Detroit Techno – The Aesthetics of Music without Stage and Performance

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May 2013

Master's Thesis

Institute of Sonology

Den Haag

Abstract

This thesis examines the musical workings and perception of 1990s Detroit Techno as a mutual socio-musical process between producers, DJ and dancers. The way Techno is communicated is shown as a self-tuning system mainly based on non-symbolic, intrinsic musical functionality. Systems like these have no centre of attention and origination, which is reflected in the absence of stage and performance in early Techno. The social implications of Techno are discussed in context of *multiplicity*, a crucial term for the different compositional concepts both of Dick Raaijmakers and John Cage.

Keywords:

Auditory Scene Analysis, Cognitive Science, Dance Floor, Detroit Techno, Embodied Cognition, Movement, Multiplicity, Musical Communication, Sampling, Self-tuning system, Step Sequencer;

Acknowledgements

I have to thank The Institute of Sonology for two equally dense as inspiring years. Probably there has been no other period of my life in which I learned so much about music. The artistic openness towards my project, despite its somewhat non-sonological character, was in every respect outstanding.

Furthermore I want to thank my parents, my sister and my brother for their sustained mental and practical support and the substantial interest with which they follow my musical development.

This thesis would not have been possible without Martin Retschitzegger and Michael 'Duke' Peter, our heated discussions about Techno and the many nights we spent in Berlin's clubs.

Finally I thank Kathrin Grenzdörffer for the happiness I am still unable to grasp.

Contents

Preface

A musical research project about Techno almost 30 years after the origination of Juan Atkins' first tracks inevitably brings up two questions: What exactly is meant by the term Techno after decades in which numerous genres and sub-genres have been created? And, after roughly narrowing down the historical time-span to the years of 1990-97 when electronic dance music reached it highest point in popularity - is there really something new to say, after countless publications dealing just with this musical period?

To start with, this master thesis does not at all intend to propose a general theory of electronic dance music, or Techno. On the contrary, I will deliberately extract some specific features from the music produced by only a handful of artists like Jeff Mills, Mike Banks, Robert Hood, Joey Beltram and Basic Channel. Although these musicians have certainly been very influential for the musical development of club music, even the strictest definition of (the) Techno Music (of that time) would have to include many more artists and musical approaches.

To address the second question, writing about popular music in general has always been difficult for musicologists in the more academic realm. Many people would agree that there is not much to analyse in pop music, apart from the text. In addition to that, there is usually no text at all in Techno music and consequently even less of a musicological tradition dealing with it.

In fact, most of the books written over the last 20 years are much more interested in sociological aspects of Techno, its group codices, fashion, and drugs, than in explaining the actual musical experience. The specifics both of production and reception are usually touched only superficially if at all. As the traditional musicological approach seems incapable of a satisfying description, I'll refer to cognitive science for an explanation of the Techno dance floor - considering music production as well as reception.

In addition to that, the history of Techno has usually been told as one of obvious musical roots and predecessors including almost all pop-musical genres. While I would of course never deny the prominent overall role of Krautrock and Disco, the influence of Jazz, Hip Hop, Soul, Punk, Funk, Synth-Pop and even Rock, all these 'roots' are just isolated ingredients in my

opinion. They do not show, what sets Techno really *apart* from other genres.

I for one experienced Techno as something elementary new, which followed neither the rules of popular nor classical music. So looking for musical antetypes of Techno has never been appealing to me. In contrast, comparing Techno to completely different music with no apparent similarity whatsoever, will not only highlight the obvious differences. Furthermore this approach will also reveal a common set of artistic and philosophical questions, despite the difference between the answers. Being a student at The Institute of Sonology, Dick Raaijmakers is a logical choice for a contrasting aesthetic. John Cage, being a composer I am very familiar with and a famous antagonist of Sonology, will be Raaijmakers' antagonist in the framework of this thesis as well.

By following this road I also hope to explain the practical part of my master project. Ideally, the discussion of Techno would not only help to understand my music's constraints and oddities. The other way round, the music I composed in the course of this project might highlight some aspects of Techno which are almost forgotten or have never been seriously discussed.

1 Introduction - Towards a Definition of Techno

1.1 Genre and Sub-Genre

Techno is not a clearly confined concept: In the 1990s it stood for electronic dance music in general on the one hand, and on the other for a sub-genre of it, bordering on things like House, Drum'n'Bass, Trance or Ambient. The drawing of boundaries between the individual stylistic trends was likewise accompanied by many questions from the very beginning. That is also and particularly true of the distinction between Techno and House. However, some objective criteria can be identified for that distinction, as explained below. Therefore when 'Techno' is referred to in this text, the sub-genre is meant throughout; its profile is derived from a comparison with House. My observations concentrate on the period from ca. 1990 to 1997, when Detroit Techno and Chicago House left their birthplaces, and in interaction with the European scene turned into something new.

It is a problematic but nonetheless inevitable decision to refer strictly to so-called 'Underground Techno' in the course of this thesis, as opposed to more commercial forms. This is problematic because for a comprehensive theory of Techno, the 'masses' and their response to Techno music had to be a weighty and fascinating chapter. So trying to describe Techno at its core as a strictly non-elitist music while leaving out more mass-compatible styles may be strange. For pragmatic reasons though, this thesis has to restrict itself to a small section of Techno, fully aware of this decision's contrariness[1]. On the other hand even 'Underground Techno' in its purest form was open to a very heterogeneous audience. In Berlin's legendary Club 'Tresor' for instance, a place where I spent many nights of my life, the public was quite representative for the whole younger generation of the 1990s, money being no factor of the door policy. So the music as well as the musical practice you could find in Tresor is a good starting point for my definition of techno.

An overview of the history of Techno and its further development would probably be helpful for the reader at this point. As this is not the intended subject of this thesis I would instead

1 The word 'mass culture' has often been used in descriptions of the 1990s' Techno scene. For this discussion and the often contradictory use of the term 'mass' itself refer to Gabriele Klein's insightful book *Electronic Vibration* (2004)

like to recommend the following books: Ulf Poschardt's *DJ Culture. Diskjockeys und Popkultur*[2] for a general overview and Felix Denk's / Sven von Thülen's *Der Klang der Familie. Berlin, Techno und die Wende*[3] for a more Berlin-centred point of view.

1.2 The DJ

Techno and House are based on a similar form of musical offering: A DJ selects the disks in response to the reactions of the public, creating an improvisatory mix by using several turntables and a mixing console. However at the beginning of the 1990s this creative achievement was not yet in any way perceived as a performance. Typically the dancers even turned their backs on the DJ, so no attention was being focused on a centre. That was also part of the self-perception of the DJs of this early period. A star cult only developed over the course of the years.[4] While the DJ's role was of course more important for Techno than for other genres of that time[5], this role was first and foremost that of a receiver for the dancers. DJ Westbam, while belonging to the driving forces of the commercialisation (!) of the German Techno scene, categorised four levels of DJing:

- Opportunism: The DJ totally subordinates the audiences' wishes.
- Egocentricity: The DJ doesn't care of the audience at all.
- Despotism: The DJ overwhelms the audience. Note that this is on a higher level than simple egocentricity because a despotic DJ has to be aware of the audience.
- Collective authorship: 'The highest level is reached, when there is in fact no contradiction any more between the DJ and the crowd. When the question who is obeying whom ceases to exist. When everything falls into place for the crowd and the

2 Poschardt 1997
3 Denk and von Thülen 2012
4 The emergence of DJ stars was discussed extremely critically in the 'scene'. The first German DJ stars Maximilian Lenz (DJ Westbam) and Sven Väth were reproached in an admittedly knee-jerk reaction, but perhaps not entirely wrongly, for selling out to commercialism. In the case of international big names, first and for foremost Jeff Mills, the problem lay more in their great virtuosity which was regularly gawped at and filmed by great clusters of people all round the DJ console, getting in the way of the rest of the public in their dancing.
5 In Hip Hop, while demanding greater technical skills from the DJ than Techno does, the DJ's role is more one of a musical backbone than a focal point.

DJ, transformed into a new flow. Without any question of power and will. At this point, I feel, music has its freeing effect on all participants. This is the highest level of DJing. Then, everybody is dancing with everybody.'[6]

Considering the last, highest level it is more than debatable to put the DJ's role in the centre of the discussion[7] instead of considering the whole process he is only one part of.

1.3 DJ Tools

For Techno in particular the musical dynamic between DJ and public resulted in the pieces put on being understood increasingly as the raw material for an improvisatory mix[8], but not as completed artworks, important in themselves. There was correspondingly little inclination for people to put themselves forward as the authors of these pieces.[9] The concept of the 'DJ tool'[10] was derived from such disks; however fanciful they were, they always kept their eye on the capacity to connect up to pieces by other producers. How exactly this connection works on the musical and perceptional level is the core of my understanding of Techno and will be examined in detail in chapter 2.

The general principle of the DJ tool favoured the dissolution of typical pop music fetters in the further development of Techno (House producers were considerably more conservative in this respect). As two disks in different keys can only rarely be mixed successfully, Techno often dispensed totally with tonality[11]. In typical 'Acid Techno' the synthesizer's filter frequency, resonance and envelope were preferably set in such a way that the fundamental

6 Westbam 1997, 71-72. Translation by me. As a side note, Westbam was a true master of this balancing act, especially considering the huge number of dancers he usually played for.

7 Poschardt's influential book *DJ Culture. Diskjockeys und Popkultur.* (1997), while worth reading from a descriptive point of view, demonstrates this conceptional misunderstanding just in its title.

8 I would ask you to bear this in mind when listening to the enclosed CD. CD Track #01 Jeff Mills: Mix-Up Vol.2, 1995 is a clip from his DJ set in the 'Liquid Room' in Tokyo and should give at least some impression of the possibilities that DJ tools open up to an extremely accomplished DJ. This clip is also recorded on video, and is well worth watching: http://www.youtube.com/watch?v=6-6x0NeeAQc 5/12/2011

9 For example, the Berlin duo 'Basic Channel' had their first disks mastered and pressed in Detroit, to make their role as authors as invisible as possible. And in the following years there were no published photographs of them, hardly any interviews, and even fewer live appearances by them.

10 From the mid-90s, as a result of attrition this concept increasingly became an abusive term for pieces that concentrated too comfortably on functional aspects of danceability.

11 Most of the audio examples included in this thesis however demonstrate that tonal material as such is of course not ruled out.

tonal pitch could hardly be recognized any more. The tendency to use noise-like sound material in Techno can also be explained in exactly the same way. A similar development took place in time and arrangement: Techno tracks from this period often had no musical sections longer than a single bar, generally a very short one[12]. So in the end, song, text and melody played hardly any role. As against this, House remained much nearer to traditional song structures[13], there was more of an attempt to facilitate harmonic transitions between two disks by means of skilful arrangements.

Connectivity as the main feature of the DJ tool also relates to the balancing act between danceability and experimental interest: The self-perception of explicitly experimental formations like Autechre or Mouse on Mars completely disregarded the danceability of their music. Producers who devoted themselves to Techno in the sense explained above, on the other hand, explored the boundaries of what could still be understood in some way as dance music, or as a however bold contribution to an otherwise functional DJ Mix. The reception of music became the central focus of the experiment[14], which could be prepared only partially by the producer in the studio. DJ Tools therefore enabled DJ and dancers to be equally involved in the creation of the musical progression.

1.4 Live Performance in Techno

From the very beginning producers tried to improvise live with their equipment, with varying success. A whole host of technical and aesthetic problems cropped up that became apparent especially in direct juxtaposition with DJ sets. First of all the live sets of the 1990s could not be elaborated, cut and mixed in the same way as the mastered disks that were available to the DJ. In addition the number of sound parameters that could be simultaneously controlled

12 CD Track #02 phylyps: *trak II, 1994.* phylyps is a sub-label of Basic Channel, and *trak II* is a prime example of an artistically successful DJ tool. The tonality of the contrabass is hardly discernible, the beat structure remains unaltered over long sections, and the tonal information content of the minor chord is practically meaningless in its isolation.

13 Accordingly the mix techniques of Techno and House also developed in divergent ways. As extreme opposite examples we may mention the Detroit DJs Claude Young and Blake Baxter: Whereas one created an often confusing mix fissured by techniques taken from HipHop, the other frequently filled in his long-drawn-out transitions with sung improvisations.

14 The early 90s' club scene as a whole was certainly experimental, if not completely illegal, for each individual participant.

manually did not allow the complex sonic progressions of a multi-track recording. So the live improvised versions of pieces that had already been published on disk often seemed one-dimensional in comparison. With technological progress the objection of inadequate elaboration of the arrangement and mixing gradually ceased to apply. Software solutions[15] have allowed live sets for quite a long time now, and with appropriate preparation they can co-exist tonally alongside DJ sets without any problem. At the same time that raises the question of what is necessarily still 'live' about the performance. But above all there is still nothing that could replicate the spontaneity with which a DJ can react to the public with pieces by quite different producers.

The contradictions on the visual level turned out to be even more severe: Producers who best liked hiding behind their machines in their authorial role found themselves back in a concert situation. As the majority of the musically necessary interventions did not lend themselves to being staged, a certain pressure to put on a show came about. Many live acts reacted with a tactic of refusal and performed say through a curtain, separated from the audience. But as a rule the show often fizzled out in half-hearted head-nodding in time to the music and the spurring on of the public, which compared with the conclusive role of the DJ seemed like a regression into communication patterns believed to have been overcome.

For some years attempts to play Techno 'by hand' with instruments have become increasingly fashionable. The band 'Whitest Boy Alive' imitated classics of Detroit Techno in polished, chilly rock arrangements, and Jeff Mills too had his old pieces replayed by a symphony orchestra. Irrespective of the commercial success of these ventures it is patently obvious how much the note sequences whose simplicity first made tonal complexity possible in the Techno context decline into banality directly they are re-enacted by people.

Nor is the point of attempts to create something new in the field of today’s Minimal Techno using classical instruments and contemporary composition techniques completely clear. Of course I do not want to deny the quality of say pieces by Brandt Brauer Frick[16]. But it remains an unanswered question of where the aesthetic gain of transferring tasks to physical musicians lies when these tasks could be performed possibly better by samplers.

In the area of House these problems were far less pronounced. For one thing the

15 Appearances dispensing with Ableton Live have become rare.

16 http://www.brandtbrauerfrick.de/index.php/video-reader/items/the-brandt-brauer-frick-ensemble.html May 2011

incomparably more prominent role of song implies the appearance of a singer.[17] For another even the extremely virtuoso live-sampling performances of someone like Matthew Herbert would be inconceivable in the context of a decided Techno aesthetic both because of his strong affinity to fairly traditional Jazz harmonics and because of the loading of his performances with political and social-criticism content.

To sum up, the musical form of a concert seems to be inappropriate for Techno in general. Even after more than 20 years the manifest contradiction between Techno aesthetics and live performance has not been satisfactorily resolved. Perhaps it has not yet even been formulated in musical terms.

1.5 Between Aesthetics and Technology

As regards the scholarly description of electronic sub-cultures and their interpretation in terms of art philosophy, until now experimental electronica has been the central focus of interest. This music, also (and somewhat tendentiously) called 'Intelligent Techno' has been studied and appreciated in various articles[18], generally linked with the assumption that the knowledge acquired could be transferred to dance floor Techno without any problem (because of its orientation to dance, 'regular' Techno was commonly regarded as a less radical variant of this music). As a rule the contrasting structures of the musical production and reception of experimental electronica and Techno are deliberately overlooked.

On the other hand, musicological literature definitely relating to Techno has long been very thin on the ground. There are several reasons for this. The most important is certainly that the formal analysis of a piece seems less fruitful if it emerges without distinguishable units of meaning: No text, no singer, no melody and no attitude to identify with. Furthermore the production techniques used are sometimes quite trivial, like the use of drum synthesizers for example, but on the other hand often very difficult to convey.[19] It is therefore no accident that even discussions of new phenomena in the scene magazines are seldom concerned with

17 The singer Robert Owens as 'the voice of Chicago House' has been omnipresent for decades.
18 By way of example, and very well worth reading: Cox 2003
19 Refer yet again to Trak II of Phylyps as an example: In the end it is impossible to decide definitely whether the chord comes from a modulated synthesizer or say from a multi-voice resonator.

technical details. Instead there has always been a preference for writing about the sociological aspects of Techno in order to get close to its aesthetics in that way. As a current example mention may be made here of Tobias Rapp's *Lost and Sound*[20]; while it certainly provides very illuminating insights into the Minimal Techno scene in Berlin, already in the introduction it frankly admits that it deals only with promoters, musicians and dancers, but not with the music itself.

One of the few musicologists to try to analyse Techno as dance music is Ansgar Jerrentrup.[21] This author seems either not to listen discerningly enough, or to listen to the wrong pieces. He interprets the requirement for danceability merely as an impediment to greater creativity.

Where thought is given to Techno as music, in most cases this happens in connection with the phenomenon of sampling. On the one hand this might well again be because the theme of sampling is much easier to grasp without profound technical knowledge than the subtleties of electronic production techniques. On the other, just like the overemphasised role of the DJ, it provided a welcome starting point for popular discourses on music theory. In the opinion of some authors, the innovative potential of Techno lies in a 'post-modern' procedure with sampling: Whereas the quoted elements in HipHop still retained their referential character, in Techno they were misappropriated to the point of becoming unrecognisable.[22] By this manoeuvre Techno was made to comply with the fundamental idea of a 'musical deconstruction'.[23]

Of course there is no intention here of disputing that sampling became increasingly important for Techno over the course of time - as for many other genres. But several observations spring to the eye: Firstly, many samples used in Techno tracks are very well recognisable at least for the connoisseur. Secondly, it would be hard to prove that samples used in other genres always retained the reference to their source. And thirdly and most importantly it cannot be overlooked that many style-shaping Techno tracks emerge totally without sampling.[24] So the only useful insight of the whole debate seems to be that Techno aesthetics are not about the origin of any specific sound in use, be it synthesis or sampling, but about the way sounds are organised in relation to others.

20 Rapp 2009
21 Jerrentrup 2001
22 On this see e.g. Fiebig 1999
23 On this see Poschardt 1997
24 The majority of the tonal examples listed by me are also among them.

Instead of sampling, the use of step sequencers (a sound organising device) is a commonly shared technological feature that could help to define Techno[25]. Probably all the audio examples included with this thesis were made by using step sequencers, in the one or the other form. Beats were almost always generated by drum synthesizers like Roland's TR-808 and TR-909 which both contained a step sequencer with trigger tracks for each part.[26] Acid-Techno would have been inconceivable without the simple TB-303 bass synthesizer with its equally simple built-in step sequencer.[27] As external devices, they were frequently used only in their basic functions, which even so could produce enormously complex results.[28] All the same there are many examples of polyrhythmic structures[29] and/or the simple possibility of putting in and deleting notes.[30] It is far rarer to find transpositions and variations of pitch.[31]

Consequently in my analysis of Techno the question of sound generation will always be thought in the context of sound combination, sequentially and spectrally. The central focus is again on connectivity - not only between several pieces during a DJ mix but also from sound to sound on the level of a single piece.

1.6 Summary

As we have seen there is no standard musicological approach to Techno which could restrict itself just to examine how this music is produced. Instead the musical practice in which Techno is being created and perceived seems to be a communicative system. Consequently I will first describe the immanent functions of that system, its components and their interplay. Therefore I will introduce and apply different approaches of cognitive science. The findings will subsequently discussed in a more artistic context by opposing them to the concepts of John Cage and Dick Raaijmakers. This will be the subject of the following two chapters. In the last chapter I will briefly discuss the technical background and aesthetic peculiarities of my own music in relation to Techno.

25 For House it was much more important to play beats, melodies and chord sequences manually.
26 CD Track #04 Jeff Mills: Curse of the Gods, 1992.
27 A representative example is CD Track #03 Circuit Breaker (Richie Hawtin): Overkill, 1993
28 CD Track #05 Jeff Mills: Medusa, 1996 set the benchmark in this respect
29 The very elegant CD track #06 Jeff Mills: Growth, 1995
30 CD Track #07 Robert Hood: minus, 1994
31 CD Track #08 Mike Banks: skypainter, 1992

2 Intrinsic Functionality

2.1 Cognitive Science versus Sociology

As I pointed out in the introduction, sociological examinations of Techno have been the most promising approach so far, because sociology's subject is the coaction of people. There is also a strong tradition to conceive of society as a communicative system containing lots of sub-systems. The description of a Techno party through the means of system theory, based on the sociological works of Niklas Luhmann[32], yielded highly interesting results in Johannes Windrich's dissertation in literature on German writer Rainald Goetz[33]. His reading highlighted an often-overlooked aspect of Luhmann's theory, a distinctive feature of the arts' communicative structure: In contrast to all other systems (apart from love), the process of acting and experiencing takes place *synchronously*, in *all* participants of an artistic communication[34]. The appreciation of reception on both sides leads to a convincing philosophical explanation of the structure between DJ and public on the Techno dance floor. Johannes Windrich also analyses some well-chosen Techno records thus explaining the aforementioned concept of DJ tools[35], which he derives directly from this communicative structure.

However, there are some open questions which relate explicitly to music, not to philosophy (or literature, for that matter). For instance considering reception and perception playing such a central role, how exactly is reception working in Techno, on both sides, DJ and dancers? What is communicated, what is perceived? What are the communicative paths? What features of Techno music and its production methods are related to that? A truly comprehensive answer to these questions would probably involve extensive neurological research, directly on the dance floor and right in the DJ's head. This is something I am understandably not able to do. On the other hand, lots of research has already been done on the perception of music and auditory stimuli in general. To strive for a better understanding of the body's role in perception seems a logical thing to do in the course of a thesis on dance music. The main references of this chapter will therefore be three books: Lawrence Shapiro's *Embodied*

32 Of particular interest: Luhmann 1998
33 Johannes Windrich 2007
34 J. Windrich 2007, 234-236
35 J. Windrich 2007, 103-163

Cognition[36], Albert S. Bregman's *Auditory Scene Analysis*[37] and Michael H.Thaut's *Rhythm, Music, and the Brain*[38]. The goal is an equivalent cognitive-scientific description to Luhmann's communicative system, providing deeper insight of the musically intrinsic processes typical for the musical practice of Techno.

2.2 Algorithms, Symbols and Dynamical Systems

Until quite recently cognitive sciences had a relatively clear subject matter, consisting of the mind's internal neurological operations necessary for the processing of any sensory input from the surrounding world. These processes have widely been seen as computational algorithms: 'That is to say they involve operations over symbols, where these symbols are entities with a representational content and an arbitrary connection to that which they represent.'[39] These operations have a clear starting point, a middle and an end, which could be for instance a motor response. If there is no input, there is no activity, as the mind is passively 'waiting' for work. The analogy to the computer is also valid in respect to the place where cognition takes place. With the exception of energy supply, the mind is seen as functionally detached from the body and completely set apart from the world. Cognitive scientists 'tend to draw the boundaries of *cognition* at the same place that a computer scientist might draw the boundaries of *computation* – at the points of interface with the world'[40]. Due to this strict separation, sensory input always lacks crucial information, but the learned, rule-based computation on the input gives us a comprehensive representation[41].

In the 1960s, things became more unclear with J.J. Gibson's Ecological Theory of Perception. According to him, perceptual input is not at all inadequate, because 'the available stimulation surrounding an organism has structure, both simultaneous and successive'. This structure 'depends on sources in the outer environment', which means for the brain that no processing at all is necessary in order to construct information[42]. Gibson introduces the term of *invariant*

36Shapiro 2011
37Bregman 1990
38Thaut 2005
39Shapiro 2011, 14
40Shapiro 2011, 26
41Shapiro 2011, 28
42J.J. Gibson 1966, quoted after Shapiro 2011, 30

features in the observer's environment. An example in vision is the reflection of light which can provide a lot of information about the shapes, edges and surfaces, without any additional computation of the mind: If a surface reflects light in a uniform way no matter the angle you look at it, it is probably a coherent surface and belongs to one and the same item. This information is not accessible for a passive mind though, because the invariances can only be detected by movement, through multiple viewpoints. The same is true for spatial listening which is based on tiny, unconscious head movements. Environmental information emerges '*as* invariant only in the context of change', which requires an active observer. Gibson concludes that 'the function of the brain when looped with its perceptual organs is not to decode signals, nor to interpret messages, nor to accept images'. In other words, there are no representational symbols at all in his model. Instead, 'we can suppose that the centers of the nervous system, including the brain, resonate to information'[43]. That means, by hunting invariant features in the environment perception is tuning itself for an already structured input. Unfortunately Gibson fails to explain how the mind should be doing this - 'he gives no indication as to how an observer recognizes and uses this information'[44]. So in the end Gibson's fundamental for a self-tuning system is not completely satisfying.

Nonetheless Gibson's findings have inspired many alternative, more recent approaches to cognition. One of them is the Theory of Replacement, which has a lot in common with Gibson's Ecological Theory, especially its denial of computational, symbol-processing models. One of the most favourite models of Replacement theory, Shapiro reports, are dynamical systems.

> A dynamical system is any system that changes over time. Dynamical systems *theory* (DST) is the mathematical apparatus that describes how systems change over time. The first step in describing the behavior of a dynamical system is to identify those parts of it that change. The second step is to map out all the ways in which these parts might change.[45]

Another strength of Dynamical Systems Theory is its capability to describe a feedback loop of causal actions which results in a coupled system:

> Systems, or parts of systems, are coupled when the mathematical description of the behavior of one must include a term that describes the behavior of the other.[46]

43 J.J. Gibson 1966, quoted after Shapiro 2011, 35/36
44 Shapiro 2011, 38
45 Shapiro 2011, 116
46 Shapiro 2011, 118

Above description is quite obviously related to Luhmann's Systemtheorie, although on the technical level, not the human. But as 'dynamical systems theory can be used to explain just about everything'[47], it is worth of further investigation.

Tim van Gelder uses a technical invention by James Watt in order to highlight the differences between computational models of cognition and dynamical systems: The centrifugal governor, used to control the throttle valves of steam engines. This is a task which a regulation mechanism based on algorithmic, symbolic processing would solve like this:

1 Measure the speed of the flywheel.
2 Compare the actual speed against the desired speed.
3 If there is no discrepancy, return to step 1. Otherwise,
  a measure the current steam pressure;
  b calculate the desired alternation in steam pressure;
  c calculate the necessary valves adjustment.
4 Make the throttle valve adjustment.

Return to step 1[48]

Worth noting is the essential role of measured values for speed and steam pressure, over which computations are made, the values being meaningful representational symbols. Watt found a different, very elegant solution: he attached flyballs on the vertical axis of the engine's flywheel. Depending on the rotational speed, the flyballs' distance to the axis changes, thus closing or opening the throttle valve accordingly.

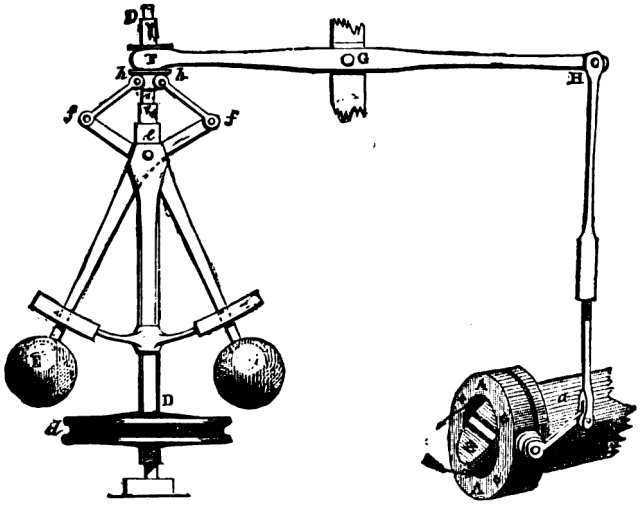

Fig.1 Watt's Centrifugal Governor

47 Shapiro 2011, 118
48 T.v.Gelder, quoted after Shapiro 2011, 120

This is an example of a 'cyclical pattern of causation and coupling', where 'speed of the flywheel, height of the flyballs, and opening of the throttle valve are continuously dependent on each other'.[49] This implies that there is also no order of action specified, as well as no clear beginning nor end of the process – all of which are crucial features of computational models.

From the passionate Techno dancer's view, this metaphor is immediately convincing. There are a lot of questions you tend to ask *not* on the dance floor: what algorithm are the sounds based on? What is the DJ doing? In what key is the music written? What are the rhythmical patterns? Am I listening to one single record or to a mix of several? What is the musical form? What are the composer's intentions? What is this doing to me? What does that mean for society and mankind?

Admittedly, I do ask such questions at least sometimes. This might be due to my classical training or my professional interest. But on the other hand, I always find reflections like these distracting when they happen to me on the dance floor. They pull me out of the auditory stream, interrupting the process of perception. This is a point that sets dance music in general apart from classical music, where I experience my own efforts to comprehend the musical structure not at all as disturbing. On the contrary, previous knowledge about the composer's intellectual background is said to enhance the musical understanding of his pieces, something I am happy to confirm for my part in most cases. It is furthermore common sense that the point of listening to classical music is to reason about the composer's intentions, be it on the emotional, structural, philosophical, ethical or political level. It must also be said the same principle holds true for popular music, the communicative structure is the same: There is a message to understand, as well as the people expressing it. In contrast, on a Techno party people usually do not know whose record they hear and they do not care much. It seems not very important for the listening process. There are only two typical situations for the kind of reflections I described above: When I like what the DJ is doing but I am not dancing (yet) or, while dancing, when I am musically overwhelmed and somehow have to protect my mind from sensory overflow.

Personal reflections, thoughts and judgements, are apparently no constitutive part of the communicative system of DJ and dancers. Of course they might be triggered - Techno has inspired many people to think and write about. More so, it would be much harder to imagine

49 Shapiro 2011, 122

the other way round, that people would not at all reflect their experiences. But if thoughts are not the very subject of musical communication in Techno, it is an indicator that the inner workings of this music are not based on the processing of symbolic representations. This in turn explains why musical reflection in a more classical sense always pulls me out of the musical *process*.

Another indicator for the non-representational nature of Techno is its dependence of capable loudspeakers. This may sound trivial at first, but it is worth a closer look: Classical music is generally considered complex music, where even the most subtle nuances of an interpretation matter. Consequently, the knowledge and technology of recording classical music is without any doubt highly developed. A state-of-the-art recording of say Wagner's 'Götterdämmerung', known for its outstanding musical complexity, usually involves world-class artists, sound engineers, rooms and equipment. All the more relevant is the question how this recording is usually heard by the music lover. Probably only few of them have enough money, interest and knowledge to buy and properly set up a nice pair of loudspeakers, let alone suitable rooms. Conversely, many people listen to music in their cars, through computer loudspeakers or even mono radios which might be seen as an abundant mismatch. But the relationship between quality of the playback situation and musical joy is, while evident to some degree, apparently not proportional. An especially drastic example is a good friend of mine, who knows the works of Beethoven, Wagner and Bruckner almost by heart. He even prefers mono to stereo recordings and does not care at all about the quality of playback. Nevertheless he is one of the most passionate music listeners I know. When I notified him of the (more than obvious) distortion of his turntable, he answered that he hadn't noticed it and furthermore that the actual listening took place in his head, filling all the gaps. While admittedly an extreme case, it shows how a lacking sensory input can be completed by a mental apparatus of assumptions, executing computations following musical rules. This I believe is possible because Wagner composed his music by processing of symbolic representations, not only in the immediate sense of writing a score using Leitmotive. If you are, as my friend, an educated listener that has learned how to listen to classical music, then you know what the double basses are playing, even when you barely hear their masked overtones through a small mono radio. If I on the other hand would be listening to a Techno track played back by the same mono speaker, I could probably judge to a certain degree the producer's concept and arrangement, his rhythmical skills or the sound sources. I could therefore appreciate his achievement,

because I have learned how listen to Techno and know its rules. But could I enjoy it? Would I start dancing? Would the way I drive a car become dangerous, because I get too ecstatic? The latter, my friend does quite often, especially when listening to Hagen and Alberich, but surely I would not when listening to Techno on inadequate speakers. The reason therefore is again that Techno does not communicate a lot of representational symbols, in other words, barely any meaning. If the bass is missing in playback I cannot mentally reconstruct its impact on me. If transients are reproduced too slowly by the speaker, beats loose their point. Without a proper stereo set-up I can never get lost in Basic Channel's sophisticated artificial rooms. Of course, you might argue, the quality of playback is more important for any kind of electronic music than it is for acoustic pieces. Firstly because there are not many previously known sound sources whose information the mind can quite easily replace if missing. Secondly because sine waves below the speaker's frequency range are simply inaudible, in contrast to the example of the double bass whose missing fundamental does not matter that much. I would concede that the intrinsic experience of listening as such has become increasingly important to acousmatic music in general. I'm neither claiming that Techno music works without *any* representational symbols – for example, after a while it becomes quite easy for the connoisseur to recognize popular instruments, typical chord progressions or rhythmical patterns. Nor do I think that any music can possibly consist *only* of symbols. But I believe it is a quite safe statement that most music's emphasis is still on the communication of meaning, ideas and emotions, in contrast to Techno, where symbols are in conflict with the intrinsic impact of music.

We have seen that there is an obvious similarity between Luhmann's Systemtheorie and Dynamical Systems Theory. The discussion also put forth an important distinction between symbolic communication and intrinsic impact of music. Unfortunately many advocates of DST claim that there exists no processing of symbolic representations at all. This would make any explanation of musical communication very difficult. A more open systematic model which accommodates both ways of communication is required.

2.3 Constituents of Extended Cognition

The Constitution Hypothesis is, compared to Replacement Theory even more radical. Many researchers on extended cognition do not only deny the brain's functional detachment from the body, but also that from the world. On the other hand it is less radical because it acknowledges the existence and importance of representations and the computational processing on them. This could turn out to be a successful way of describing the processes underlying the musical practice of Techno. Let us first take a closer look on the location of cognition:

> Whereas standard cognitive science puts the computational processes constituting the mind completely within the brain, if Constitution is right, constituents of cognitive processes extend beyond the brain. Some advocates of Constitution thus assert that the body is, literally, part of the mind.[50]

Cognitive processes typically involve not only body activity, but also the use of items in the surrounding environment. Constitution therefore argues that these items are themselves part of the cognitive process, just like the body movement making use of them. The difficulty is then 'to distinguish *constituents* of the mind from mere *causal influences* on the mind'. In other words, body and world have to be something that is not just causing a process but is part of it:

> The debate over Constitution turns on whether the body and world are *important* or *central* constituents in cognitive processes, such that cognition would break down, or be incomplete, or be something other than what it is, without their constituency.[51]

There is some evidence in favour of this hypothesis. For example, people are using gestures while speaking. They are using them not only as a communicative support, but also in darkness, during a telephone call or a soliloquy, where there is obviously no communicative benefit to them. However this does not mean there is no benefit at all. Experiments showed that subjects solved tasks of spatial reasoning faster when they were allowed to use gestures, and had 'more difficulty 'finding the words' to describe spatial situations' when they were not. Surprisingly, when the task consisted of non-spatial problems, it was the other way round.[52]

50 Shapiro 2011, 158-159
51 Shapiro 2011, 159
52 F.Rauscher, R.Krauss and Y.Chen (1996). 'Gesture, Speech and Lexical Access: The role of Lexical Movements in Speech perception,' *Psychological Science 7*: 226-31, quoted after Shapiro 2011, 173

For Andy Clark, one of the most important researchers of extended cognition, this is an example where

> ...we confront a recognizably cognitive process, running in some agent, that creates outputs (speech, gesture, expressive movements, written words) that, recycled as inputs, drive the cognitive process along. In such cases, any intuitive ban on counting *inputs* as parts of *mechanisms* seems wrong. Instead, we confront something rather like the cognitive equivalent of a forced induction system.[53]

This analogy's similarity to Watt's centrifugal governor is no accident, and in fact advocates of constitution think of cognition as a dynamical process between brain, body action and world. As convincing the results of this and many more experiments on gestures might be, the question whether they are to be considered just simple contributing factors of cognition (the standard cognition point of view), or a constitutive part coupled to it is subject of heated debates. Shapiro concedes 'that in some cases the debate over Constitution does tip dangerously close to a merely verbal dispute'.[54] The most important difference between constitution and standard cognitive science is the brain-centrism of the latter,

> its assumption that the constituents of cognition must fit within the boundaries of the cranium. Because standard cognitive science is unwilling to *extend* its explanations to incorporate non-neural resources, it will often fail to see the fuller picture of what makes cognition possible, or will be blind to cognition's remarkable ability to self-structure its surrounding environs.[55]

As fascinating the ongoing scientific debate about how cognition works is, this thesis does not dare to propose a solution. If anything, the discussion of different scientific concepts wants to show their potential for musical discussions: For instance, in a concert the audience's response might be to some degree a constituent of the *performance*, but definitely not of the *score*. Usually, interpreters report, the audience's presence motivates them to take a bit more risk in technical terms thus playing more lively. But the constructive properties of the piece remain pretty much unchanged. In improvised music it might be a bit different when players are actively perceiving the audience. Similarly, a musical instrument can be conceived of as a constituent of musical thinking. This is something which I as a violin player would intuitively like to confirm, especially when improvising. Just to make sure this does not sound too esoteric, the violin is not thinking *itself*, it is just coupled to the process, with all its features.

53 Clark 2008, 131
54 Shapiro 2011, 159
55 Shapiro 2011, 209

The examination so far puts forth the following hypothesis: Dancing is a constituent of Techno practice. It is not just a self-evident reaction to the music, as you could say about any sub-genre of dance music. Dancing actively enhances the sensual experience of Techno and the dancers' movements are 'recycled as inputs' to the DJ thus driving the musical process. Reception tunes the music for its purpose; dancers and DJ are therefore constituents of a common cognitive process, synchronously acting and experiencing. To foster this hypothesis, the following questions have to be answered:

- What exactly are representational symbols in music?
- What are the intrinsic, non-symbolic features of Techno?
- How does their perception work on the individual dancer's level?
- How exactly does dancing change auditory cognition?
- Is the observation of other dancers' movements a constituent of auditory cognition too and, with respect to the DJ, influences his musical decisions?

In order to shed some light on these questions I will turn to Albert Bregman's *Auditory Scene Analysis*.

2.4 Unstable Gestalts, Ambiguous Scenes

Gestalt Theory's main interest from its very beginnings (then called Gestalt Psychology) has been our ability to connect sensory stimuli and the relationship between the whole and its parts that determines what connections are made. In other words, the combination of individual elements determine the Gestalt of the whole, but also the knowledge of the whole has a strong influence on the combination of the single parts. For a long time, Gestalt Theory was mainly about vision, but even when Christian von Ehrenfels' introduced the term Gestalt Psychology,[56] he mentioned the example of a melody: A melody is more than the sum of its individual tones. It is also possible to transpose all its tones and still it is perceived as the same melody. Also the question what enables us to hear a melody played on the piano against the accompanying chords played on the same piano belongs to Gestalt Theory's subject

56 Tholey 1999

matter. So if we want to know how musical symbols are constructed in our mind, Gestalt Theory is likely to provide elucidating insight.

One of the most prominent scientists that followed the gestalt approach in music is Albert Bregman. His book *Auditory Scene Analysis* is as much about speech perception as it explores gestalt building from the musical point of view. Consequently, my reading of Bregman will have to focus on the latter aspect, always keeping in mind the aforementioned questions of intrinsic functionality versus symbolic representation. Let us first take a look at Bregman's summary of the Gestalt Theory principles: the grouping of elements to gestalts takes place on the perceptual field where various forces of attraction compete with each other. This is an innate and automatic process which we can work against by means of attention, but we can't stop them. The basic attractors are relative proximity, similarity and good continuity (the obvious completion of interrupted gestalts). Elements are *always* perceptually organised and always belong to *one* organisation, even when several possible organisations compete with each other. The way in which we experience for example a single component of a picture is also influenced by the context of the whole picture.[57]

In Bregmans terminology the general process of auditory gestalt building is called stream formation. The fusion of elements to formations is called stream integration, the breakup of one stream into two or more segregation. The auditory forces of attraction are of course frequency (the most powerful), spectral envelope, loudness (and loudness contours), spatial localisation and the time interval between sonic elements. The grouping of synchronous elements takes place in the spectral domain, whereas successive elements group sequentially. About the quality of stream formation Bregman makes a central distinction between unlearned pre-attentive automatic processes and learned context dependent ones. The latter (schema-driven) consists of a conscious selection of information provided by the former (primitive) stream formation. Schema-driven stream formation enables us to combine streams, vertically and on the time-axis, thus creating entities and hierarchies in more traditional musical terms: melodies, accompaniments, harmonics, instrumentation, smaller and larger formal sections, musical genres and listening conventions. So according to Bregman, communication of musically meaningful content is based on learned, schema-driven percepts. Obviously Bregmans fundamental distinction between primitive and knowledge-based processes directly relates to the difference of intrinsic and symbolic-

57 Bregman 1990, 196-202

representational. Reading Bregman bearing Shapiro in mind I take his work as an implicit confirmation that non-symbolic cognitive processes exist, even if the boundary between them is often a bit unclear[58]

During the reading of ASA a few details struck me that could immediately be related to Techno: The repetitiveness of many of his experiments, their tempo and the sounds he used, as well as some technical requirements of his methodology.

To start with repetition, Bregman gives four practical reasons for the experimental use of recycled sequences:

- Long examples are possible while maintaining the same relationship between the single acoustic events.
- The perception is not influenced by starting and ending points.
- Repetition supports the segregation of streams. Listening to loops makes reflection harder: 'For example, when a non-repeating sequence is presented and then listeners are asked to make some judgements about it, they can use the silent period after the termination of the tones to review their briefly persisting sensory memories of the tone sequence and to figure out, in a problem-solving way, the answers to the questions of the experimenter. With a loop, however, a short rapid pattern occurs over and over, continually wiping out these memories and creating new ones, probably too fast to permit the use of slow cognitive processes that use memory to any great extent.'[59]

These reasons, especially the last two, almost sound like stereotype criticism of Techno music: Nothing changes over the course of time and instead of being confronted with distinct musical pieces – with clear beginning and ending - the individual gets lost in the endless mix of a party. The listener falls in trance through the repetitiveness of an otherwise regressive music, that lacks any memorable structure, melody or message[60]. The correlation between repetitiveness and increased stream segregation is indeed seen as a sort of physiological breakdown, a symptom of fatigue by some scientists[61]. Conversely, Bregman gives a functional explanation for the cumulative effect of repetition, which he interprets as an accomplishment:

58 One example are cumulative effects of repetition, see Bregman 1990, 128-133
59 Bregman 1990, 53
60 Klein 2004 gives many examples of the easily predictable feuilleton's view on Techno.
61 S.Anstis and S.Saida, see Bregman 1990, 130

The functional explanation sees the cumulative effect as the way that the auditory system deals with evidence in a complex world. When a series of sounds appear after a silence, the system begins with the simplest assumption, namely that the elements of the sequence have all arisen from the same external source. Only after there has been repeated activity in one or more restricted frequency regions does the system develop a bias toward restricting the streams to those regions.[62]

It is worth noting that this process of evidence-accumulation already needs memory and simple educated assumptions. Bregman confirms its partly belonging to the schema-driven realm[63]. My own interpretation of the cumulative effect sees it as an schema-based affirmation of the primitive stream: *Yes, nothing changed*. As basic as this affirmation might be - it is hard to think of a more basic attentive process in music – it shows us the exact boundary between purely intrinsic functions and representational symbols. This is, I believe, exactly Techno's point of interest, it plays with and around this boundary. Of course it would be unsurpassably boring if the confirmation that sequences do not change *at all* was the whole point of listening to Techno. But while we can only pay attention to one selected auditory organization, the underlying processes of primitive stream segregation captures and prepares the whole auditory input, regardless of attention:

> My current view is that the detailed conscious perception of a sequential auditory structure (a stream) is the result of a description-forming process that is at a higher level than primitive grouping. But the organization and packaging of the sensory evidence to facilitate the construction of such a percept is done in parallel for more than one cluster of evidence at the pre-attentive level.[64]

This allows the theoretical scenario of a music whose perceptual organisation is completely static on the symbolic schema-driven level, regardless of dramatic changes on the primitive level: As long as there is in the pool of possible selections *one* that is more plausible than all the others, nothing would change perceptually. More realistically, constellations in the primitive realm can change without being noticed, until all of a sudden the conflict becomes obvious and the description finally tilts into something new. Exactly this is an integral part of my Techno listening experience: Techno creates ambiguous auditory scenes.

Ambiguity of an auditory scene is very sensitive to tempo. Many experiments of Bregman and his colleagues have examined the influence of tempo on perceptual organisation. All of

62 Bregman 1990, 130
63 Bregman 1990, 133
64 Bregman 1990, 194

them showed a qualitative threshold, where the perceptual organisation changes, higher speeds favouring segregation.

- Bregman and Jock Campbell: The subjects were played three alternating 'high-pitched sine tones of different frequencies and three low-pitched ones. The high and low tones were alternated, and the sequence was played to subjects at 100 milliseconds per tone in a repeating cycle.' The subjects couldn't tell the right order of the tones and reported two streams of three adjacent notes instead of one stream of six alternating tones.[65]

- In Leo van Noordens experiments on temporal coherence boundaries, onset-to-onset times of the notes varied between 60 and 150 ms. At a repetition rate of 150 ms, the l istener can 'decide' whether to hear one integrated or two separated streams when the intervals are in the range of 4-12 semitones. With increased tempo the ambiguous range of frequency separation gets smaller, making control over the selection of segregated or integrated percepts easier. According to Figure 2, the ambiguous interval range for a repetition rate of 125 ms is approximately between 3 to 10 semitones. For a repetition rate of 100 ms, the range is between 3 and 6 semitones.[66]

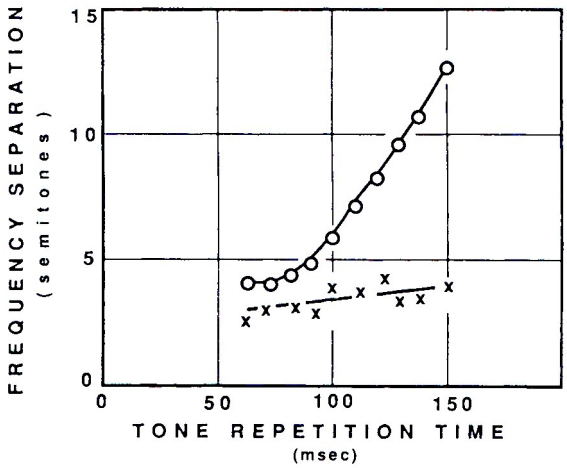

Fig. 2 Temporal Coherence of Auditory Streams

- Anstis' and Saida's results 'showed that the probability of hearing a single coherent stream fell approximately in direct proportion to the logarithm of the number of frequency alternations per second. They also showed that at a fixed rate of four alternations (i.e., eight tones) per second, the probability of hearing a single stream in

65 Bregman 1990, 50
66 Bregman 1990, 58-60

> a continuous alternation of high and low tones fell linearly with the size of the frequency separation between high and low tones expressed in semitones.'[67]

These experiments show a tendency to segregate streams at repetition rates between 100-150 milliseconds, which relates to 16th notes at 100-150 BPM. Of course this range varies a bit from experiment to experiment, but the region around 125 BPM turns out to be critical for all experiments. Bregman points out that the influence of tone rate on the task of integrating tones to one stream is much bigger than on the task of hearing the tones as separate streams: While hearing a sequence as integrated becomes very hard with increased tempo, it is relatively easy to hear a sequence as separated streams even at slower tempi, as long as the pitches are not too close to each other. Bregman emphasizes this fact so much because 'the temporal coherence boundary indicates the point at which the auditory system is forced by automatic and primitive processes of organization to segregate the signal into two streams. The fission boundary, on the other hand, measures the limits of an attention-based processing creating a stream by a process of selection.' These are exactly the boundaries I pointed out as constitutive for Techno. The tempo range of House and Techno confirms this correlation. It is typically between 110 and 145 BPM, classic old-school Detroit tempo at 125-135 BPM.

The relation between Bregman's experiments and Techno is also quite apparent when you listen to the examples that come with his book: Most of them make use of simple sounds like sinusoids, noise bursts and occasional basic additive synthesis, usually without loudness contours other than sharp on- and offsets. To say it with Dick Raaijmakers words, he removed all 'human flesh'[68] from the sound's skeleton, which is for example needed to clearly distinguish the effect of frequency versus timbre on sequential grouping. This is particularly important for experiments in which primitive effects shall be examined in isolation from any influences of schema-based formation. The reason why the sounds used for Techno are relatively simple is analogous: If you want to play around the boundary between intrinsic and symbolic processes, you can not move too far away from it. Therefore melodies and acoustic instruments are not well suited because they are firstly so strongly integrated by learned schemata and secondly because the playing inevitably causes unintentional by-products. This makes it difficult to control the segregation of streams with other sounds on the primitive level.

67 Bregman 1990, 64-65
68 Raaijmakers 2005

> We know from ordinary listening that the differences in timbre of instruments favor the segregation of melodic lines in music, and Robert Erickson has composed a piece called LOOPS as an experiment on the effects of timbre on sequential grouping. Unfortunately, the sounds of the natural instruments differ from one another in so many ways that it is hard to say what acoustic factors will integrate sequences. More analytic experiments are required.[69]

Techno is in this respect a very analytic music. To give an example how similar Bregman's experiments and Techno can sound, listen to Robert Hood's *minus*[70] and compare it to the second of Bregman's experiments[71].

Addressing the last point, his methodology, Bregman unveils an interesting problem of measuring the subjects' responses. For instance the measuring *Method of Adjustment* enables the subject to change the relevant parameters himself (in this case the frequency of selected components of a sequence) in order to reach the boundaries of stream integration / separation. At this point, the phenomenon of perceptual hysteresis occurs:

> Suppose listeners hear the sequence as split into two streams. Even when they reduce the separation past the level that would normally yield the percept of a single integrated stream, the perceptual organization in terms of two streams will be held on to just the same. Once the sequence is heard as integrated and the listeners start to increase the frequency separation again, it may require a large separation to split the sequence. The threshold between the two percepts can be so unstable as a result of this hysteresis that the thresholds are very unreliable[72].

Not only this sounds like a promising approach to producing Detroit Techno. Furthermore if you would ask me to design a piece of equipment suitable for this experiment, easy enough to use for musically untrained subjects, I would probably conceive of something that looked very similar to the Variable Function Generator in BEA5: this experiment is the perfect description of the creative use of step sequencers in Techno music. In contrast to playing a sequence on the keyboard, using a step sequencer is a much more analytical approach and usually yields non-gestural successions of notes. All differences between parameter settings of individual steps are typically developed while the device is running in a loop. Consequently the effects of cumulation and primitive stream formation lead the producer in a certain direction. He is interacting with the Gestalt-building forces of attraction along the

69 Bregman 1990, 115

70 CD track #07
71 CD track #09
72 Bregman 1990, 55

boundary of sequential coherence, where manifold perceptual organisations are possible. Therefore fundamental frequency has to be dealt with in a way that segregation is favoured, for the reason it is the most powerful force on the perceptual field. In the course of a piece however, other parameters like brightness, articulation and accentuation are more likely subject of variation, subtly changing a sequence's perception, also in relation to other parts of the piece. The result is that segregation does not only take place within the boundaries of one sequence but also in combination with other sounds of the piece. This is only possible when the segregation effect is not overpowered by more drastic changes, like pitch modulations.[73] The connectivity between pieces, core feature of DJ Tools, results from the very same process: the easier a piece's perceptual streams are to segregate with other streams, the bigger the potential for a creative transition between two disks.

These explanations might create the impression that all participants of early 1990s Techno scene would have read Bregman's *Auditory Scene Analysis* and then started their own collective experiment – something which is clearly out of consideration. Instead my reading of Bregman wants to highlight that the dance floor certainly was the place of a collective experiment, one of musical practice, not of science. Techno artists followed the lines of Bregman's findings in a surprisingly direct way, but not in order to transport emotions, ideas or concepts to the listener as efficiently as possible – a purpose Bregman might have had in mind. Instead they did their best to create ambiguous auditory scenes, supposedly helped by the limitations of their 'musical' knowledge[74] in the classical sense, and the shortcomings of the technical equipment they got hold of: The way Techno music dealt with sequential stream segregation found its spectral counterpart in mixing techniques. In 1990, even after many years of popular music production 'independent' of major companies, the knowledge of operating a studio and the necessary technology was by far not spread as widely than it is today.[75] The mixing equipment most Techno producers could afford was of inferior quality. Professional mixing desks in particular were far out of reach and so was the knowledge to mix 'properly'. A proper mix strives for transparency. Transparency in the context of voices or

73 Of the included sound examples, Mike Banks' *skypainter* (track ??) is the only piece in the course of which tonal variations are performed. The effects of segregation are clearly weaker than for instance in Jeff Mills' or Robert Hood's pieces.

74 To be more precise, this knowledge varied a lot from artist to artist. Many were unable to read musical notation, others of course were highly educated in the classical sense. The point is, classical education did not matter much.

75 The discussion whether this knowledge is really spread wider now is, while interesting, not subject of my thesis.

acoustic instruments means that each individual sound source as such should be easily distinguishable, as well as it's contribution to the big picture. The goal is a faithful reproduction of reality. No matter if it was on purpose or due to the lack of better knowledge and technology, but Techno producers gave up on this goal altogether. The way many Techno artists worked with studio equipment was rather anarchistic in every respect, and never 'true to the source': Gain-staging was hardly more than a synonym for distortion, hiss and crosstalk simply had to be accepted (or used creatively, at best) and settings for equalizers and compressors never shied away from excess.[76] On the other hand, most producers had only few compressors (if any), so the dynamic range, while certainly smaller than in other genres of that time, still used to be considerably larger than today. Without dismissing the prominent role of compression in today's popular music, the working principles of Techno 20 years ago definitely profited from this greater range.[77] The point I want to make is that this anarchy served musical purposes. At typical Techno speed, the frequency of individual tones of a sequence has much stronger effect on stream formation than loudness differences between the tones:

> It has been shown that increasing the speed of a sequence increases its tendency to split into substreams, and that this splitting affects the ability to track an auditory sequence, even when this sequence is 30 dB louder than distractor tones. Hence frequency dominates over loudness as a grounds for segregation at high speeds.[78]

I believe it's exactly the lack of (over-)compression in earlier Techno that allowed for a rich interplay of a piece's different musical elements in terms of primitive stream formation. In electronic dance music, compression is mainly used for two reasons[79]: Firstly to manipulate the articulation of individual sonic events to make them more assertive and secondly to blend different sources together. While it is definitely very useful in many cases to accentuate sounds, the very effect of accents is to attract conscious attention. Consequently compression does not only limit a sound's dynamic range on a technical level. It changes thus the ratio of attentively perceived foreground and the pool of alternative perceptual organisations, the background. This is most obvious in respect to the release phase of sounds: As we have seen,

76 The same took place of course in the club, where I've seen many DJs operating their mixers with all red lights on - not blinking, but more or less constantly burning.

77 Similarly, the absence of reverb in most genre-defining Detroit Techno tracks was not only due to the equipment's high price tag, but rather a conscious artistic decision.

78 Bregman 1990, 64

79 One of the original purposes of compressors, to even out large level differences on a bigger time-scale of a piece, does obviously not apply for electronic dance music.

even very soft sonic events can act as subtle distractors for an already existent stream. Furthermore, the release phase is crucial for our perception of overlapping sounds:

> An odd feature of hearing two segregated streams is that often the elements of the high and low streams seem to overlap in time even when they do not. Suppose you are presented with a repeating cycle formed of an isochronous alternation of high and low tones that forms two streams. Each of the streams is also isochronous. At first the rate of the two streams seems the same, but after you listen for a while, you are not sure at all. It seems that one of the cycles could actually be faster than the other. You are not sure whether the sounds of the two streams alternate in time, occur at the same time, or are partly overlapped.[80]

In other words, compression, where used to make everything as articulate as possible, is damaging the central feature of techno, the creation of ambiguous auditory scenes. Considering the fact that, according to Bregman, in some cases of overlapping sounds even the Gestalt principle of exclusive allocation of elements to *one* organisation can be somewhat 'hurt',[81] it is easy to see how much musical potential can be lost through compression.[82] This point is of course all the more relevant for a transition between two records, where the new record, or selected frequency bands of it, used to be faded in progressively. The difficulty to tell *what* changed at the beginning of a transition, even if the *fact* of change is pretty obvious, has often been described as typical for Detroit Techno. The same goes to the other way round: Even after repeated listening to recordings of a DJ mix I'm sometimes unable to specify what element was actually muted when I notice that something is suddenly missing.

2.5 Simple Sounds, Relative Complexity

As we have seen, Detroit Techno's main focus has never consisted of striving for the most advanced means of sound production. Admittedly, many Techno artists have acquired an amazing expertise in that respect. Neither would it be a big problem to present successful attempts to integrate more complex sounds. On the other hand, the typical studio's sound generators consisted of analogue subtractive and FM synthesis, supplemented by basic

80 Bregman 1990, 159
81 Bregman 1990, 171
82 Again, this is not to be understood as a criticism of the contemporary use of compression. Nowadays the creative anarchy may just consist of applying as many sound shaping plugins to each individual sound source. I can see no a priori reason why this should not yield musically interesting results.

sampling equipment. What I want to demonstrate is that the interplay of however simple perceptual units can nevertheless bring up enormous musical complexity. It is in my opinion a question of tuning ones perception. In this context it is worth reasoning about how perceptual units are built (as a special case of stream formation), namely whether larger units are based on the perception of smaller ones. Of course the onset of a sonic event is crucial, as it defines the time of an action: 'It is the onset of the piano tone that tells you when the pianist's finger hit the key.' And consequently, if a sequence of such onsets occurs, the auditory system 'is not treating them as parts of a single environmental event, but as a series of distinct short events that have all arisen from a common source'.[83] But surprisingly this does not necessarily mean that for instance the segregation of words out of a continuous stream of phonemes is based on detecting the correct order of each syllables' onsets. Although it turned out in experiments that trained subjects are easily able to tell the exact order of pairs of sonic events (as long as they aren't totally unrelated in timbre[84]), even if they appear in rapid succession of less than 20 milliseconds of onset-to-onset time. But the subjects reported 'that they were able to attain the high levels by noticing a qualitative difference between the sound of the pair taken *as a whole* when it appeared in the two orders. This implies that they were perceiving the sequence as a single event, not as a sequence of two sounds.'[85] Bregman draws the following conclusion, inspired by Gestalt Theory:

> A homogeneous perceptual input contains no units. Only when it is broken up by some sort of discontinuity does it organize itself into units. According to this way of thinking, the perceptual unit is itself formed by a process of perceptual organization. After being formed, units can be grouped by similarity and other factors to form higher-order organizations.[86]

And further:

> The unit plays the same role in segregating events in time as the stream does in segregating them in frequency. In fact it is possible that the terms 'unit formation' and 'stream formation' simply pick out different aspects of a single process, the formation of auditory entities that represent distinct happenings in the world.[87]

By means of acousmatic music we are basically creating auditory entities that do *not* represent distinct happenings in the world. By detaching the process of sound production from 'the

83 Bregman 1990, 66-67
84 Bregman 1990, 94
85 Bregman 1990, 69, my italics
86 Bregman 1990, 70
87 Bregman 1990, 72

world' we are able to produce auditory entities without any reference to an action that would produce it. Nevertheless Bregman is probably right in respect to the way our listening apparatus still works – as of today. Therefore a discrepancy is likely to emerge between a unit in terms of sound production and in terms of perception. The perceptual stream formation processes decouple themselves from the logic behind the sound production. The more advanced the sound producing algorithm is, the bigger the discrepancy is likely to get. That is not at all to say that the striving for new, ever more complex algorithms and compositional structures, which is associated with acousmatic music would be wrong – why should this discrepancy not be fruitful? If there is anything to criticise in this respect then it is some composers' apparent lack of awareness of this gap. For Detroit Techno on the other hand, this awareness is an inherent feature. Usually, its single sounds' internal structure is not much more difficult to grasp as a perceptual unit than the piano sound of Bregman's aforementioned example. Indeed, old-school Detroit Techno tracks often make extensive use of piano riffs. Nevertheless, for Techno aesthetics the constant process of breaking up and rebuilding auditory entities is a core feature, so the reference to the 'real' world gets lost, too. It is just the strategy that is different. It is based on simple, sometimes even familiar sounds whose perceived units get undermined by ambiguous stream formation, both sequentially and spectrally. It turns out to be difficult to decide whether this approach is less complex than the 'classical' one or not. There is however one fundamental difference: What is complex about Techno is located close to the boundary between learned and unlearned Gestalt building processes.

A problem related to that of perceived auditory units occurs in Bregman's explanation of how to specify timbre. Our use of the word usually takes timbre as a fixed property, notwithstanding the fact it is very hard to define.[88] Bregman is aware of that difficulty and describes some of his colleagues' attempts to specify our sensitivity to timbre by the method of multidimensional scaling. For instance, in R. Plomp's experiments subjects had to judge the timbral qualities of sustained, looped sounds of familiar acoustic instruments (without their attack phase). The reported differences between the sounds suggested three categories of timbre, a result that could be approximately matched by spectral analysis.[89] However, according to Bregman, these categories cannot be generalized for an understanding how we

88 I remember well Paul Berg's lecture on timbre where he presented an encyclopedia's definition, which was basically a negative one: all the features of a sound other than frequency and loudness.

89 Bregman 1990, 123-124

distinguish timbre.

> For example, if the researchers had added the sound of a rattle, the dimension of noise versus tone would probably have emerged as a new component, and if they had allowed the different sorts of onsets and vibrato to appear in the sounds, or had included a sine wave oscillator as one of the sounds, other dimensions of variation would have been found.[90]

A crucial point for understanding perception of timbre is the number of timbral dimensions we can pay attention to at the same time, which is apparently limited. Bregman continues in his above criticism:

> Does that mean that if they had done these things [adding sounds of rattles, sine waves and so on, EW] the multidimensional scaling procedure would have found the original dimensions *plus* several new ones? Not at all. When you ask subjects to judge differences that are present in a particular set of stimuli, they tend to fasten on the two to four most salient ones. Therefore multidimensional scaling tends to come out with this number of dimensions whatever the stimuli. However these will shift depending on the set of stimuli that is used.[91]

In short: What can be perceived as most important dimensions of variation always depends on the whole picture – this is classical Gestalt argumentation. Leaving the scientific realm now and speaking more about music it seems obvious that *judging* differences and *perceiving* them in the course of normal listening is not the same task. So the point I want to make is of course not that acousmatic music shouldn't be too complex because humans couldn't simultaneously distinguish more than four dimensions of timbre anyway. Instead, Bregman's findings about timbre and their Gestalt background can be transformed into a perspective on musical complexity and form in general. Assuming that musical complexity is defined by the amount, speed and intensity of (simultaneously or sequentially) varying sound parameters, we can draw the following conclusions:

- The number of dimensions in which we can simultaneously perceive change is probably limited. The exact number may vary from listener to listener.
- The allocation of attention to the different dimensions is a dynamical process. That means, increasing the complexity of a certain musical parameter will therefore most likely move this dimension more in the foreground.
- Thus other dimensions will be necessarily pushed in he background or below the

90 ibid
91 ibid

threshold of attention. I remember well Paul Berg's lesson where he demonstrated different concepts of organising rhythm in *AC Toolbox*: At a certain point he got bored by the purely rhythmic examples and applied random pitch variation to them. The very same rhythm I had easily been able to follow before got suddenly almost unrecognisable.

- Therefore perceived complexity is not proportional to physical complexity. This allows us to experience minute variations performed on only a handful parameters as complex – given these subtle parameter changes do not face too much competition on the perceptual field.
- The exchange of different sonic dimensions in the centre of attention is itself part of the perceived complexity. This is the subject matter of musical form.
- Thus it should be absolutely possible to create complex music using very simple sounds and the other way round – to compose boring music using the latest and greatest sound producing algorithms.

The last two points need further explanation. When speaking about sequential grouping of more 'natural' sounds (as opposed to the sine waves and noise bursts of his experiments), Bregman introduces the term 'granularity' in order to describe sounds whose 'amplitude changes rapidly over time in an irregular pattern'. This could be for instance 'the sound of a piece of metal being dragged over different surfaces'. This pattern, however, 'is not entirely irregular. We can tell a lot about the roughness of the surface by listening to the sound. The best way to describe it is to say that the sound is granular, reflecting the granularity of the surface over which it is being dragged.'[92] The question is now whether or not we have to analyse the properties and order of each individual grain for the resulting percept of a granular surface. Bregman's aforementioned findings about order detection of rapid sound successions suggest the answer no. To delve deeper let us take a look at an analogous phenomenon in vision, our ability to detect boundaries of textures.

> As an example, when a heap of fish netting is piled on a surface of concrete, although the surfaces of both are irregular, they are irregular in different ways and, because of this, we will see a discontinuity at the boundary even when the netting and the concrete have the same average

92 Bregman 1990, 116-122

brightness and color and when the netting casts no shadows at its boundary.[93]

Bregman agrees with Bela Julesz's concept of the *texton,* an equivalent to the grain in sound. Textons are 'an elementary local property of the visual field, such as a small elongated blob with a particular color, angular orientation, or length'. The recognition of boundaries between textures would then depend on an 'instantaneous analysis of the visual field'[94] in terms of density and type of textons. This is a quite demanding mental process, which is in normal cases not necessary, because surfaces' edges are usually well defined by much simpler cues such as reflected light. So the texton analysis plays 'a smaller, though definite, role in helping us to detect boundaries'.[95] Bregman's conclusion is that something like a grain analysis function in our auditory system is even less likely to contribute a lot to boundary detection, because of the indispensable time lag of such a statistical analysis. Compared to the much simpler cue of abrupt amplitude changes in the spectrum indicating the beginning of a new sound, grain analysis seems quite inefficient for this task.[96]

What does that mean for our discussion of musical complexity? Complexity in contemporary music, be it instrumental or electronic, is often created as musical textures. The point I wish to make is that a texture always carries at least two basic perceptual dimensions: its consistency and its boundary. The difficulty that arises for a composer is that no matter how complex the compositional method or software algorithm to produce a texture, its perceived boundary may be nonetheless very simple or even banal. Admittedly, through attention we can overcome to a certain degree the perceptual processes Bregman describes, even the primitive, unlearned ones. So an educated listener will probably perceive the internal structure of a grainy surface easier than the less experienced. Nevertheless these processes exist, no matter how big the attentional effort. So textures can very often be perceived just *as* textures – as simple clouds, rumblings or just as undefined noise. The other way round, under some circumstances we are well able to perceive physically simple sonic processes *as* complex. Which dimension is activated by the listener's perception is in both cases dependent on the context of the whole picture.

93 Bregman 1990, 116
94 Bregman 1990, 117
95 Bregman 1990, 121
96 ibid

2.6 Closing the Loop

Coming back to the discussion whether a Techno party can be understood as a common cognitive process where all participants act as constituents of each other, there remain two questions. Firstly, is dancing constitutive of listening (to Techno), or simpler, is there an effect of dancing on the perception that can not be otherwise achieved and shows that Techno music itself is tuned for this effect? Secondly, is the effect of dancing only working on the level of individual perception or is it also evident as component of a common experience? To be more precise, how much affect the dancers each other and how likely are the DJ's musical decisions in fact influenced by an *intrinsic, embodied musical reaction* of the dancers? Or is he only relying on the dancer's obvious appreciation, rejoicing and screaming? Comprehensive answers to these two questions would admittedly be beyond the limits of this thesis, they would involve neurological experiments - and the necessary knowledge on my side, to start with. So this section has to remain quite speculative even if there are indicators that both questions can be answered yes.

Addressing the first I will refer to Michael H. Thaut's book *Rhythm, Music, and the Brain.* Thaut wants to 'advocate for an autonomous music aesthetics that is fundamentally a biologically centered aesthetics of perception and cognition'. This notion is somewhat surprisingly backed by a reading of Kant's *Critique of Judgment*. Thaut claims that 'Kant's formulation of innate a priori knowledge … as a basic cognitive structure and mechanism imposed on perception and reasoning' is in line with recent neurological findings. This is seen as in contrast to a concept of arts as a pure cultural artefact which is 'driven by external sensory-based learning'.[97] Thaut draws the conclusion that the 'perception of artworks becomes a fundamental biologically based activity because it operates on mechanisms in our brain that are built for that purpose'.[98] Kant's philosophy is understood in the context of D.E. Berlyne's concept of 'hedonic tone': 'Forms and patterns of artworks create a particular input to the brain that synchronizes perception and cognition in a satisfying and pleasurable way.'[99] This results in a musical aesthetics that is structured by a threefold division of 'two concentric circles around a center.' The outer layer consists of music's 'role and function ... in society' where the role might be changing historically, but not the underlying function. The middle

97Thaut 2005, 35
98Thaut 2005, 36
99Thaut 2005, 37

layer comprises all structural aspects: the subject matter of composition and musicology, but also interpretation and instrument playing. Located in the centre are the intrinsic functions as an 'innate component of brain function'.[100]

Although I have some general doubts about the validity of his aesthetic system,[101] Thaut's findings are very useful for this chapter's discussion. Firstly because of his attempt to explain the workings of music on the intrinsic level of innate knowledge. Comparing verbal to musical communication he states that 'most likely the most important difference between speech and music lies in the lack of explicit semantic or referential meaning in music'.[102] This is also reflected by different processes in the brain.

> Whereas expressive and receptive speech functions can be localized in a relatively constrained and lateralized neural network, the neuroanatomical basis of music is widely distributed neurologically and quite dependent on subfunctions of music processing.[103]

The processing of music in the brain is apparently based on a complex interplay of rather different brain functions and its components are changing according to the music's structural components. If this is the case, body movement related to music is very likely to be one of these components, a player with considerable potential to influence the game in our mind.

> [T]he neural network underlying rhythmic motor synchronisation is essentially a composite of auditory and motor areas with no specific separate brain structure dedicated to time transduction and entrainment mechanisms in the motor system.[104]

This implies

> that rhythmic time information coded in the auditory system may be directly projected into motor tissue entraining rhythmic motor responses, similar to a resonance function in a musical instrument (for instance, between vibrating strings).[105]

In context with my reading of Bregmans *Auditory Scene Analysis* it seems therefore plausible to assume that changes on the level of primitive stream formation have the potential to affect movement directly. This is in line with the observation that dancing to Techno is usually neither 'expressive' nor communicative at least in comparison to other genres of dance music where self-manifestation and/or dancing as a couple or in a group play a much greater role.

100Thaut 2005, 34
101The functional aspect of art as a means to optimise our brains, while undeniable, is not at all defining artistic quality.
102Thaut 2005, 2
103ibid
104Thaut 2005, 48
105ibid

The second reason I am referring to Thaut is his focus on rhythm and how we perceive it: 'Rhythm in music is the core element that binds simultaneity and sequentiality of sound patterns into structural organizational forms underlying what we consider musical language.'[106] Rhythm can act as a coordinator for the aforementioned interaction of different brain regions. Chapter 5, *Rhythm-driven Optimization of Motor Control,* of Thaut's book deals with the way we synchronise to an isochronous beat,[107] which is obviously relevant for Techno. This process is based on a distinction between pulse and beats, the former being 'biologically based more on the entrainment of oscillatory circuits in the brain than on actual acts of measurement',[108] whereas the latter 'can be simultaneous with the underlying pulse, but can also deviate from it in slight shifts.'[109] Consequently synchronisation to a beat is not just happening once but rather a steady process of deviation and correction, which is apparently far more complex on the intrinsic level than on the representational level in our mind. Nothing in music *seems* easier to us than to move in sync with the beat. Thaut's experiments have shown

> that the *period* of both the stimulus and the movement dominates temporal correction of isochronous, metronome-driven movement, and that the application of a rhythmic driver shapes movement over the entire movement trajectory, rather than merely at movement extremes, where attempted synchronization with the rhythmic stimulus occurs.[110]

Not only is the starting point of (dancing) movements synchronised, but also its quality. That is, in Thaut's terminology, a process of optimisation. Experiments on the efficiency of arm movement between two targets on a table, with and without a metronome, provided evidence for this. Stroke patients could improve their motor apparatus with the help of a rhythmic driver: '(N)ot only did temporal variability of the responses decrease (as might be expected), but the spatial variability of the trajectories of the entire trial also decreased.'[111] The optimal movement is according to Thaut that one with the least drastic changes in acceleration.[112] A similar study was executed with music students: while performing the same task as the stroke patients the metronome speed was suddenly increased by 2%, which is considered to be below the threshold of conscious recognition. Although their response time to the new tempo

106Thaut 2005, 4
107Thaut 2005, 85-112
108Thaut 2005, 6
109Thaut 2005, 8
110Thaut 2005, 85
111Thaut 2005, 90-93
112Thaut 2005, 110

was very short - after one or two pulses they could adapt to the new speed – it took the subjects five times longer to get in correct *phase* again.[113] The scenario of slight tempo changes occurs quite regularly during a DJ mix, at least when he is working with vinyl. At every transition between two records he has to synchronise the new record to the previous. This is done by using the speed adjustment of the turntable, but also by manually accelerating or slowing down one of the two records. This results in the dancers having to correct their phase relationship to the beat. On the level of dance music production, micro-timing (or simply groove) is essential as well, especially when the rhythm is quite easy on the symbolic level. This is nothing exclusive to Techno though, apart from the fact how it is controlled: many step sequencers allow for a 'swing factor', the more sophisticated models even on a per-step basis.

Thaut's findings show the strong impact of rhythm on movement. But is the other way round also true, that motion related to music changes our perception of it? It seems at least very likely. Remember that the reception of music involves the interaction of many brain regions:

> The basic neural network underlying isochronous pulse synchronization consists mainly of composite motor and auditory areas, with no clearly designated, functionally separate brain area for synchronization. It appears that the temporal information processing follows multiple parallel and possibly hierarchically ordered neural computation processes. Such processes may be coded on a cellular level in the emerging timing patterns of synaptic network coupling. In the case of music perception or production, these processes may originate in the auditory system and subsequently entrain other brain areas via resonant physiological network functions. Thus, the neuronal activation patterns that precisely code the perception of rhythm in the auditory system spread into adjacent motor areas and activate the firing patterns of motor tissue.[114]

Assuming that the physiological network functions are in fact resonating then the experience of movement has to influence our perception of music. The same goes to being slightly out of phase while dancing, it is a considerable change in the perceived relation of the whole to its parts. As these resonating processes work on the intrinsic level it is most likely that the interaction of body movement and music perception take place in the realm of primitive

113 Thaut 2005, 93-95. Interestingly, when the tempo change was easy to recognize consciously, the subjects over-reacted at first, decreasing their synchronisation error over the course of the following beats, while the phase error was corrected much earlier.

114 Thaut 2005, 58

stream segregation. That would finally mean that movement belongs to the 'competing forces of attraction on the perceptual field'. Although based on somewhat speculative ground the first question, whether dancing movement is a constituent of listening to Techno, may therefore be answered yes.

Addressing the second question whether dancers and DJ are each others' constituents, synchrony seems to be the key-word again. In the chapter S*tream Segregation and Vision*[115] Bregman describes analogies between vision and sound processing: 'When we see a series of spatial displacements as motions, this is an analogous to hearing a series of tones as a coherent auditory stream.'[116] Various visual experiments similar to the auditory ones of Bregman (for instance with alternately flashing light bulbs) have shown similar effects of stream formation.[117] Also there seem to exist quite strong effects of interaction between vision and auditory grouping, which is hardly surprising as in most cases we experience an action correlated to the sound it produces.

> If you present an infant with two simultaneous visual recordings of different women speaking and at the same time present the audio recording of the speech of one of them from a speaker located halfway between the two images, the infants prefer to look at the face that belongs with (and therefore is synchronized with) the voice they are hearing.[118]

And A.O'Leary states:

> (F)aces move as people talk; the sound of a box or toy covaries with its motion as it is dragged along the ground; the sound of leaves rustling in the wind covaries with the swaying of the tree's branches.[119]

Our mind is even able to use this experience of correlation between the senses in order to 'correct' the input of each other, as it is the case in lip reading. In an experiment, a film sequence of a speaking person was presented in which one syllable was replaced by a different sounding one, although synchronous to the picture. Bregman reported, that the change in sound was of course clearly noticeable, but *only* with closed eyes. With open eyes he could not detect it.[120] Obviously the interaction between vision and auditory system helps to create definite results. But what does that mean for music? For instance, I'm convinced that

115 Bregman 1990, 173-184
116 Bregman 1990, 174
117 Bregman 1990, 177
118Spelke and Cortelyou, 1981, quoted after Bregman 1990, 181
119A.O'Leary, 1981, quoted after Bregman 1990, 181
120Bregman 1990, 183-184

the imperious movements of a conductor at the end of Beethoven's 5th Symphony 'help' us to perceive the dramatic culmination of the last chords. Even considering less obvious examples, the strong trajectory effect of visual movement, which is schema-based,[121] strengthens the currently active stream organisation *against* alternative ones. It gives more evidence and weight to schema-based processes compared to primitive segregation.[122] The aforementioned damaging effect of a visual centre of attention (i.e. a stage situation) on Techno finds its explanation exactly here. Movement should consequently be reserved for the dancers. In this case, the correlation between the visual domain and auditory stream formation is in fact helpful because there is no single centre, but a multiplicity of different translations of sound into movement. They communicate with each other, influencing each others' individual auditory system. This is also enabling the DJ to 'read' the crowd, because his stream formation is constantly changed by the dancers, allowing him to foresee new possibilities of record choice and ways to mix. How strong this effect is remains speculative for now. However dancing is a form of individual locomotion that is 'intrinsically cyclically rhythmic', at least as much as walking. Since we are able 'to identify a walking person from a great distance, without any other perceptible cues'[123] we may assume the DJ's mind is very well tuned for this task. Techno dancers, although they hardly attempt to deliberately express themselves, are doing just that anyway, unintentionally. They express the way their body is involved in their individual reception. Among many other things related to Techno, the seemingly non-communicative style of dancing has always caused harsh prejudiced criticism. As opposed to that I believe the way people dance just matches precisely the inner workings of Techno music, contributing to a common experience of great complexity. The constitutive circle of synchronously alternating roles of action and experience is closed.

2.7 Summary

The place where Techno music happens is broadly seen in the dance floor during a transition between two records. At this moment, all components that define and create Techno interact altogether as constituents of a common cognitive process: The dancers, the DJ, and the

121 The influence of an expected continuation on the perception of sensory input, see Bregman 1990, 416-442

122 Of course it is possible to use visual cues to increase the ambiguity of the auditory scene: In the 1990s, the speed of stroboscopes used to be adjusted manually, so they were always slightly out of phase. Not only to protect the device from over-heating this effect was used quite sparsely as it can be extremely confusing.

123 Thaut 2005, 88

records he plays. This generates a musically complex experience through all its constituents and for all its participants. At the core of such a self-tuning system, if it consists of humans, lies the communicative synchrony of sending and receiving in all participants. This system is mainly based on intrinsic, non-symbolic musical functionality, and all constituents have to be 'tuned' or tune themselves accordingly: The music itself focuses on the boundary between primitive (innate) and schema-driven (learned) stream formation, thus being open for alternative perceptual organisations. This enables the DJ to improvise along this boundary by mixing several records. His musical decisions reflect the multiplicity of dancing movements that result from each dancer's individual synchronisation to the beat. Dancing is therefore both a Gestalt-building force of attraction on the individual perceptual level and a constituent of the common cognitive system. This system is open to uneducated listeners (and producers) as its workings are mainly based on unlearned cognitive processes. All the more, it is very sensitive to the attitude and behaviour of each participant. The system when it works - and emphatically it is Techno then and only then - has neither a single originator nor a centre. People who, unlike me, experienced the early days of Techno, when the DJ was usually paid no particular attention to, will confirm it is a very fragile system. It can easily be bastardised into the banality of a relationship between consumers and a musical service provider. This is the price to pay for its self-tuning nature. On the other hand, the unforeseeable complexity and confusing beauty of the moments when it works, is to my belief beyond the reach of any planned compositional concept.

3 From Detroit to The Hague - Approaching Raaijmakers and Cage from the Techno Point of View

3.1 Social implications

Being neither classical nor pop music in its beginnings, Techno had to face harsh and stereotype criticism from both sides. Whereas from the bourgeois feuilleton point of view Techno was doomed for its hedonism, pop-intellectual circles first and foremost missed a political commitment. While both notions were somewhat true at the surface, more open-

minded observers at least acknowledged the social atmosphere of Techno parties, which was usually equally peaceful as respectful. For example, Berlin's inhabitants and politicians were mostly annoyed by the Love Parade and showed little support for it, but not so the police. Even during the mid-90s, when more than a million ravers met in Tiergarten to celebrate, water cannons only had to be used to provide a bit of welcome cooling for the dancers under the burning sun. This indicates that, while in fact not expressing any political convictions or requests,[124] Techno has strong social implications. As intrinsic the inner workings of Techno might be, the reasoning they trigger can indeed contribute to an ethical or political discourse.

In order to specify this contribution I will discuss the thoughts and works of two composers that seem to have not much in common with Techno: John Cage and Dick Raaijmakers. The only apparent ground in common they might have is firstly the absence of direct political requests in their music, unlike Luigi Nono, Klaus Huber, Matthias Spahlinger or Cornelius Cardew, and secondly the focus on an implicitly social structure of their music. This chapter's examination will therefore be based on a synopsis of Michael Nyman's book *Experimental Music. Cage and Beyond*[125] and Dick Raaijmakers' *Cahier M*.[126] It would be absurd to assume they would have considerably influenced Techno. The other way round, my reading of both books is deliberately influenced by Techno. Thus, I believe, fruitful observation angles can be obtained.

3.2 Dead Sound

At the core of Raaijmakers' explanation is the concept of *dead sound* or standing sound. This is conceived of as pure abstract material without any history or identity of its own. The idea to treat sounds as pure objects, unimpeded by human factors, was originally expressed by Piet Mondriaan:

> Et quant au moyen de production du son, il sera préférable d'employer l'électricité, le magnétisme, la mécanique, car ils excluent mieux l'immixtion de l'individuel.[127]

124 At least concerning the European Techno Scene, black communities in Detroit and Chicago might have had a quite different point of view.
125 Nyman 1999
126 Raaijmakers 2005
127 Raaijmakers 2005, 22

The resulting objects are 'stripped of “curves”, “swells”, “resonances” and other such typical instrumental characteristics of a “romantic” idiom',[128] created by basic sonic units, freed from any harmonious order. As instrumentalists are necessarily a constant source of subjectivity and imperfection they are consequently unable to create dead sounds, whose Gestalt is absolutely flat: no fade-ins and no variation in level or spectrum during the sustain phase. Standing sound is a sound of standstill, without intrinsic movement or expression. Ideal dead sounds are therefore sinusoids[129] or the clicks Raaijmakers' *Canons* consist of. According to Karel Goeyvaerts, these sonic units are prerequisite of 'a musical form devoid of evolution, tension or drama, which could only be built on the foundation of composition according to serial directives and the use of electrical devices'.[130] This corresponds to Raaijmakers' point of view that 'only composers are in a position to realise the desired new music “directly”, “non-subjectively” and “non-individualistically”'.[131] Consequently a composition of dead sounds purely consists of the relationships between them, there is no other layer of artistic expression. These relationships are established by means of sound-matrices, following the rules of 'balanced interrelationship'[132] and 'mutually exclusive opposition'.[133] Mondriaan conceived of vertical, layered, (still-)standing sound as an equivalent to a sculpture that requires the audience to move around it. This is of course not directly achievable. As music is temporal it is impossible to escape the need of linear, horizontal succession. Therefore Raaimakers developed the idea of projected, 'diagonal sound': Identical copies of matrices are placed behind each other, offering endless individual viewpoints on (or itineraries through) the matrices, each of it with its own set of relationships between the sound-objects.[134] The music itself stands still, but the observer has to move in order to explore the full potential of sonic relationships. This has social implications as there is no passive way of observing, as opposed to watching a film: 'the field-like board represents an open-form arrangement for an optimal “open society”, in which that same observer takes part democratically and actively in the act of observing'.[135] While the word 'optimal' indicates that we still have to wait a bit for

128ibid

129 Karel Goeyvaerts stated about dead sounds / dode klanken: 'Standing sound-structures are an image of unity, of the unchanging-unmoving, of the 'being' of time. They must be fixed as immobile 'dead' sounds. The ideal dead sound is the electrical sine-tone.' Quoted after Raaijmakers 2005, 30

130Raaijmakers 2005, 30

131Raaijmakers 2005, 24

132J.van Domselaer in dialogue with P.Mondriaan, quoted after Raaijmakers 2005, 29

133P. Mondriaan, quoted after Raaijmakers 2005, 33

134Raaijmakers 2005, 50-53

135Raaijmakers 2005, 69

such a society, the paragraphs about copies and resulting perceptual multiplicity are explicitly related to W.Benjamin's essay 'The Work of Art in the Age of Mechanical Reproduction'.[136]

As long as Raaijmakers speaks about the producing and structuring of sound, staying in the realm of his intentions, he follows an admirable non-compromise approach. However when it comes to the observer of aforementioned sound-matrices, some contradictions occur: the stated social significance of multiplicity consists of its democratic, emancipated way of reception, of its openness toward an active listener. At this point Raaijmakers faces practical limitations, because sharing the same observation angle is impossible for several observers at the same time. Furthermore, simultaneous but different musical itineraries through the matrices would in most cases disturb each other. Consequently, under normal circumstances the composer will have to undertake the adventurous itinerary through the rows and columns of sound all by himself and simply give us a report of that.[137] This report has necessarily to be linear music in a conventional sense.

> An observer who moves through a field of aggregates while observing it projects this field on a plane: *his* “perceptual plane”. On this plane the “image” of his perception comes into being. The observer can communicate only this image to a *third party*, not the act of perception itself.[138]

This is an unbridgeable gap in Raaijmakers' concept. Active adventurous experience of the sounding matrices is apparently only possible for one observer, the rest has to listen to the adventurer's story. In essence, the listener whose activity should according to the concept be enabled and motivated, is in practice downgraded again to a passive third party. More so, as instrument players can not be involved because of their distracting subjectivity, the composer himself becomes the interpreter of his own piece. It goes without saying he is also the best possible interpreter: he '”explains” and “narrates” the landscape as artwork, in the course of which *no detail escapes his attention*'.[139] This turns out to be much more practical than the democratic approach: 'In the democratic kind of hiking, such details pass the listeners by: he is, in a *hierarchical sense, an uneducated person* who merely wishes to go on a hike, and restricts himself to this out of both preference and necessity'.[140] This elitist attitude toward the audience is quite surprising. Raaijmakers' pluralistic intentions seem to turn into their opposite at this point:

136Raaijmakers 2005, 87
137Raaijmakers 2005, 53
138Raaijmakers 2005, 52, my italics
139Raaijmakers 2005, 56, my italics
140Ibid, my italics

- According to him, there is as a rule no way of perception which is both democratic and musically interesting. 'In this way, art takes to the street (to use 1960s jargon), resulting in a thorough democratisation of artistic practice in general and musical practice in particular – an ideal formula, which can indeed be “played with” but hardly if ever put into practice.' [141]
- There is no interpreter left that could read the score and translate it into communicable sound other than the composer himself.
- Consequently, the composer takes total control not only over the creation of his music, but also over the (only) right way to interpret and perceive it.

As long as there is only one perception considered 'right', one might ask, how serious about democracy and multiplicity is the concept then? This problematic impression is also fostered by the fact that hierarchies play such a central role in Raaijmakers' reasoning. According to Cahier M, on top of this hierarchy is the composer, below him the interpreters with all their subjective imperfections and on the lowest level the audience which has to be educated:

- Composition is on a higher level than sound production, which is regressive. Raaijmakers draws a comparison to the relationship between language and speech. While the 'composer dreams of a new music full of sound-color, he leaves behind the domain where tone may be articulated and composed sound – the language – and descends to the level of the suggestive, associative, tactile sound – in other words, speech'.[142]
- 'Only composers are in a position to realise the desired new music “directly”, “non-subjectively” and “non-individualistically”.'[143] - This quote is of course meant on a pure technical level (hence the quotation marks), referring to the inevitable technical imperfections of instrument playing as opposed to tape pieces. But having said that, why should only the instrument player's subjectivity result in a prejudice of sound? Why not the composer's as well?
- Is it at all possible that 'no detail escapes [the composer's, EW] attention' when exploring the sonic potential of his matrices? This seems just unrealistic, as there is no

141Ibid
142Raaijmakers 2005, 18
143Raaijmakers 2005, 24

such thing as an absolute viewpoint of observation. I can see no reason why an open-minded, self-consistent listener – yes, they exist! - should not be able to detect details that *did* escape the composer's attention. After all, the listeners viewpoint is necessarily different from the composer's and so are his observations. Raaijmakers attempt to put the composer in the position of the only capable observer of his own music, that 'goes on ahead and the listeners follow in his footsteps', [144] is highly questionable.

- The ideal listener is the so-called 'emancipated observer' who takes 'the initiative to "read out" these aggregates in diverse ways', but only 'led by an analytical disposition and aided by well thought-out strategies'.[145] A pupil might be led by the composer, but an emancipated listener is by definition able to find his own way through a piece.

It is obvious that polemic statements like those of Raaijmakers about interpreters and listeners bring up equally polemic questions concerning the composer's position. They deserve though a serious and balanced answer. In *Cahier M*, Raaijmakers describes his own work as a particular example of the serial approach. It is serialism in general which he tries to give a democratic grounding. While I take it for granted that reasoning about democracy and how the arts could contribute to it was a major incitement for serial composers, Raaijmakers' explanations rather show serialism's failure in that very respect. There are for sure examples of truly despotic serial composers. The point is, Raaijmakers is not among them. His installations *Ideophones* for instance allow the listener in fact a tremendous freedom to approach them.

144Raaijmakers 2005, 56
145Raaijmakers 2005, 77

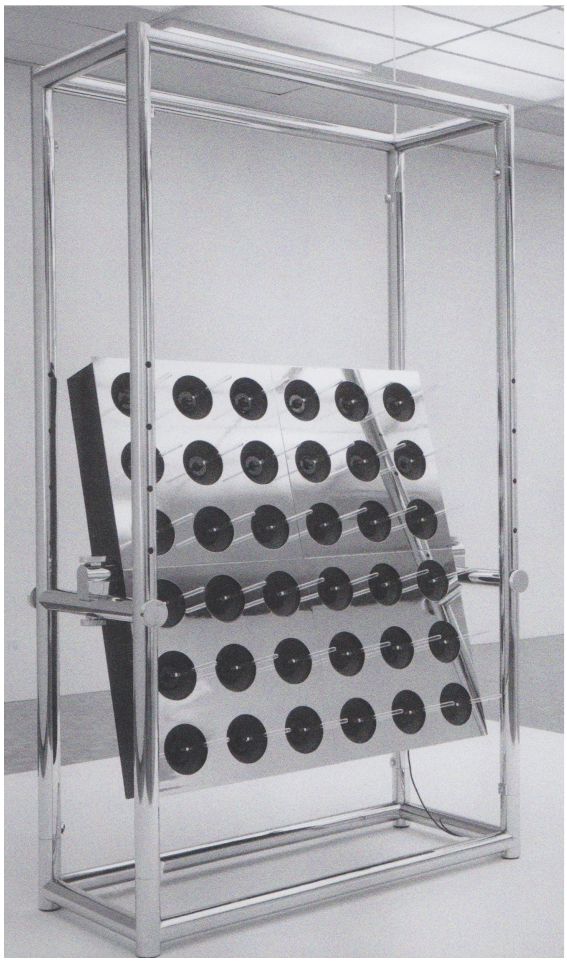

Fig 3 Raaijmaker's Ideophone I

It seems the social implications of Raaijmakers' music are more the result of his personal integrity and less of the serial composition methods he tries to defend. However even in his music there is a considerable gap between intention and result, analogous to the gap between musical concept and its practical perceptibility. This could well be an overall dilemma of post-war avantgarde music: it is written for (a society of) self-consistent, active listeners but they should perceive or at least understand exactly what the composer wants him to. Taking serious what Raaijmakers writes about multiplicity and its social implications on the one hand, and about the educational nature of the composer's task on the other, there is a certain mistrust in democracy or at least in our society's readiness for democracy. If a composer is serious about democracy, it is at least contradictory to claim the superior hierarchical position of a teacher.

Let us go back to the fundamental question: Why should we need dead sound? To summarise Raaijmakers' point of view, dead sounds are freed from all subjective predefinition and

therefore allow the composer an unprecedented precision and immediacy of expressing his intentions. He sees serial music as an object carrying a fixed meaning independent of any third party observation. All possible viewpoints on this object are already determined by its creator. Dead sounds are the perfect abstract material, like unresisting modelling clay willing at the disposal of composer. Their only point of interest lies in the abstract relations between them, dead sounds carry no meaning of their own. These are distinguishing marks of representational symbols. The function of dead sound in serial composition is equivalent to the role of phonemes in speech. For example, a single click in Raaijmakers' Canons 'marks a brief moment of time and possesses no further musical pretensions'.[146] While this might be valid on the level of the compositional concept, it is far beside the point perceptually. Every sound is always part of a perceptual organisation, which is in turn dependent on context in the broader sense. It makes already a huge perceptual difference whether this click happens by accident in daily life or is somehow expected and readily heard *as music* in a concert situation. Likewise it is also necessarily heard in relation to all surrounding sounds, including extraneous noise or periods of silence. Raaijmakers' understanding of dead sounds as phonemes of speech implies that by getting rid of 'all superfluous flesh'[147] the remaining sonic skeletons would also loose any intrinsic functionality. In the light of the the second chapter's explanations this seems doubtful.

3.3 Flat Sound

While Raaijmakers wants to cut off all human gesture and failure from sounds in order to control the relationship between them, Cage goes the other way round. He avoids any structural relationship between sounds by detaching them from any intentional human context, hierarchy or fixed musical form. Where for Raaijmakers 'dead sounds' are the fundamental for a structural goal, Cage's goal is to obtain 'unimpeded' sound, or in Nyman's words, 'flat sound' as a result of his abandonment of structure. Consequently, for Cage the unimpededness relates not only to the player's subjectivity, but also to the composer's. 'Cage was in effect *freeing* music – or, as he might have put it, freeing sounds of music'.[148] He

146Raaijmakers 2005, 89
147Raaijmakers 2005, 105
148Nyman 1999, 32

resigns any control over relationships and viewpoints in order to give freedom both to sound and its observation:

> I would assume that relations would exist between sounds as they would exist between people and that these relationships are more complex than any I would be able to prescribe. So by simply dropping this responsibility of making relationships I don't loose the relationship. I keep the situation in what you might call a natural complexity that can be observed in one way or another.[149]

According to Cage, sounds have a 'dynamic' meaning of their own, depending on constellation and observation. This is the exact opposite of a symbolic understanding of sound which can consequently not be used equivalently to phonemes of speech. This implies further that

> music should no longer be conceived of as rational discourse, concerned with manipulating sounds into musical shapes or artifacts (motives, melodies, twelve-tone rows) as though they were parts of a discursive language of argument.[150]

Cage's music is based on the intrinsic functionality of sound, or better on our ability as perceivers to combine sounds to perceptual organisations.

> (T)he less we structure the occasion and the more it is like unstructured daily life, the greater will be the stimulus to the structuring faculty of each person in the audience. '*If we have done nothing then he will have everything to do*.'[151]

This is reflected in his compositional strategies. Firstly, by leaving the relationship between sounds undetermined, often by means of chance operations. Secondly, by layering of sounds and even of whole pieces which can be played simultaneously, for instance *Concert for Piano and Orchestra*, *Solos for Voice, Fontana Mix* and *Rozart Mix.* Thus Cage wants to create endless mutual viewpoints, depending on the individual observer's viewpoint. In the words of Richard Toop:

> The striking feature of these pieces is not their individual content, but their unlimited capacity for combination with other pieces, which theoretically allows for the obliteration of every distinguishing characteristic of each individual piece, and thus undermines any attempt to view any of them as a self-contained unit.[152]

The third strategy concerns Cage's understanding of rhythm (i.e. not *rhythms)* as a means of structuring time regardless of sound. 'For Cage, a rhythmic structure was “as hospitable to

149Quoted after Nyman 1999, 29
150Nyman 1999, 32-33
151Quoted after Nyman 1999, 25
152Quoted after Nyman 1999, 64

non-musical sounds, noises, as it was to those of conventional scales and instruments."' Rhythm is also structuring silence, as the only of 'the four determinants of a sound (pitch, timbre, loudness and duration)'.[153] This argument is twofold. Firstly, rhythm allows one to listen to any sound *as* music, including the opposite of sound, silence. Secondly, it does so because structured time is the core of musical experience, which is is the reasoning behind *4'33"*. The importance of performance aspects in Cage's music is a direct consequence of this. The performer's role in playing *4'33"* is to make the audience experience the underlying time structure (it consists of three movements) thus enabling them to listen to the silence and all accidental noises that will inevitably occur, as music. The performer's task is to motivate the audience to pay attention to their own apparatus of perceptual organisation. Or, as Morse Peckham put it: 'A work of art is any perceptual field which an individual uses as an occasion for performing the role of art perceiver'.[154] Consequently, the concrete temporal, spatial and social circumstances of every 'occasion' are as a whole defining the musical outcome. There is no fixed content any more hidden somewhere in the music, instead it is conceived of as a description of a process with unique results each time it is executed.

> A performance of a composition which is indeterminate of its performance is necessarily unique. It cannot be repeated. When performed for a second time, the outcome is other than it was. Nothing therefore is accomplished by such a performance, since that performance *cannot be grasped as an object in time.*[155]

This marks perhaps the central difference between Cage and Raaijmakers. The latter strived for a non-temporal concept of still-standing musical objects, while the identity of Cage's pieces is strictly temporal and volatile. Their identity is that of the concrete performance. All the more important is the performer's discipline. His personal attitude is as much contributing to the musical result as his artistic accomplishment. More so, personal attitude becomes a crucial part of artistic accomplishment. Cage's famous 'carelessness as to the result',[156] the acceptance of whatever the outcome might be, is dependent on the careful fulfilling of one's tasks. This means also to restrict oneself to it and to avoid anything that is not part of the task. Playing Cage means to strip human expression from one's performance.

So however contrasting their approaches are, there are as well a couple of aspects relevant for

153Nyman 1999, 32
154Nyman 1999, 26
155John Cage, quoted after Nyman 1999, 10
156Quoted after Nyman 1999, 15

both Cage and Raaijmakers. They have in common the wish to overcome subjectivity. This results in sounds freed of human expression, creating a multiplicity of observation viewpoints. And finally they want the listener to be active. Probably Raaijmakers would agree with Cage:

> Most people think that when they hear a piece of music, they're not doing anything but that something is being done to them. Now this is not true, and we must arrange our music, we must arrange our art, we must arrange everything, I believe, so that people realize that they themselves are doing it, and not that something is being done to them..[157]

Interestingly, this does not mean that Cage would try to activate the audience as producers. Admittedly there are pieces like 33 *1/3,* an installation for twelve turntables where the listeners may themselves choose the records they want to hear. This piece also creates a very nice group dynamics as the audience is not being told that they are allowed to play records and usually hesitate to do so at first. Nevertheless this is an exception in Cage's work leaving the question open whether above quote entails substantial consequences regarding the relation between composer and audience. Raaijmakers' attitude towards the audience is quite clear: He is in the tradition of enlightenment, trying to educate the audience, based on the presumption that he as a composer has a relevant and exclusive knowledge legitimating his hierarchically higher position. At first sight, Cage seems to break that tradition, because of the abandonment of discourse. What he does seemingly not abandon however is the aim of education as such: He resolutely propagates a very specific way of listening, which is inspired by Zen-Buddhism. So musical communication fails if the audience is not willing to play the role as a perceiver in the way Cage imagined it. In Raaijmakers' case it fails when the listener is not educated enough to understand the composer's intentions. In that respect there is no big difference between the composers to speak of: they aim at attentive listening and they want the audience's attention. This last point, as banal as it might sound at first, could turn out to be not at all that simple.

We have seen there are two more things the composers have in common. Firstly the strict, traditional separation between sender and receiver. Both seem to fall behind their ambitions in that respect. Secondly they share an elitist aversion against 'passive' listening. These two points could well be correlated. To conclude the comparison between Cage and Raaijmakers I want therefore ask whether there is such thing as passive listening at all. The findings of

157Nyman 1999, 24

chapter two speak quite clearly against it. Bregman concedes a main difference between automatic, unconscious and learned, attentive processes of listening. The communication of Raaijmakers' educational attempts is *based on attention*, while Cage wants to *create attention* for the process of listening as such. The existence of innate, pre-attentive organisational processes of perception does not mean however that listening 'in a naïve way'[158] is necessarily passive. The different approaches of Embodied Cognition follow Gibson's concept at least insofar as the mind is seen as an active information-seeking system even on the unconscious level. And for Thaut,

> (a)rtistic expression may exercise *fundamental brain functions* and may create unique patterns of perceptual input that the brain needs and cannot generate through other means in order to keep its sensory, motor and cognitive operations at optimal levels of functioning.[159]

Raaijmakers quotes W.Benjamin's *The Work of Art in the Age of Mechanical Reproduction* when speaking about *repetition in general*.[160] In Benjamin's famous essay, it is just the film that is allowed the greatest artistic and social potential,[161] despite or better *because* of the role distraction plays for its reception. It is *not* the plaque fixe that Raaijmakers favours for its social significance.[162] This might show that it is, I believe, very difficult to judge different forms of reception and to rate their artistic relevance.

3.4 Conclusions for the Discussion of Techno

Although it would be obviously far-off to state a direct relation between Techno and the music of Raaijmakers and Cage there are central terms and correlations between them that are helpful for the discussion of Techno. Multiplicity is adequate for the perception of art in modern democratic societies. The less determined the music is by the composer's subjectivity, the more important becomes the recipient's part. Acousmatic music is predestined for this, as its sounds are not caused and perceptually defined by humanly expressive actions. This is also

158Bregman 1990, 138
159Thaut 2005, 25, my italics
160Raaijmakers 2005, 86-87
161'Die Rezeption in der Zerstreuung, die sich mit wachsendem Nachdruck auf allen Gebieten bemerkbar macht und das Symptom von tiefgreifenden Veränderungen der Apperzeption ist, hat am Film ihr eigentliches Übungsinstrument.' Quoted after Klein 2004, 95
162Raaijmakers 2005, 64-66

reflected by the absence of centred attention, as there is neither the need for a stage nor for a performer. The term 'active listener' implies that, taking multiplicity of viewpoints seriously, any reception of art should be understood as an active participation in its processes. In this way, synchrony of reception and production, which is characteristic for artistic communication, should be strived for by composers. Consequently, the listener has to be accepted in the way he approaches music, including inattentiveness or rejection. This is the point where Raaijmakers' and Cage's attempts fail in their relationship to the audience in democratic terms: by and large, they determine themselves the way their music has to be perceived. If the listener is unable or unwilling to subordinate to this specific way, musical communication breaks down. In a self-tuning system, on the other hand, the way to perceive music is created and dynamically changed by all its constituents. Accordingly, also the music itself as the common point of interest is created collectively. For some time in the 1990s, this point happened to be the boundary between symbolic and non-symbolic processes of listening. It goes without saying that the outcome of such collective, social processes changes over time. Self-tuning systems are necessarily 'self-detuning' systems, too[163]. Musical 'truth' or 'relevance' is therefore nothing steady which could be fixed in a piece's structure. Instead it is volatile, emerging together with the perceptual situation it is embedded in.

The better the dance floor as a social system works the more exciting the music becomes. This is, simply put, Techno's social significance. It consists of the correlation between musical complexity and the personal attitude of each participant, his readiness not to act as the all-determining centre of the common process but as one of equally important constituents.

4 Techno and My Music

The first three chapters of this thesis will probably have shown my admiration and preference for musical processes that are beyond the realm of individual artistic intentions. In the time-span of Techno this thesis is devoted to it was a good tradition to accept the inevitable dimension of personal expression, but to leave it in the background. Any *explicit* explanation of my music and its production methods would therefore be far-off. For Techno these questions are just not really important. Instead I hope most of my music's peculiarities have

163In the case of Techno, even its commercial turn emerged out of the system and not by manipulation from outside.This is impressively documented in chapter of Denk and Thülen 2012

been *implicitly* explained in previous chapters.

However the music which is part of my research project – first and foremost two pieces, V*iolin Case 8* and *BEA5 Compendium*[164] - is not exactly Techno. To start with, it is not intended for the dance floor but for a bit more attentive listening. In chapter two I described dance floor Techno as a music whose perception is not primarily based on symbolic reflection but certainly has the potential to trigger it. My thesis is the result of this and the same goes to my music. It consists of affectionate reasoning about Techno. The rules of Gestalt building between primitive and schema-based segregation I followed in my pieces are roughly the same as I perceived them on the dance floor. They are just a bit more obvious, allowing the listener not only to feel but also to recognise them. The technical realisation was also similar, as I used extensively the Variable Function Generator for *BEA5 Compendium*. For V*iolin Case 8* I programmed a comprehensive step sequencer in Reaktor, containing every musical function that I considered potentially relevant for Techno. The biggest difference to real Techno though is that my music does not originate from a self-tuning social system. It has to rely on a more one-directional musical communication. So at least some general remarks about my musical strategies seem appropriate.

Above all, I did not try to develop a however philosophical model as an analogy for the socio-musical processes on the dance floor. Those processes are based on the perceivers' participation and should be left to them. On the other hand I had to find a way to restrict my degree of control over sound production. In V*iolin Case 8* it is the use of feedback, in *BEA5 Compendium* it is the patching[165] that forces me to act and react on the sound synchronously, varying the sound into directions I could not foresee. Both pieces are based on recordings of such rather short improvisations. For the creation of the overall musical form I followed a reductionist Techno approach: cut and edit the recordings only where necessary, preserve them as raw as possible and finally compile them in an appropriate way. There is no single, 'right' way to order such short improvisations in time, so you are forced to use your instinct, just as a DJ would do it.

Three more attributes spring to the eye. Firstly there is no bass drum, but secondly there is

164Being multichannel, they are not included in the accompanying CD. Please refer as an example from the earlier stage of my project to track #10, *violin case*: o*pen strings G*, 2012

165In most cases, four tracks of the VFG are patched via four mixers to four *different* parameters of four VoSim oscillators. So one mixer's output controls frequency of VoSim1, the number of repetition of VoSim2, decay of VoSim3 and the amplitude of VoSim4. This assignment is permuted for the remaining mixers.

sometimes a violin. And thirdly, the two main pieces of my research project are for five or eight channels respectively. The missing bass drum is the most obvious indicator that my pieces while being repetitive are no dance music. Being of course the most physical, intrinsic factor of dance music, contemporary Techno producers spend most of their time to get the bass drum 'right'. Quite often it is so prominent nowadays that it can not be integrated in different perceptual streams any more, as is explained in chapter 2.4. In this case the bass drum becomes the all-determining centre of the Gestalt-building processes, destroying perceptual multiplicity. So in my opinion, its impact works best if the kick is solid and simply 'there', but you forget it because it melts with many other elements. In a similar way I want my music to sound as if the bass drum was somehow forgotten.

In that specific respect the violin's role for *BEA5 Compendium* is equivalent to the bass drum's for Techno in general. I developed different ways and degrees to integrate the violin sound in the perceptual field. The range goes from almost complete integration to a clear perceptual centre. The first is achieved through simple gating or ducking the violin by the oscillator sequences, to the point where it becomes difficult to distinguish the violin from the VoSim-oscillators, which were used for all recordings of *BEA5 Compendium*. The most extreme example for the latter would be a live violin performance, in other words a stage situation. In this case the violin playing occupies the centre and all other Gestalt-building cues are related to it.

The violin samples used for V*iolin Case 8* however have a different role. All sampled playing techniques have in common a minimum of physical interaction between player and instrument. They are all executed on open strings and once the string is excited, there are no further actions required from the player's side. Pitches result exclusively from the place of string excitement, not from shortening its length with the left hand. In that way I detached the sound production from the player's body as far as possible, creating 'dead sounds' on the violin. This effect is similar to the gating processes of *BEA5 Compendium*. The samples are triggered by aforementioned step sequencer and fed in a feedback network, creating more or less repetitive but often hard to predict sounding results. The gestural, expressive aspects of violin playing however are removed in both pieces, or in Cage's words, the violin is 'freed' of its player.

Both pieces are finally multichannel pieces. This does not mean however that the individual

channels would create a virtual space that should be perceived from the ideal place in the centre between them. They are rather discrete channels without one distinct point they refer to. This seems an appropriate way to transfer a bit of Techno's multiplicity to the concert hall, as these pieces are about the individual listener's processes of perception. Spatial cues are relatively weak forces of attraction in Gestalt terms, too weak to play a bigger role for dance floor Techno – there are even a couple of clubs whose loudspeaker systems still work in mono. All the more it was a logical step to profit from the technical possibilities of a concert hall in order to translate Techno into something like concert music. Consequently, as long as you are not too close to one loudspeaker and you can still hear enough from the others, there is no best place to listen to them. *BEA5 Compendium* is essentially for four speakers. The fifth, being the centre speaker, is mainly used to confront the multiplicity created by the four other speakers with a referential point, a centre of attention. It is conceived of as a functional equivalent for a stage and is therefore mostly reserved for the violin or some occasional bass drum-like sequences.

I want to emphasize again my preference for the self-organising socio-musical processes I was lucky to witness on the dance floor. This is also a preference over my own musical contribution. On the other hand, the discourse about Techno *as music* has rarely been adequately serious in my opinion. This is hardly surprising because Techno itself is no discursive music. At least in that respect I hope my master research project at The Institute of Sonology could contribute to a more profound discussion.

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Figures

1. *Watt's Centrifugal Governor.* en.wikipedia.org/wiki/Centrifugal_governor
2. *Temporal Coherence of Auditory Streams.* Van Noorden, L. 1975. Taken from Bregman 1990, 60
3. *Ideophone I.* Raaijmakers, D. 1970. *Witteveen+Bos-prijs voor Kunst+Techniek 2011. Dick Raaijmakers*. Deventer: Witteveen+Bos

Appendix

#01 Jeff Mills: *Mix-Up Vol.2*, 1995

#02 phylyps: *trak II,* 1994

#03 Circuit Breaker (Richie Hawtin): *Overkill*, 1993

#04 Jeff Mills: *Curse of the Gods*, 1992

#05 Jeff Mills: *Medusa*, 1996

#06 Jeff Mills: *Growth*, 1995

#07 Robert Hood: *minus*, 1994

#08 Mike Banks: *skypainter*, 1992

#09 Albert Bregman: *Auditory Scene Analysis, Example 2*, 1990

#10 Ekkehard Windrich: *violin case*: o*pen strings G*, 2012