continuité facile de la **sensation** et de la **déduction** ;
[poco poco cresc…]
Être poète, c'est multiplier la dialectique temporelle, c'est refuser la continuité facile de la **sensation** et de la **déduction** ; c'est refuser le repos catagénique pour accueillir le repos vibré, le psychisme vibré.
[sempre cresc…]
Être poète, c'est multiplier la dialectique temporelle, c'est refuser la continuité facile de la **sensation** et de la **déduction** ; c'est refuser le repos catagénique pour accueillir le repos vibré, le psychisme vibré.

(..Être poète) **Subitement**, nous trouvions des **passages**, des **accords**, des **correspondances** toutes baudelairiennes entre la pensée pure et la poésie pure. Nous n'allions pas seulement d'un sens à un autre sens, mais des sens à l'âme.
[wondering in awe] La poésie ne serait donc pas un accident, un détail, un divertissement de <l'être ?> Elle pourrait être le principe même de l'évolution créat<rice ?> L'homme aurait un destin poé<tique ?> Il serait sur Terre pour chanter la dialectique des joies et des <peines ?>

[wait ~15s]

(Si ce qui dure le plus est ce qui se recommence le mieux; Si ce qui dure le plus; qui dure le plus) [p] Si ce qui **du**re le **plus**; Si ce qui **du**re le **plus** est ce qui se **re**commence le **mieux**; Si ce qui **du**re le **plus** est ce qui se **re**commence le **mieux,** nous devions ainsi trouver; Si ce qui **du**re le **plus** est ce qui se **re**commence le **mieux**, nous devions ainsi trouver sur notre **che**min la notion de **rythme**; la notion de **rythme**; la notion de **rythme**; nous devions ainsi trouver sur notre **che**min la notion de **rythme;**
[unison, p] Si ce qui **du**re le **plus** est ce qui se **re**commence le **mieux**, nous devions ainsi trouver sur notre **che**min la notion de **rythme** comme notion **tem**porelle **fo**ndamentale. [*fine*]