Electronic Dance Music and Academic Music

Genre, Culture and Turntables

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Abstract

'Found sound' has become a more prominent element in electronic dance music in recent years. Artists such as Mum, Fourtet, Squarepusher, Aphex Twin, Luke Vibert and Boards of Canada include elements from the world of 'found sound' into their music, either as full sound art compositions or minute gradients of field recordings incorporated into more rhythmic based tracks. This leads to a blurring of genres and sound worlds; however, an interesting anomaly is that while these artists seem to embrace this blurring of genres, it is my belief that the same cannot be said for the more academic side of sonic art. Within academic institutes who cater for the sonic arts, the influence of electronic dance music is not always noticeable. An instrument which seems to have transcended genre is the turntable. It is now accessible in both the world of sonic art and electronic music culture. But how is this so? What I intend to look at in this paper is why this dichotomy of sound worlds exists, concluding with a look at how the turntable could act as an intrinsic element of performance and composition but also as a milestone instrument in the fusing of genres and cultures.

Electronic Dance Music and Academic Music: Genre, Culture and Turntables

Introduction

Prior to entering the academic world of music, I was unaware of any major dichotomy between genre and culture in relation to Electronic Music. As a turntablist and electronic musician, I was (and still am) interested in sound/music as an art form, a means of expression and a communicative force, regardless of genre, context in which it is appreciated, or culture associated with it. As I progressed through the world of academia and 'became' a composer of academic music (electro-acoustic/acousmatic music) or participated in more sonic art based practices (such as installations), a divide became apparent between the cultures and sonorities of academic 'art' music and the electronic music culture to which I was accustomed. Having examined the history of both, it was interesting to find how closely the two cultures co-existed.

At this point in my studies and career I feel that there is a specific space in music where academic/art music and electronic dance music co-exist, where the precise sonorities and performances associated with academic music fuse with the heaving mass of sound associated with electronic dance acts. Within this domain there is no cultural divide and there is little one can do in terms of imposing a genre on the sound. I believe that it provides a valuable insight into the future of music and will continue to push the boundaries of our perception of genre and music cultures. Where I feel I can incorporate elements from the world of academic music into electronic (dance) music, the same cannot be said for incorporating electronic 'dance' music into the academic domain. Why is this so? This paper attempts to explore this anomaly, exploring it from the perspective of an aficionado of this emerging hybrid of sound and cultures and explores an instrument which has apparently transcended genre. It is important to note that some generalisations are made in discussing terms like academic music or electronic 'dance' music, in order to keep from deviating too much from the topics in question.

Electronic Music: In the Beginning

The introduction of the Telharmonium in the early twentieth century by Dr Thaddeus Cahill gave the world its first electronic instrument. The Telharmonium was a cumbersome instrument which was originally designed to transmit electronically generated tones from a

> 'central station to translating instruments, located at different points in nearby concert halls. Cahill's plan was to build an 'electronic music device and pipe live music to remote locations' (Holmes 2002, p. 45)

with the aid of telephone signals. The Telharmonium was essentially a piano-like, keyboard based, tone generator which allowed the user to shape and envelope sounds dynamically. Due to this, the coining of the term *synthesis* can be attributed to Cahill, to describe what he was doing, in terms of combining 'individual tones to create composite sounds' (Holmes 2002, p. 46), as was described in his original patents for the Telharmonium. Performances from the instrument were aired over telephone wires, to nearby concert halls, and although it was an initial success and provided interest for composers of the day, the instrument was largely an impractical mass of machinery, '60 feet wide, 20 feet tall and weighs 200 tons' (Shapiro 2000, p. 4). This, along with the financial aspect of building and maintaining such a machine, made it redundant.

The practice of performing over telephone wires was also made obsolete with the invention of the triode (a vacuum tube that allows the transmission of sound through electrical signals) around 1906, which heralded a new be-

ginning for electronic instruments. These instruments no longer had to rely on the technology of telephone signals to transmit or perform music. This technology resulted in the creation of more compact instruments, which resulted in more accessible Electronic Music instruments, for the public and audience alike, as they could now see the instruments which were producing the audio. Instruments like the Theremin, developed by Leon Theremin, and the Ondes Martenot, produced by Maurice Martenot, began to emerge: the ethereal sounds of such instruments, contributed to the eerie soundscape of this period in Electronic Music history.

Toward the end of the forties, the sonic terrain of Electronic Music was beginning to change. Opposed from the purely synthesised sounds of the early pioneers of Electronic Music, such as Thaddeus Cahill or Leon Theremin, a new ideology was born in *Music Concrète,* where one did not need synthesis to compose 'music'. Pierre Schaeffer began utilising sound samples, as opposed to traditional instrumentation, as material for compositions.

> '1948 to 1951 – European composers broke through the 'sound barrier' into two, initially quite distinct, areas of electronic music: the French variety, music concrète, which used sounds of an everyday acoustic or environmental origin, and *Electronische* Musik, the German brand which used only electronically generated sounds as its raw (or rather, smooth) material' (Nymann 1999, p. 48)

Both genres were helped immensely by the introduction of tape in the early fifties which allowed composers to overdub and edit sounds in a quicker and more creative manner and performances did not require human performers and 'the work could be played over and over again' (Holmes 2002, p. 93): This heralded the age of the '*Tape Piece'.* Mike Berk (see Shapiro 2000, p. 171) notes that early pioneers such as Cage and Stockhausen 'made tape editing and processing, art forms in themselves', which begins to ensue this notion of 'art music' within the domain of found sound composition. After experiments in the field of 'found sound composition', the Radiodiffusion Télévision Française (RTF) funded Schaeffer and Pierre Henry in order to assist them in setting up their own studio. *Groupe de Recherches Musicales* (GRM) established a studio where one could hear lectures on *Musique Concrète* and also have the opportunity to compose.

The thirst for knowledge in Electronic Music, led young composers to seek out institutions like the *GRM* or the *Cologne Electronic Music Studio*, to gain more insight into the technical and musical processes of Electronic Music. Aside from the institutionalised realm of Electronic Music, there were important and historic developments happening. The evolution of the Moog synthesiser (created by Bob Moog, an avid fan of Leon Theremin and subsequent manufacturer of the instrument) gave Wendy Carlos the means to produce the first completely synthesised record, using the Moog. Her 1968 album, *Switched On Bach,* in which she interpreted some of Johann Sebastian Bach's keyboard music, 'became the top selling album at that time' (Holmes 2002, p. 168) and

> 'dragged the synthesiser by its patch cords out of the chilly atmosphere of academic electronic music studios into the spotlight of public awareness' (ibid).

The basis for the next thirty years in Electronic Music had been cast. The concepts and ideologies in synthesised music and *Musique Concrète*, became co-opted by the underground movements, most notably Hip-Hop. The idea of re-contextualising sound samples with the use of turntables became a notable characteristic of Hip-Hop in the early seventies, as the DJ gained rock-star status. Away from the academic institutes, which researched the processes in Electronic Music, Hip-Hop artists and DJs were re-contextualising earlier funk and soul records, creating new compo-

sitions with technical processes such as scratching and beat juggling. The ethos of the counter culture instilled by genres such as Hip-Hop followed through to the early nineties and was helped by the production of pieces of hardware such as the Akai range of samplers and Roland's hugely influential range of synths and drum-machines such as the TB 303 or TR-808. The make-up and desires of the artist were changing.

The focus begin to shift from the pioneering electronic artists and composers of the early 1900s, whose revolutionary research and inventions changed Electronic Music. Now, artists and producers had machines to make the sounds for them and cared little for the inner workings of their machines as Matt Black (see Shapiro 2000, p. 190), of Breakbeat artists Coldcut, explains

> 'We want to lie down and let the machines get on with it. We want to slack off a bit. We've got the acronym DNA-ROM which stands for "do no art – run our machine"'.

This contrasts greatly with the earlier reference to the art involved in making Tape Music and the meticulous technical processes involved in the composition of early Electronic Music.

Throughout the last three decades, it seems that as the hardware became more accessible to the commercial market, one did not need to know the concepts behind the device. Regardless of how negative this might be, this ideology contributed to some of the boldest musical and cultural revolutions in history and one could view this as a primary point as to why this dichotomy emerged within Electronic Music, in content and context.

Electronic 'dance' Music and Institutionalised/Academic Music: Content and Context

What becomes apparent from the previous discussion is the divide in the sonorities which began to emanate as a consequence of different approaches to composition. In the fifties and sixties, the two schools of thought in composition, Musique Concrète and Elektronische Musik, produced opposing ideas in production concepts and sonic results. At this time the practice of composing within the sphere of Electronic Music would have been confined to either academic/research institutes or serious composers, primarily due to the cost of equipment associated with producing such music.

It wasn't until the introduction of the Moog Synthesiser in the mid sixties that Electronic Music became truly commercialised and accessible to the public. Albums like *Switched on Bach,* defined a new breed of artist such as Wendy Carlos, who wanted to make accessible and beautiful music, which contrasted with the music being made by established composers of the time.

> 'When I tried to do had anything like a melody or a recognizable chord progression or the same meter in three measures in a row, it was all considered demeaning and laughable and not nearly serious enough because it wasn't designed to be profound art and befuddling to the average person' (Carlos in Holmes 2002, p. 169).

Inventors and artists like Moog and Carlos were embracing a notion of making Electronic Music accessible. Carlos was making music which contrasted with the dissonant abstract sounds of 'established composers' which she refers to as ugly music (ibid, p. 168), while Moog was paving the way for accessible and affordable musical instruments. With this shift in the commercial aspect of Electronic Music, a difference in the sonorities and a further divide from the more institutionalised aspect of Electronic Music was imminent. A significant shift in culture and context of Electronic Music emerged as different hybrids of the genre became popular, the most evident being the synthesizer, as it was co-opted by the world of rock and pop.

> 'Electrically synthesized music had become public property. Commercial manu-

> facturers quickly learned that most pop musicians wanted portable, easy to use machines that could be readily blended into an acoustical texture dominated by the electric guitar' (Pennycook in Emmerson 1984, p. 123).

Academic institutions, at the time, acted as places where the science of Electronic Music could be studied, where young enthusiasts got the chance to operate equipment and learn compositional concepts which would otherwise be unavailable to them. However, while an

> 'increasing number of students chose Electronic Music courses the musical language which they used was based on electronically generated rock or jazz styles which they were most familiar with' (Emmerson 1984, p. 124).

Students and artists alike were embracing new hybrids, merging familiar genres and compositions with instruments and concepts from the electronic world.

The hip-hop movement which took place in the ghettos of New York in the seventies relied on re-contextualising funk and soul records to make new compositions, while inventing new and original artistic mean of expression utilising turntable technology such as beat-juggling and scratching, an art form in itself. Electronic music was on the streets (Hip-Hop block parties), in clubs (Disco Music) and available to a larger demographic with it being featured in films and on the radio, it was no longer the culture of the elite, of composers or academics. This new empowering mind frame carried through to the eighties as a flurry of new genres emerged, seemingly overnight, all formed by a strong symbiotic relationship with electronic instruments, most notably:

Drum and Bass, Jungle, Breakbeat – these genres were heavily influenced by the sampling culture which emerged as a result of the growing use of the Akai range of samplers. This hardware made re-contextualising old break beats and other samples easier and faster to do. was inspired by the evolution of the Akai range of samplers

Acid House – the bass sounds by Roland's synth, the TB 303, were used first over house records in the late eighties. The pioneer of the genre, *Phuture*, released Acid Tracks, whose steady 4/4 beat and squelching bass sounds spurred on a new generation of underground raves and drug culture.

> '[Electro] started by Afrika Bambataa's *Planet Rock* in 1982, was a branch of Hip-Hop that featured drum machines, video game imagery and a general funky robotic feel' (Shapiro 2000, p. 218).

Techno – Derrick May described Techno as a complete mistake, joking that it was a result of *Kraftwerk* and George Clinton stuck in an elevator with only a sequencer to keep them company. With its origins in the likes of *Kraftwerk* and funky Detroit House Music, it soon became coopted by the rave generation. By then

> 'techno bore almost no resemblance to the funky beats and rhythms of house music as it took on more drug influenced hypnotic tribal beats' (Snoman 2004, p. 286).

The context and content of music had changed dramatically since the days of the early electronic pioneers as artists wanted to appeal to there audience primarily through making them dance. They no longer wanted to make, as Wendy Carlos says, abstract ugly music, and it is in these differences where one can find the defining characteristics which divides electronic 'dance' music and academia/institutionalised music.

Digitalism: The rise of the Personal Computer

The meticulous works of the early electronic pioneers, inventors and artists like Cahill, John Cage, Bob Moog, Stockhausen, Kool Herc, Grandwizard Theodre and Grandmaster Flash and hardware manufacturers like Roland or Yamaha have all now been appropriated by the laptop generation. Instead of rooms

of hardware equipment, artists now have access to software programs like Propellerhead's Reason, Ableton, Fruity Loops, Acid, Max/MSP and Csound and can avail of synthesis concepts and processes implemented by the early pioneers. However, this era of computer music would never have been possible had it not been for the work of early computer musicians and programmers. Holmes (2002) describes digital synthesis as being concerned with producing tones using solid-state oscillators on integrated computer circuits, then using a digital to analogue converter to convert the binary numbers from the computer to analogous electrical waves that can drive a loudspeaker system. It's not surprising that the powerful computer systems of today have their origins in more primitive computer systems. Consider the early experiments by Bell Labs and Max Matthews in the late fifties, with systems such as MUSIC V or Barry Vercoe's adaption of this system Music 360: these programs

> 'required access to large mainframe computers which could accommodate digital to analog conversion hardware for real-time playback' (Pennycook in Emmerson 1984, p. 122).

The primary system of the early days was the IBM 360 which could take days or even weeks to render and produce audio which was not only inconvenient for the composer but also made the commercialisation of this type of system completely impossible. This, once again, left experimentation with such equipment up to composers who had sufficient institutional or academic privileges that access to such a system would be available (e.g. The Center For Research in Music and Acoustic-CCRMA at Stanford University, MIT or IRCAM). The introduction of the Digital Equipment Corporations PDP-11 computer system gave composers a lower cost and portable computer system with which to compose. However, even then

> 'few institutions with PDP-10s in general use by the university community were prepared to support computer music at these costs' (Emmerson 1984, p. 126).

Towards the end of the seventies and into the eighties, digital sampling became a popular concept and machines like the Fairlight CMI and the Synclavier exploited the analogue synthesiser design while incorporating internal computers which aided the production of digital synthesis since one could store samples on the internal memory.

An equally important development, which aided the evolution of the home studio was the introduction of midi in the mid-eighties. MIDI (Music Instrument Digital Interface) acted as a protocol for computer instruments to communicate with synthesisers and drum-machines which allowed users of the popular personal computers of the time such as IBM and Apple Computers (which became prevalent in the early eighties as more commercial versions of original systems such as the IBM 360) synchronise their hardware with a computer, which can be seen as a milestone event in the world of computer based performance and production.

In the last two decades, as technology and computers advanced, the recording studio and production environment became commercialised, with companies like Steinberg and Propellerhead, Cycling 74, Logic and Ableton exploiting the home computer, contributing to a new breed of bedroom producers and DJs. This meant that academic institutions and large recording studios were no longer necessary to record, produce or learn about music technology. Once, the only places that provided access to equipment such as synthesizers were research institutions but now the power of the studio was in the hands of the counterculture and the everyday artists. This liberating concept gave birth to equally liberating genres and continues to do so, to this day.

The Turntable: A Cultural Mediator

The turntable has been a creative catalyst in many of the genres discussed up to this point. Consider the Hip-Hop movement in the 1970s and defining electronic dance genres such as Disco, Acid House and Electro. As early as 1930, there were explorations into turntable based composition:

In Berlin, Paul Hindemith and Ernst Toch made preliminary studies in

> 'made for-phonograph record music as early as 1930, 18 years before Schaeffers's leap into *musique concrète'* (Kahn in Emmerson 2007, p. 15).

John Cage's early experiments also exploited turntable technology as in his 1939 composition *Imaginary Landscapes No 1*. However, it was not until the advent of *Musique Concrète* in the late 1940s that the symbiotic relationship between turntable and genre became apparent. The turntable was an intrinsic element in Pierre Schaeffer's studio, allowing him to pitch shift, loop and reverse samples to create the founding production processes which formed the basis for numerous genres in years to come. From the seventies, the turntable became accessible to a different demographic, as a medium for playing music, and with the rising importance of the DJ in genres like Hip-Hop (with its offshoots into turntablism) and Disco the 'shamanic role of the orchestra conductor has translated to become the DJ' (Emmerson 2007, p. 16). With the introduction of the CD, the turntable as a household commodity waned but was still kept alive by turntablists.

Turntablism is concerned with using turntables as musical instruments, recontextualising records and samples as the source material. Turntablists'

> 'primary interest is to generate sounds from the turntable and DJ mixer, rather than playing pre-recorded music as the typical DJ does' (Lippit 2004, p. 211).

Within the realm of Hip-Hop and turntablism, artists like Q-bert and DJ Spooky developed techniques pioneered by Grandmaster Flash and Grandwizard Theodre to develop scratch music and the DJ culture as a Twentieth Century art form, while turntablists/composers like Janek Schaeffer, Phillip Jeck and

Christian Marclay championed turntable sound collages within the art music culture.

Advances in computer technology in the last century brought with them an influx of computer software for DJs, VJs (video jockeys), programmers and turntablists alike. Software such as Ableton, Traktor, Serato and MsPinky challenged the place of turntables in both social and musical contexts as DJs opted for computer orientated interfaces to create and mix music. *Computer Based Turntablism* (Smith 2009) can be seen as the resultant hybrid culture of this technological climate. The ethos behind such a genre is using time-coded vinyl to control audio files on a computer. More in-depth programs, like Ms Pinky, used in conjunction with the programming environment of Max/MSP, can control more minute parameters such as pitch, direction and speed with information retrieved from the time-coded vinyl. As this genre is in its infancy, there is not a clearly defined group of computer-based turntablists, although there are online communities which act as a forum for these artists who are otherwise internationally dispersed. One such forum is the *Alternative Turntable Forum* which features the use of turntables in various disciplines, including visual and audio performance and some fixed media pieces.

The context of the turntable continually morphs as it is co-opted by different genres and cultures. Where, in one respect, a cultural climate might be unfavourable toward the instrument, another social or musical paradigm introduces it and a new context in which it is appreciated is created, contributing to its ebb and flow presence within culture.

This restates the instrument's uniqueness and conveys its cultural mediating qualities, as an engaging instrument for aficionados of the music world, academic and electronic dance cultures, and the general public alike.

The Turntable in an Adaptive Synthesis System: A New Model for *Computer*

Based Turntablists

Computer based turntablism relies on the symbiotic relationship between performer and computer. If the performer does not act as an input source (in the sense of supplying a computer system with physical gestures to create sound) to the computer instrument, no sound will be produced. This ethos can be viewed in parallel with that of the adaptive synthesis concept described by Risto Holopainen in his PhD project description, 'Building Autonomous Instrument: *Aesthetic, Psychoacoustic and Musico-Technologic Perspective on Adaptive Synthesis'.*

> 'Adaptive Synthesis or self modifying synthesis works by analysing the instrument's output, while the analysis simultaneously influences the way the instrument generates sound' (Holopainen 2008, p. 1).

In the context of a computer-based turntablist system this style of synthesis is highly relevant. Without delving too much into the technical aspect of the system one can view this style of synthesis with a relatively simple computer instrument using Max/MSP and Ms Pinky. The configuration in my current system allows me to control numerous audio files from my computer by using one turntable. With the ability to control the audio similar to that of any record, pitch, direction and speed are easy to manipulate via the vinyl. However, one huge advantage of using Ms Pinky software in the programming environment of Max/MSP is the ease with which one can make the vinyl control other aspects of the computer instrument, as numeric values for pitch, direction and speed are relayed to the computer. This allows the user to control filters and effects like reverb feedback and, with the use of conditionals, allows me to turn on buttons and trigger events, such as a record button.

The adaptive synthesis model is applicable in a number of ways. The numeric values outputted from the vinyl to the laptop, affect the ways the instrument will generate audio, in the sense of imposing different characteristics on the audio files controlled by the laptop, with regard to filtering or effects. Equally, if I triggered a buffer to record this processed audio, I could then control the pitch, direction and speed of this buffer from the turntable, again restating the ethos of adaptive synthesis. 'In a sense, adaptive synthesis is all about constructing musical automata' (Holopainen, p. 3). Within the system above there is a presence of autonomous instruments: the interactive computer environment can be designed to be better behaved and responsive to a musician's actions, as opposed to merely acting as an instrument that the musician doesn't control, once started. These are the two major differences in instruments within the realm of autonomous instruments and adaptive synthesis, distinctly separated by Holopainen, the former of which I think is more applicable to computer based turntablism.

This hybrid of turntablism and laptop performance is a genre which, I believe, will usher in a new era of appreciation and interest for the turntable from both the academic world and Electronic Music culture alike. The history of the turntable conveys that while the instrument itself remains relatively unchanged in design and functionality, the context in which it is used calls for a new approach and way of appreciating the instrument. Given the current technological climate, it would seem to be a logical conclusion for the instrument to be introduced to a computer or laptop system. Artists such

as DJ Sniff, Daito Manabe and a selection of students from academic institutions worldwide are embracing this hybrid and are fusing an instrument which they have used for many years in a different context with more institutionalised styles of music and production processing on the computer.

Conclusion

The divide between electronic dance music and academic/institutionalised music is most obvious in the early days of the genre. Financially, Electronic Music was not accessible to the public until the commercialisation of the synthesizer, toward the end of the sixties. Institutions such as GRM or the Cologne Electronic Music Studio allowed for research into the science of Electronic Music by established composers and young enthusiasts and allowed these aficionados 'hands on' experience with equipment which would otherwise be inaccessible, the more prominent divide emerged in the early seventies as the countercultures co-opted concepts and practices made famous by early pioneers and with hardware becoming more available, the science of Electronic Music became less important and the electronic dance culture evolved as a result of this shift. Notable genres in this era such as Disco, House Music and Hip-Hop placed more emphasis on the performance of the DJ and his/her instrument of choice. The rise of the personal computer widened the gap further between institutions and electronic dance music culture as once again, due to cost of early computer systems, only academic facilities could afford such equipment.

These divisions have been accentuated in the current technological climate with the development of software and computers which alleviate the need for studios and the absolute necessity for the technology to be taught in academic institutions. In parallel with the evolution of Electronic Music, the turntable has remained prevalent, whether as a domestic commodity or creative tool. In the age of the laptop performer, manufacturers realise the desire to use turntables and an influx of software has emerged, some of which caters for the role of the DJ, whereas others lean toward an interesting mix of programmer and DJ, which seems to transcend genre and context.

This paper was by no means meant to be a concise history of Electronic Music or the turntable: instead, it was a look at genres and cultures which have influenced the way we produce, perform and appreciate Electronic Music today. Some genres, artists and manufacturers have been overlooked not out of ignorance, but in order to keep my focus myopic and centred around the ideas I wanted to explore.

Bibliography

Alternative Turntable Forum. Available from: http://forum.itchymuzik.com/index.php [accessed 11/10/2009]

EMMERSON, S. (1984) *The Languages of Electro-Acoustic Music.* Hampshire and London: The Macmillan Press Ltd.

EMMERSON, S. (2007) *Living Electronic Music,* Hampshire, England: Ashgate Publishing Limited.

HOLMES, T. (2002) *Electronic and Experimental Music.* 2nd ed. London: Routledge.

HOLOPAINEN, R. (2008) *Building Autonomous Instrument: Aesthetic, Psychoacoustic and Musico-Technologic Perspective on Adaptive Synthesis.* PhD Project Description, University of Oslo. Available from: http://folk.uio.no/ristoh/adaptive.html

LIPPIT, T. (2004) *Realtime Sampling System for the Turntablist Version 2: 16padjoystickcontroller*, in: NAGASHIMA, Y. and LYONS, M.J., Proceedings of the 2004 Conference on the New Interfaces for Musical Expression (NIME04), Hamamatsu, Japan.

NYMAN, M. (1999) *Experimental Music: Cage and Beyond. 2nd ed.* Cambridge: University Press.

SHAPIRO, P. (Ed.) (2000) *Modulations*, New York: Caipirinha Productions, Inc.

SMITH, E. (2009) *Turntable and Computer Composition,* in: WOLF, M. (Ed.) Proceedings of Sound, Sight, Space and Play 2009, De Montfort University Leicester, United Kingdom.
Available from: http://www.mti.dmu.ac.uk/events-conferences/sssp2009

SNOMAN, R. (2004) The Dance Music Manual: Tools, Toys and Techniques. Oxford: Elsevier Ltd.

Discography

Wendy Carlos (1968), *Switched on Bach,* Music LP, USA, Columbia Records.